

ಮಂಗಳೂರು  
MANGALORE



ವಿಶ್ವವಿದ್ಯಾನಿಲಯ  
UNIVERSITY

[Accredited by NAAC with 'A' Grade]

ಕ್ರಮ/No. : MU/ACC/CR.46/2014-15/A2

ಕುಲಸಚಿವ ಕಛೇರಿ

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ದಿನಾಂಕ/Date: 15.02.2016

## NOTIFICATION

Sub : Revised syllabus for Ph.D. Course work in Biotechnology  
Ref: Academic Council decision No.: 3:20(2015-16), dated 25.01.2016.

The revised Syllabus for Ph.D Coursework in Biotechnology which approved by the Academic Council at its meeting held on 25.01.2016 is hereby notified for implementation with effect from the academic year 2015-16.



REGISTRAR.

To:

- 1) The Chairmen of P.G. Departments/ Co-ordinators of P.G. Courses/ Principals of the Recognised Colleges/ Directors of Recognised Institutions of Mangalore University.
- 2) The Chairman, Board of Studies in subject concerned.
- 3) The Superintendent (ACC), O/o the Registrar, Mangalore University.
- 4) Guard File.

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

**Program Outcome**

The program of PhD Biotechnology Program is aimed at nurturing quality human resource with research acumen in the varied aspects and fields of Biotechnology. 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. It is also hoped that students will be able to evolve innovative solutions to existential problems through their work.

**Program Specific Outcomes**

- Research expertise in Biotechnology
- Driving innovation in the medical and agricultural field through biosimilars and formulations
- Indigenous research solutions to health problems
- Driving sustainable development through topics on environmental biotechnology
- Development of suitable research models for use in pre-clinical and other sectors

**Scheme of Examination for Ph.D. Course Work**

Papers	Particulars	Hours of Instruction per week	Duration of Examination (Hrs)	Marks			Credits
				IA*	Theory	Total	
Paper 1	Research Methodology	4	3	30	70	100	4
Paper 2	Review of Literature	16	-	-	-	150	8
	Review Report Viva	-	-	-	-	50	2
							<b>14</b>

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

\*Review report should contain state of the art research works analysis, related implementation issues and motivation for the stated research work

## PAPER 1 - RESEARCH METHODOLOGY

### Course Outcomes:

- Students will derive the basics of:
- Methods used to arrive at quality, reliable, reproducible, innovative research
- Writing of a research paper
- Biosafety guidelines and precautions including good laboratory practices
- Model organisms evolved for research in Biotechnology
- Regulations regarding use of microorganisms, rDNA technology, animal and human samples for research
- Biological Techniques required for cell and molecular biology
- Biological Techniques required for separation and quantification
- 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- design, 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. Journal indexing impact factor, h-index, journal ranking
- e) Format of writing research paper/dissertation. Plagiarism, Shodhganga, IPR and patenting
- f) Types of research/study (e.g. Cohort study)
- g) Design of questionnaire
- h) Safety standards, safety measures, safety regulations, and good laboratory practices, guidelines and ethics in animal experimentation
- i) Model organisms in life science research – *Neurospora crassa*, *Drosophila melanogaster*, *Caenorhabditis elegans*, *Arabidopsis thaliana*, *Zebra finch*, *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, Northern

#### **Unit 4: Biostatistical methods**

- a) Standard deviation, standard error of the mean
- b) Sampling - Design, concepts, types and techniques, 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**

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- Rastogi, V.B. 2006. Fundamentals of Biostatistics. Ane Book India, New Delhi

## PAPER 2 – REVIEW OF LITERATURE

### Course Outcomes

The student will learn to:

- Search, retrieve authentic research papers, reviews, monographs, and books for background information
- Synthesise the relevant information for use in the research project
- Identify the gaps and create a hypothesis with tangible objectives
- Appraise relevant methodology for the research work
- Envisage the outcome and scope of the proposed work



**Ph.D. Course Work Examination**  
**BIOTECHNOLOGY**  
**Research Methodology**

**Time: 03 Hours**

**Max. Marks: 70**

1. Write short notes on **any five** of the following:

**(5x3=15)**

- a)
- b)
- c)
- d)
- e)
- f)
- g)
- h)

2. Answer **any five** of the following:

**(5x5=25)**

- a)
- b)
- c)
- d)
- e)
- f)
- g)
- h)



Answer any three of the following:

**(3x10=30)**

- 3.
- 4.
- 5.
- 6.
- 7.

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