M.Phil., ZOOLOGY

SEM	SUB CODE	COURSE	SUBJECT TITLE	HRS / WEEK	CREDIT	CIA Mark	ESE MARK	TOTAL MARK
I	20MPZO1CC1	Core I	Research Methodology	4*	4	25	75	100
	20MPZO1CC2	Core II	Advances in Biological Research	4*	4	25	75	100
	20MPZO1CC3	Core III	Teaching and Learning Skills (Common Paper)	4*	4	25	75	100
	20MPZO1CC4	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	100	300	400
II	20MPZO2PD		Dissertation##	-	8	-	-	200
GRAND TOTAL				-	**24**	-	-	**600**

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

Sem	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
I	20MPZO1CC 1	Core – I	RESEARCH METHODOLOGY	4	4	100	25	75

Course Outcome:

1. Define and describe Research, literature survey, Journals, Impact factor, Citation index, Reviews monographs; Thesis components.
2. Discuss and explain model organisms, patent, Spectrophotometry , Centrifuge, Chromatography , Electrophoresis, Blotting technique- types, principles &application.
3. Summarise Microtechnique procedures, tissue processing and Histochemistry; acquire knowledge on SEM & TEM, and Photomicroscopy .
4. Decide and apply the different methods in microbiological studies.
5. Judge and Justify the use of statistical methods and tools in biological experiments.

UNIT I: Literature survey and Thesis writing 12hours

Research – Objectives – Types, 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.

UNIT II: Separation Technique 12 hours

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,descriptionandapplications).Electrophoresis– Types:– PAGE, SDS-PAGE, 2D Electrophoresis. Immunoelectrophoresis – #ELISA #– Blotting techniques – Southern, Western and Northern – Principle andapplications.

UNIT III: Microtechnique and Microscopy 12 Hours

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.

UNITIV: Microbial Culture Techniques 12 Hours

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.

UNIT V: Statistical methods and tools **12 Hours**

Statistical Methods: Hypothesis testing. Tests of Significances: Student's "t" test, F– Test – One way and Two way 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 statisticalanalysis.

#....# Self-study portion

Text Books:

1. Grumani, N. Research Methodology for Biological Sciences. MJP Publishers, Chennai. 2006.

Books for Reference:

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 EasternLimited.1970.
3. Pelczar, M.J. and R.D. Reid.. Microbiology. Tata Mc GrawHill, NewDelhi.1996.
4. De Robertis, E.D.P. and De Robertis, E.M.F.. Cell and Molecular Biology. 8th Edition, B.I. Waverly Pvt. Lid., NewDelhi.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, NewYork.2000.
7. Gupta, P.K. Biotechnology and Genomics (I Edition) Rastogi Publications, Meerut.2004.
8. Zar, J.H. Biostatistical Analysis. Pearson Education Asia, NewDelhi.2003.
9. Dubey, R.C and Maheshwari, D.K.. A text book of microbiology. S.Chand&Co Ltd., NewDelhi.1999.

Web Reference:

1. https://gradcoach.com/what-is-research-methodology/
2. https://www.sciencedirect.com/topics/engineering/bioinstrumentation

Relationship Matrix for Course Outcomes, Programme Outcomes and ProgrammeSpecific Outcomes:

Semester	**Code**			**Title of the Paper**				**Hours**		**Credits**
I	20MPZO1CC1			**RESEARCH METHODOLOGY**				**4**		**4**
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	√		√	√	√	√	√	√	√	√
CO2	√	√	√	√	√	√	√		√	√
CO3		√	√	√	√	√		√	√	√
CO4	√	√		√	√	√			√	√
CO5	√	√	√	√	√	√	√	√		√
Number of Matches= 38 ,Relationship : High										

Prepared By:
Dr. I. Joseph A. Jerald

Checked by:
Dr. M. Aneez Mohamed

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Sem	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
I	20MPZO1CC2	Core – II	ADVANCES IN BIOLOGICAL RESEARCH	4	4	100	25	75

Course Outcome

1. Acquire knowledge on environmental biology, bioremediation, conservation of biological diversity and molecular markers in Genome analysis.
2. Comment and communicate microbiology and microbial techniques; cloning techniques and their application in biology.
3. Review immunological techniques and cancer biology and pregnancy.
4. Survey and record basic technique in cell culture, Protein Engineering and Transgenics.
5. Evaluate and apply Bioinformatics tools and Biological databases.

UNIT I: Environmental Conservation **12 Hours**

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 – *ex situ* and *in situ.* 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.

UNIT II: Microbiology and Microbial Techniques **12 Hours**

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 anddemerits.

UNITIII: Immunological Techniques **12 Hours**

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#.

UNITIV:AnimalBiotechnology **12 Hours**

BasictechniquesofMammaliancellcultures–Celllines– Manipulation of cultured cells and tissues – Application of Animal cell cultures – Stem cell cultures – Apoptosis – Protein Engineering – Transgenic animals – Advantages. Gene Therapy. #HumanGenomeProject# – DNAfingerprintinganditsapplications–BiosensorsandBiochips and their Applications – **Plant Biotechnology:** Explants and their incubation – Regeneration of plants from callus – #Applications of Tissue culture# – Transgenic plants – IPR and PatentRights.

UNIT V: Bioinformatics **12 Hours**

Scope of Bioinformatics – Genomes and Proteomes – The genome of *Homo sapiens* (the human genome). Single Nucleotide Polymorphisms. Biological Databases – Primary, Secondary, Specialized and Structural database. Databases searches for homologous sequences – FASTA, BLAST and molecular docking. Local and global alignment concepts – Clustal-W –#Phylogenetic trees – clusteringmethods#.

#...# Self-study portion

Text Book:

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.

Books for Reference:

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 reference:

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.moscmm.org/pdf/Ananthanarayan%20microbio.pdf
6. http://www.grsmu.by/files/file/university/cafedry/microbiologii-virysologii-
7. immynologii/files/essential_microbiology.pdf
8. https://www.ncbi.nlm.nih.gov/
9. https://pubmed.ncbi.nlm.nih.gov/
10. https://blast.ncbi.nlm.nih.gov/Blast.cgi
11. https://www.embl.org/
12. https://www.ddbj.nig.ac.jp/index-e.html
13. https://prosite.expasy.org/

Relationship Matrix for Course Outcomes, Programme Outcomes and ProgrammeSpecific Outcomes:

Semester	**Code**			**Title of the Paper**				**Hours**		**Credits**
I	**20MPZO1CC2**			**ADVANCES IN BIOLOGICAL RESEARCH**				**4**		**4**
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	√		√	√	√	√	√	√	√	√
CO2	√	√	√	√	√	√	√		√	√
CO3		√	√		√	√		√	√	√
CO4	√	√		√		√			√	√
CO5	√	√	√	√	√	√	√	√		√
Number of Matches= 36 ,Relationship : High										

Prepared By: Dr. I. Joseph A. Jerald

Checked by: Dr. M. Aneez Mohamed

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Sem	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
I	20MPZO1CC 3	Core – III	TEACHING AND LEARNING SKILLS	4	4	100	25	75

Course Outcome

1. Explain the applications of computers and examine ICT and its merits.
2. Investigate and manipulate communication skills
3. Compare and construct communication technique and browsing techniques.
4. Design and apply Pedagogy to improve Teaching Learning Techniques.
5. Revise and standardize Teaching skills.

UNITI: Computer Applications Skills 12 Hours

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.

UNITII: Communication Skills 12 Hours

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 anddynamics#.

UNITIII: Communication Technology 12 Hours

Communication Technology: Bases, Trends and Developments – Skills of using Communication Technology – Computer Mediated Teaching: Multimedia, E-Content – Satellite-based communication: EDUSAT and ETV Channels. Communication through web: Audio and Video applications on the internet, Interpersonal communication through the web. #Browsing Techniques#, Website: Pub-med, Springer Link, Science directs.

UNITIV: Pedagogy 12 Hours

Instructional Technology: Definition, Objectives and Types – Difference between Teaching and Instruction – Lecture Technique: Steps, Planning of a Lecture, DeliveryofaLecture–NarrationItunewiththenatureofdifferentdisciplines– Lecturewithpower 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 andWBI.

UNITV: Teaching Skills **12 Hours**

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 TeachingSkills.

#...# Self-study portion

Text Books

1. Kumar, K.L. Educational Technology, New Age International publishers, NewDelhi. 2008.
2. Vanaja, M and Rajasekar, S. Computer Education, Neelkamal Publications, Hydrabad. 2006.

Books for Reference:

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), NeelkammalPublications,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 Reference:

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.

Relationship Matrix for Course Outcomes, Programme Outcomes and ProgrammeSpecific Outcomes:

Semester	**Code**			**Title of the Paper**				**Hours**		**Credits**
I	**20MPZO1CC3**			**TEACHING AND LEARNING SKILLS**				**4**		**4**
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	√		√	√	√	√	√	√	√	
CO2	√	√	√	√	√	√	√		√	√
CO3		√	√		√			√	√	√
CO4	√	√		√		√			√	√
CO5	√	√	√	√	√	√	√	√		√
Number of Matches= 34 ,Relationship : High										

Prepared By:
Dr. I. Joseph A. Jerald

Checked by:
Dr. M. Aneez Mohamed

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high