ಮಂಗಳೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ

MANGALORE UNIVERSITY

(Accredited by NAAC)

ಕ್ರಮಾಂಕ/ No. : MU/ACC/CR 67/2020-21/A2

ಕುಲಸಚಿವರ ಕಛೇರಿ
ಮಂಗಳಗಂಗೋತ್ರಿ – 574 199
Office of the Registrar
Mangalagangothri – 574 199
ದಿನಾಂಕ/Date:25.11.2021

NOTIFICATION

Sub: Revised syllabus for Ph.D. Coursework in Biotechnology
Ref: Academic Council approval vide agenda
No.: ಎಸಿಸಿ:ಜೈ.ಸಾ.ಸ.2: 18(2021–22) dated 27.10.2021

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The revised syllabus for Ph.D. Coursework in Biotechnology which has been approved by the Academic Council at its meeting held on 27.10.2021 is hereby notified for implementation with effect from the academic year 2021-22.

REGISTRAR

To,

1. The Chairman, Dept. of Biosciences, Mangalore University, Mangalagangothri
2. The Co-ordinator, Biotechnology Programme, Dept. of Biosciences, Mangalore University.
3. The Chairman, PG BOS in Biotechnology, Dept. of Biosciences, Mangalore University.
4. The Registrar (Evaluation), Mangalore University.
5. The Superintendent (ACC), O/o the Registrar, Mangalore University.
6. The Asst. Registrar (ACC), O/o the Registrar, Mangalore University.
7. Guard File.

MANGALORE UNIVERSITY
Department of Biosciences
Ph.D. Course Work in Biotechnology

Program Outcome

PO 1 The program of PhD Biotechnology Program is aimed at nurturing quality human resource with research acumen in the varied aspects and fields of Biotechnology.

PO 2 This is proposed to be done by providing the required academic and research inputs, so as to enable them to arrive at deliverables that would not only enhance the research in the concerned field of Biotechnology, but also provide tangible research publications.

PO 3 It is also hoped that students will be able to evolve innovative solutions to existential problems through their work.

Program Specific Outcomes

PSO 1 Research expertise in Biotechnology

PSO 2 Driving innovation in the medical and agricultural field through biosimilars and formulations

PSO 3 Indigenous research solutions to health problems

PSO 4 Driving sustainable development through topics on environmental biotechnology

PSO 5 Development of suitable research models for use in pre-clinical and other sectors

Scheme of Assessment and Examination

Courses	Particulars	Hours of Instructions per week	Duration of Examination (Hrs)	Marks			Credits
				IA	Theory	Total	
Course I	Research Methodology	4	3	30	70	100	4
Course II	Research and Publication Ethics	2	3	30	70	100	2
Course III	Review of Literature Review Report Viva	14	-	-	-	 150 50	 6 2
		Total				**400**	**14**

* Internal Assessment (30 marks) will be based on assignment/seminar.

* Review report should contain a detailed synthesis of research work in the area, methodologies used, gaps identified, aims and objectives and expected outcome of the stated research work

COURSE I –RESEARCH METHODOLOGY

Course Outcomes:

Students will derive the basics of:

1. Methods used to arrive at quality, reliable, reproducible, innovative research
2. Writing of a research paper
3. Biosafety guidelines and precautions including good laboratory practices
4. Model organisms evolved for research in Biotechnology
5. Regulations regarding use of microorganisms, rDNA technology, animal and human samples for research
6. Biological Techniques required for cell and molecular biology
7. Biological Techniques required for separation and quantification
8. Statistical Analysis and graphical representation of data

Unit 1: Research prerequisites

a) Testing hypothesis – null and alternate hypothesis, refinement of experiment
b) Field/Lab techniques, study/experimental design, negative and positive controls, Methodology; sample size
c) Collection, compilation, analysis, interpretation of data and drawing conclusions
d) Literature retrieval, citation methods and bibliography.
e) Formats for writing research paper/dissertation. Shodhganga, IPR and patenting
f) Types of research/study (e.g. Cohort study)
g) Design of questionnaire
h) Good laboratory practices (GLP). Safety standards, safety measures, safety regulations: Institutional Biosafety Committee (IBSC). Guidelines and ethics in animal experimentation, animal breeding and maintenance; CPCSEA; Institutional Animal Ethics Committee (IAEC); Institutional Ethics Committee (IEC).
i) Model organisms in life science research – *Neurospora crassa, Arabidopsis thaliana, Caenorhabditis elegans, Drosophila melanogaster, Danio rerio, Mus musculus, Rattus norvegicus.*

Unit 2: Principles of instrumental analysis

a) Photomicrography; Tissue preparation for microscopic analysis
b) Light microscopy, Fluorescent microscopy, Transmission and Scanning Electron Microscopic techniques (TEM and SEM) – Preparation of samples and their applications; confocal microscopy and atomic force microscopy
c) Autoradiography and scintillation counting
d) X-ray diffraction techniques, IR analysis
e) Gel documentation
f) NMR, HPLC< FPLC, GCMS, MALDI
g) ELISA, RIA
h) PCR

Unit 3: Analytical techniques

a) Ultra centrifugation (tissue fractionation)
b) Chromatographic techniques
c) Electrophoresis and Spectrophotometry
d) Photometry and related techniques, Luminometer
e) Staining techniques – cytological and histochemical, fluorescent - FISH

f) Lyophilization
g) Blotting techniques – Western, Southern and Northern

Unit 4: Biostatistical methods

a) Standard deviation, standard error of the mean
b) Sampling – Design, concepts, types, techniques and scaling, choosing sample size and z-score.
c) Theory of probability, normal distribution, parametric and non-parametric tests, independent/repeated measures design
d) Design of experiments (e.g. Random block design and Latin square design), Analysis of variance (ANOVA, ANCOVA, MANOVA)
e) Graphical representation
f) Databases, Statistical packages
g) Hardy-Weinberg equilibrium
h) Techniques of remote sensing in bioresource mapping.

References:

1) Baily and Ollis. 1986 Biochemical Engineering Fundamentals 2/e. McGraw-Hill, Michigan
2) Banwell, C.N. 1972. Fundamentals of Molecular Spectroscopy. McGraw Hill, London.
3) Buerges, M.J. 1942. X-Ray Crystallography, John Wiley, New York.
4) Carr C.E. 1982. Cell Structure: An Introduction to Biomedical Electron Microscopy. Churchill, Edinburgh.
5) Chaplin, M.F. and Bucke. 1990 Enzyme Technology. Cambridge University Press.
6) Da Skooge Holt 1985. Principles of Instrumental Analysis. Saunders.
7) Dennis, P. 1977. Kinetics of Chemical and Energy Catalyzed Reactions. Oxford University Press, New York.
8) Hayet, M.A. 1978. Principles and Techniques of Electron Microscopy. Van Nostrand Reinhold, New York.
9) Ian Freshney, R. 2000. Culture of Animal Cells: A Manual of Basic Technique. IV Edition, Wiley-Liss.
10) Karp, G. 1999. Cell and Molecular Biology – Concepts and Experiments. (Ed. John Harris, D),Wiley & Sons, New York.
11) Khan and Irfan 1994. Fundamentals of Biostatistics, Ukaae Publication, Hyderabad.
12) Khopkar, S.N. 1988. Basic Concepts of Analytical Chemistry. II Edition, New Age Publishers.
13) Newbury Dale, E. 1988. Advanced Electron Microscopy and x-Ray Microanalysis. Plenum Publishers, New York.
14) Rastogi, V.B. 2006. Fundamentals of Biostatistics. Ane Book India, New Delhi,

COURSE II – RESEARCH AND PUBLICATION ETHICS (RPE)

Course Outcomes:

Students will be able to:

CO 1. Understand the philosophy of science and ethics and research integrity

CO 2. Be aware about the publication ethics and publication misconducts

CO 3. Develop hands-on skills to identify research misconduct and predatory publications.

CO 4. Differentiate indexing and citation databases, open access publication and research metrics

CO 5. Use plagiarism tools

Theory

Philosophy and Ethics (3 hrs.)

a) Introduction to philosophy: definition, nature and scope, concept, branches
b) Ethics: definition, moral philosophy, nature of moral judgement and reactions

Scientific Conduct (5hrs.)

a) Ethics with respect to science and research
b) Intellectual honesty and research integrity
c) Scientific misconducts: falsification, fabrication, and plagiarism (FFP)
d) Redundant publications: duplicate and overlapping publications, salami slicing
e) Selective reporting and misrepresentation of data

Publication ethics (7hrs.)

a) Publication ethics: definition, introduction and importance
b) Best practices/ standards setting initiatives and guidelines: COPE, WAME, etc.
c) Conflicts of interest
d) Publication misconduct: definition, concept, problems that lead to unethical behaviour and vice versa, types
e) Violation of publication ethics, authorship and contributorship
f) Identification of publication misconduct, complaints and appeals
g) Predatory publishers and journals

Practice

Open access publishing (4hrs.)

a) Open access publications and initiatives
b) SHERPA/RoMEO online resource to check publisher copyright & self-archiving policies
c) Software tool to identify predatory publications developed by SPPU
d) Journal finder/ journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer Journal Suggester, etc.

Publication misconduct (4hrs.)

A. Group discussions (2 hrs.)

a) Subject specific ethical issues, FFP, authorship
b) Conflicts of interest
c) Complaints and appeals: examples and fraud from India and abroad

B. Software tools (2 hrs.)

a) Use of plagiarism software like Turnitin, Uukund and other Open Source software tools

COURSE III - REVIEW OF LITERATURE

Course Outcomes (CO)

The student will learn to:

CO 1. Search, retrieve authentic research papers, reviews, monographs, and books for background information.

CO 2. Synthesise the relevant information for use in the research project.

CO 3. Identify the gaps and create a hypothesis with tangible objectives.

CO 4. Appraise relevant methodology for the research work.

CO 5. Envisage the outcome and scope of the proposed work

Databases and research metrics (7 hrs.)

A. Databases (4 hrs.)

a) Indexing databases
b) Citation databases: Web of Science, Scopus, etc.

B. **Research metrics (3 hrs.)**

a) Impact factor of journal as per journal citation report, SNIP, SJR, IPP, Cite score
b) Metrics: h-index, g index, i10 index, altametrics

References:

1. Bird, A. (2006). *Philosophy of Science*. Routledge.
2. MacIntyre, A. (1967) *A Short History of Ethics*. London.
3. Chaddah, P. (2018) Ethics in Competitive Research: Do not get scooped; do not get plagiarized, ISBN:978-9387480865
4. National Academy of Sciences, National Academy of Engineering and Institute of Medicine. (2009). *On Being a Scientist: A Guide to Responsible Conduct in Research: Third Edition*. National Academies Press.
5. Rensik, D. B. (2011). What is ethics in research & why is it important. *National Institute of Environmental Health Sciences*, 1-10. Retrieved from https://www.niehs.nih.gov/resources/biothics/whatis/index.cfm
6. Beall, J. (2012). Predatory publishers are corrupting open access. Nature, 489(7415), 179-179. https://doi.org/10.1038/489179a
7. Indian National Science Academy (INSA), Ethics in Science Education, Research and Governance (2019), ISBN:978-81-939482-1-7. https://www.insaindia.res.in/pdf/Ethics_Book.pdf

Ph. D Course Work in Biotechnology

Model Question Paper

Time: 3 hrs. Max. Marks: 70

1. Write short notes on any **Four** of the following (not exceeding 2 pages each): 4X4=16

   a.

   b.

   c.

   d.

   e.

   f.

Write brief answers on any **Four** of the following (not exceeding 4 pages each): 4X7=28

2.

3.

4

5.

6.

7.

Answer any **Two** of the following (not exceeding 8 pages each): 2X13=26

8.

9.

10.