Pt. Ravishankar Shukla University
Raipur 492 010, Chhattisgarh

Syllabus

Ph.D. Course Work in Biotechnology
(Program Code: 0410)

Session
2024-2025

Approved by	Board of Studies	Academic Council
Date	14/05/2024	11/06/2024

Ph.D. Course Work in Biotechnology

Course Structure

(a) The duration of the Ph.D. course work shall be of 1 Semester (6 months).

(b) The Ph.D. course work consisting of 3 (Three) courses shall be of a total of 10 credits.

(c) These 10 credits shall be distributed as below:

Course Code	Course Title	Type of Course	Maximum Marks	Credit
LSBTCW110	Research Methodology, Advanced Tools & Techniques, Quantitative Data Analysis, and Entrepreneurship	Core	100	4
LSBTCW120	Review of Literature & Seminar	Core	100	4
LSBTCW130*	Research & Publication Ethics	Core	100	2
		Total	300	10

**This paper will be qualifying in nature. Classes and assessment of this paper will separately be done by the University Administration, and will issue certificate also.*

Ph.D. Course Work

Program	Subject	Year	Semester
Ph.D.	**Biotechnology**	**6 Months**	-
Course Code	Course Title		Course Type
LSBTCW110	**Research Methodology, Advanced Tools & Techniques, Quantitative Data Analysis, and Entrepreneurship**		**Core**
Credit	Hours Per Week (L-T-P)		
	L	T	P
4	**6**	-	**9**
Maximum Marks	CIA		EA
100	**25**		**75**

Learning Objective (LO):

Students will be able to develop a vision for different avenues of biotechnology and its scope in R&D activities. Students will become familiar with IPR, biosafety regulations and standards, and bioethics before commencing the research work. Develop ability to design, analyze, interpret and present the research work/ data. Will be acquainted with sophisticated instruments and techniques essential for various experimentations during their research. Will acquire technical skills to write research papers, reviews, research projects, project reports, thesis, *etc.*

Course Outcomes (COs):

CO No.	Expected Course Outcomes	Cognitive Levels	PO No.	PSO No.
1	Students will learn to identify research problems, understand and formulate research design, literature collection and citation, Intellectual Property Rights, management of experimental errors, and presentation of reports.	An	1,2,3,4,5,6,7,8,9,10,11	4,5,6
2	Will learn advanced tools and techniques in the field of biology, which will enable them to apply these methods into various biological analysis and research applications.	An	1,3,4,7,10,11	5,6
3	Get acquainted with skills and knowledge of conducting quantitative data analysis, foster an understanding of statistical concepts and their practical application in research and decision-making.	An	1,2,3,4,7,10	2
4	Scholars will acquire the knowledge and skills to navigate the complex intersections of entrepreneurship, biosafety, and bioethics of the biotechnology.	Ap	1,3,6,8,9,10	4,6

Cognitive Level: **An**-Analyze;**Ap**-Apply; **B**-Evaluate; **C**-Create; **R**-Remember; **U**-Understanding

Detailed Syllabus:

Unit No.	Topics	No. of Lectures	CO No.
I	Research Methodology Essential steps in research: Identification, Selection of objectives, case studies and practical knowledge of research process. Research design: Components, importance of literature collection, citation & indexing. IPR, Experimental error and control, ResearchReport Presentation: Table, Figure, Formatting and typing	15	1
II	Advanced Tools/ Techniques & their Application Electrophoresis, HPLC, Microscopy, PCR, Biosensors: Types, Application of biosensor, Biosafety cabinets; Protein sequencing, DNA sequencing, Radioisotope Techniques, Bioinformatics & Biological Databases.	15	2
III	Quantitative Data Analysis Measures of variability: Standard Deviation, Standard Error, Coefficient of Variation, Correlation and Regression, Test of Significant: t-test, chi-square test, Frequency distribution: Binomial and normal distribution, Statistical tools and techniques: MS Excel, SPSS.	15	3
IV	Entrepreneurship, Biosafety & Bioethics Entrepreneurship in bio-business: Introduction and scope in Bio-entrepreneurship, MSME, DBT, BIRAC, Make in India. Biosafety: Introduction; primary containment for biohazards; biosafety levels; principles of environmental risk assessment. Bioethics: Human, plants, microbes and animal experimentation, biopiracy.	15	4

CO-PSO Mapping for the Course:

PO	POs											PSO					
CO	1	2	3	4	5	6	7	8	9	10	11	1	2	3	4	5	6
CO1	2	3	3	1	3	2	3	2	1	3	2	-	-	-	1	3	3
CO2	3	-	2	1	-	-	3	-	-	3	3	-	-	-	-	3	3
CO3	1	3	3	1	-	-	2	-	-	1	-	-	1	-	-	-	-
CO4	1	-	1	-	-	3	-	3	3	3	-	-	-	-	3	-	2

"3" – Strong; "2" – Moderate; "1"- Low; "-" No Correlation

Ph.D. Course Work

Program	Subject	Year	Semester
Ph.D.	**Biotechnology**	**6 Months**	**-**
Course Code	Course Title		Course Type
LSBTCW120	**Review of Literature & Seminar**		**Core**
Credit	Hours Per Week (L-T-P)		
	L	T	P
4	**6**	**-**	**9**
Maximum Marks	CIA		EA
100	**25**		**75**

Learning Objective (LO): Scholars will be able to critically analyze existing literature in the area of the proposed Ph.D. program, demonstrating a deep understanding of key concepts, theories, methodologies, and findings relevant to their research topic.

Course Outcomes (COs):

CO No.	Expected Course Outcomes	Cognitive Levels	PO No.	PSO No.
1	By reaching these learning goals, students will be able to actively participate in the academic discussions in their selected area of research and set foundation for their PhD work.	Ap	1,2,3,4,7,9,10,11	6
2	It will help students to perusetheir research activity properly and make meaningful contribution to field of study.	Ap	1,2,3,4,7,9,10,11	6

Cognitive Level: An-Analyze; Ap-Apply; B-Evaluate; C-Create; R-Remember; U-Understanding

Detailed Syllabus:

Unit No.	Topics	No. of Lectures	CO No.
I	Review of Literature- Writing review of literature in the area of the proposed PhD program	30	1
II	Seminar-Based on the review of literature	30	2

CO-PSO Mapping for the Course:

PO	POs											PSO					
CO	1	2	3	4	5	6	7	8	9	10	11	1	2	3	4	5	6
CO1	3	3	3	2	-	-	3	-	2	3	3	-	-	-	-	-	3
CO2	3	3	3	2	-	-	3	-	2	3	3	-	-	-	-	-	3

"3" – Strong; "2" – Moderate; "1"- Low; "-" No Correlation

Ph.D. Course Work

Program	Subject	Year	Semester
Ph.D.	**Biotechnology**	**6 Months**	**-**
Course Code	Course Title		Course Type
LSBTCW130*	**Research & Publication Ethics**		**Core**
Credit	Hours Per Week (L-T-P)		
	L	T	P
2	**3**	**-**	**0**
Maximum Marks	CIA		EA
100	**25**		**75**

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Learning Objective (LO):

Course Outcomes (COs):

CO No.	Expected Course Outcomes	Cognitive Levels	PO No.	PSO No.
1	Students will acquire idea about philosophy of the research and its ethics, scientific conducts and publications ethics.	Ap	1,2,5,9,10,11	6
2	Students will gain knowledge of open access publishing, publication misconduct and, databases and research metrices.	Ap	1,2,5,9,10,11	6

Cognitive Level: An-Analyze;Ap-Apply; B-Evaluate; C-Create; R-Remember; U-Understanding

Detailed Syllabus:

Unit No.	Topics	No. of Lectures	CO No.
I	**RPE01:PHILOSOPHYANDETHICS** 1. Introduction to philosophy: definition, nature and scope, concept, branches. 2. Ethics:definition,moral philosophy, nature of moral judgments and reactions **RPE02: SCIENTIFIC CONDUCT** 1. Ethics with respect to science and research 2. Intellectual honesty and research integrity 3. Scientific misconducts: Falsification, Fabrication, and Plagiarism(FFP) 4. Redundant publications: duplicate and overlapping publications,salamislicing 5. Selective reporting and misrepresentation of data	15	1

	RPE03: PUBLICATION ETHICS 1. Publication ethics: definition, introduction and importance 2. Best practices/standards setting initiatives and guidelines: COPE, WAME,etc. 3. Conflicts of interest 4. Publication misconduct: definition,concept,problems, that lead to unethical behaviour and vice versa, types 5. Violation of publication ethics, authorship and contributor-ship 6. Identification of publication misconduct, complaints and appeals 7. Predatory publishers and journals		
II	**RPE04: OPEN ACCESS PUBLISHING** 1. Open access publications and initiatives 2. SHERPA/RoMEO online research to check publisher copyright & self-archiving Policies. 3. Software tool to identify predatory publications developed by SPPU 4. Journal finder/ journal suggestion tools viz.JANE, Elsevier JournalFinder, Springer Journal Suggester, etc. **RPE05: PUBLICATION MISCONDUCT** Group Discussions 1. Subject specific ethical issues,FFP,authorship 2. Conflicts of interest 3. Complaints and appeals: example and fraud from India and abroad Software tools Use of plagiarism software like Turnitin, Urkund and other open-sources of software tools **RPE06: DATA BASES AND RESEARCHMETRICS** Databases 1. Indexing data bases 2. Citation databases:Web of Science,Scopus,etc. Research Metrics 3. Impact Factor of journal as per Journal Citation Report, SNIP,SJR, IPP, Cite Score 4. Metrics: h-index, g-index, I10index, altmetrics	15	2

Recommended Books:

1. Alasdair Macintyre (First Touchstone Edition 1966), A Short History of Ethics, ATOUCHSTONE BOOK Published by Simon & Schuster.
2. C R Kothari (Second Edition 2004), Research Methodology- Methods and techniques, NewAge International Publishers.
3. Yogesh Kumar Singh (2006), Fundamental of Research Methodology and Statistics, New AgeInternational.
4. D K Bhattacharya (2006), Research Methodology, Excel Books.

5. Ben Mepham (Second Edition 2008), Bioethics "An Introduction for the Biosciences", OxfordUniversity Press.
6. Jerrold H. Zar (Fifth Edition 2010), Biostatistical Analysis, Pearson Upper Saddle River, NewJersey 07458.
7. Dr. Pranab Kr. Banarjee (Revised and Fourth Enlarged Edition 2011), Introduction toBiostatistics (A Textbook of Biometry), S Chand & Company Ltd. Ram Nagar, New Delhi –110055.
8. Khan and Khanum, Shiba Khan (Fifth Revised Edition 2018), Fundamentals of Biostatistics,Ukaaz Publications, Hyderabad, India.
9. Wilson and Walker (Eight Edition 2018), Principles and Techniques of Biochemistry andMolecular Biology, Cambridge University Press.
10. KambadurMuralidhar, Amit Ghosh, Ashok Kumar Singhvi (2019), Ethics in ScienceEducation, Research and Governance, Indian National Science Academy, New Delhi.

CO-PSO Mapping for the Course:

PO	POs											PSO					
CO	1	2	3	4	5	6	7	8	9	10	11	1	2	3	4	5	6
CO1	3	3	-	-	3	-	-	-	3	3	3	-	-	-	-	-	3
CO2	3	3	-	-	3	-	-	-	3	3	3	-	-	-	-	-	3

"3" – Strong; "2" – Moderate; "1"- Low; "-" No Correlation