

**BHARATI VIDYAPEETH DEEMED UNIVERSITY, PUNE (India)**

**Faculty of Science: Doctor of Philosophy (Ph.D.)**

**Syllabus for Ph.D. Course Work (2017)**

**For subjects under the Faculty of Science  
(Biotechnology)**

**Course work Details-**

Paper I	Research Methodology	4 credits
Paper II	Recent advances in the Biotechnology	4 credits
Paper III	Review of Literature on the proposed work In the form of presentations- a) Presentation on review of literature - 2 credits b) Presentation on the area of research - 2 credits	4 credits
<b>Total – 12 credits</b> (One credit being equivalent to 15 clock hours)		

**1. QUANTITATIVE METHODS**

**(15)**

**i. Collection of Data:** Introduction, Primary and secondary data, methods of collecting primary data, Drafting or framing the questionnaire, Sources of secondary data, Precautions in the use of secondary data.

**ii. Classification and Tabulation:** Introduction: Organization of data, Classification, Frequency distribution, Basic principles for forming a grouped frequency distribution, Cumulative frequency distribution, Bivariate frequency distribution, Tabulation meaning and importance

**iii. Graphic Representation Of Data:** Introduction, Difference between diagrams and graphs, Diagrammatic representation, Graphic representation of data, Limitations of diagrams and graphs.

**iv. Correlation Analysis:** Introduction, methods of studying correlation, scatter diagram method, Karl Pearson's method of correlation (covariance method), probable error, correlation in bivariate frequency table, rank correlation method, method of concurrent deviations, coefficient of determination, lag and lead correlation.

**v. Linear Regression Analysis:** Introduction, Linear and non linear regression, Lines of Regression, Coefficient of regression, To find the mean value from the two lines of regression, To find the regression coefficients and the correlation coefficient from the two lines of regression, Standard error of an estimate, Regression equations for a bivariate frequency table, Correlation analysis vs Regression analysis

**2. COMPUTER APPLICATIONS**

**(15)**

**i. Computers in research:**

- i. Role of computers in Conceptual phase: role of computers in literature review.
- ii. Role of computers in Design and planning phase: role of computers in sample size calculations.
- iii. Role of computers in Empirical phase: Data storage.
- iv. Role of computers in Analytic phase: Data analysis
- v. Role of computers in Dissemination phase: Research publishing
- vi. References and computer

**ii. Research Methodology and Computer applications:**

Introduction, source of data, experimental technique, methods of data collection measurement of scaling techniques, sampling methods, probability, probability distribution estimation and testing, nonparametric tests, contingency tests, computer applications

**3. Review of Literature relevant field, Research ethics:**

**(15)**

**i. Research ethics:** What is ethics, The development of ethics, The growth of ethics, Ethics in the 21<sup>st</sup> century, Making decisions,.

**ii. Environmental ethics:** Two current themes in environmental ethics.

Three current issues in environmental ethics: Terrestrial and aquatic pollution, Global climate change, Environmental degradation and loss of biodiversity.

**iii. How to write a Thesis**

**a. What is PhD**

**b. Introduction :** Status of a thesis, Get advice, Read before you write, Time table and mile stones, content of a thesis, What belongs into which section, Time: past and present tense, Graphs and figures, Tables, Format, Further information

**c. Writing a thesis:** Structuring the thesis, Sign posting, Code of practice for research, Content Chapters

The Exit strategy, Front matter, back matter and appendices, Notation, glossary and index, Look and feel, tone, grammar and style,

**d.The viva:** Role of the participants, Selecting the examiners,Preparing for viva, On the Day ,Corrections if any

#### **iv.Proposals to various funding agencies**

**a. Developing a grant proposal:** Preparation, Initial proposal development, Developing Ideas for the community support, Identification of a funding resource, Getting organized to write the proposal, Review, Criticism, Signature, Neatness ,Mailing .

**b. Writing the grant proposal :**The Basic components of a proposal, The Proposal summary: Outline of project ,Introduction: Presenting a credible applicant or organization ,The problem statement: stating the purpose at hand ,Project objectives: Goals and desired outcome ,Program methods and program design: A Plan of action, Evaluation: product and process ,Future funding: long-term project ,The proposal budget: planning the budget, Guidelines and literature .

#### **4.Training and field work:**

**(15)**

##### **i.Biosafety:**

a. General principles, b .Biosafety guidelines, c. Basic laboratories – Biosafety Levels 1 and 2

d. The containment laboratory – Biosafety Level 3, e. The maximum containment laboratory – Biosafety Level 4 ,f. Guidelines for laboratory/facility commissioning ,g Guidelines for laboratory/facility certification ,hLaboratory biosecurity,i. Laboratory biosecurity concepts,j. Laboratory equipment

k. Safety equipment ,l Good microbiological techniques ,m. Laboratory techniques ,n. Contingency plans and emergency procedures. Chemical, fire and electrical safety ,p.. Hazardous chemicals ,q. Additional laboratory hazards ,r.Safety organization and training ,s. Safety for support staff, t. Training programmers, u. Safety checklist.

##### **ii.Plagiarism:**

a. Introduction: Forms of plagiarism, Why does plagiarism matter? Why should you avoid plagiarism? What happens if you are thought to have plagiarised? Does this mean that I shouldn't use the work of other authors? Does every statement in my essay have to be backed up with references? Does this only matter in exams?, Unintentional plagiarism, Examples of plagiarism

B .Understand what plagiarism is and why it happens

c. Fully reference and acknowledge the work of others

d. Use your own words and develop your own writing style

e. Organize and structure your work in your own way

f. Don't be afraid to express your own views

g. Managing references in your thesis

h. Use of published work within research degree theses,

I. Penalties for plagiarism

##### **iii. Patent:**

**a .Introduction:**IPR, Governing laws in India for IPR, What is an innovation or invention, The patent system, Novelty and inventiveness, Commercialization of invention, Disclosing an invention, Academic research, Applying for patent, Patent specifications, , Patent Examination, Infringement.

**b.About the patent:** What is a patent, Term of patent, Territorial scope, What is patentable, Patentability searches, Information required for conducting research, Why one should go for patent, Who can apply for patent, What is not patentable invention, Documents required for filling a patent, What is patent specification.

**c.FAQs:**What does a patent application contain: Bibliographic, Background of the invention or state of art, Description of the invention, Claims. What is the Date of priority, What happens to the application after filling ,How does a patent get expired, What is traditional knowledge, What is prior information content, What is Patent cooperation treaty,

## BOOKS RECOMMENDED

1. Anekwe, T.D. 2010. Profits and plagiarism: The case of medical ghostwriting. *Bioethics* 24(6): 267–272.
  2. Baždarić, K., L. Bilić-Zulle, G. Brumini, and M. Petrovečki. 2012. Prevalence of plagiarism in recent submissions to the Croatian Medical Journal. *Science and Engineering Ethics* 18: 223–239.
  3. Brogan, M. 1992. Recycling ideas. *College and Research Libraries* 52(5): 453–464.
  4. Bruton, S.V. 2014. Self-plagiarism and textual recycling: Legitimate forms of research misconduct. *Accountability in Research: Policies and Quality Assurance* 21(3): 176–197. Butler, D. 2010. Journals step up plagiarism policing. *Nature* 466(7303): 167.
  5. Chandrasoma, R., C. Thompson, and A. Pennycook. 2004. Beyond plagiarism: Transgressive and nontransgressive intertextuality. *Journal of Language, Identity and Education* 3(3): 171–193.
  6. Couzin-Frankel, J., and J. Grom. 2009. Plagiarism sleuths. *Science* 324(5930): 1004–1007.
  7. DeVoss, D., and A.C. Rosati. 2002. “It wasn’t me, was it?” Plagiarism and the web. *Computers 9 and Composition* 19: 191–203.
  8. Gupta, S.C. (2013) Fundamentals of statistics .Himalaya Publishing House
  9. Khan, B.A. 2011. Plagiarism: An academic theft. *International Journal of Pharmaceutical Investigation* 1(4): 255. Kothari.C.R. Research Methodology and Techniques, 2nd edition
  10. Mahajan, B.K. Methods in Biostatistics: For Medical students and Research workers. 6<sup>th</sup> edition
  11. Pecorari, D. 2012. Textual plagiarism: How should it be regarded? *Office of Research Integrity Newsletter* 20(3): 3,10.
  12. Rathod, S.D. 2012. Plagiarism: the human solution. *Office of Research Integrity Newsletter* 20(3): 1,7.
  13. Roig, M. 2006. Avoiding plagiarism, self-plagiarism, and other questionable writing practices: A guide to ethical writing. Office of Research Integrity 2006.
  14. Samuelson, P. 1994. Self-plagiarism or fair use. *Communications of the ACM* 37(8): 21–
  15. Sox, H. C. 2012. Plagiarism in the digital age. *Office of Research Integrity Newsletter* 20(3): 1,6.
  16. Sun, Y.C. 2012. Does text readability matter? A study of paraphrasing and plagiarism in English as a foreign language writing context. *The Asia-Pacific Education Researcher* 21(2): 296
  17. Sunder Rao P.S.S, J.Richard. Introduction to Biostatistics and Research Methodology, 4<sup>th</sup> edition
  18. Vitse, C.L., and G.A. Poland. 2012. Plagiarism, self-plagiarism, scientific misconduct and VACCINE: Protecting the science and the public. *Vaccine* 30(50): 7131–7133. doi: Wager, L. 2011.
  19. How should editors respond to plagiarism? COPE discussion paper. 26th April, 2011
  20. World Health Organization, Laboratory biosafety manual. – 3rd ed, Wiley Int
  21. Yilmaz, I. 2007. Plagiarism? No, we’re just borrowing better English. *Nature* 449(7163): 658.
  22. Zhang, Y. 2010. Chinese journal finds 31% of submissions plagiarized. *Nature* 467(7312): 153.
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## Paper II

### Pre-Ph D Course Structure for Specialized Subject in Biotechnology 2017-2018

Credits : 4 (Module 1-3 = 2 Crs, Module 4 = 2 Crs)

	No of Lectures
<b>Module 1: An Overview of Biotechnology</b>	<b>11</b>
<ul style="list-style-type: none"><li>- History &amp; landmark Discoveries</li><li>- Applications of Biotechnology in agriculture, environment and health</li></ul>	
<b>Module 2: Basics of Genetic Engineering &amp; Tissue Culture</b>	<b>15</b>
<ul style="list-style-type: none"><li>- RNA, DNA, Flow of Genetic information, Gene &amp; its Expression &amp; Regulation</li><li>- An Overview of r-DNA Technology, Vectors and Promoters</li><li>- Plant &amp; Animal Tissue Cultures</li></ul>	
<b>Module 3: Principles &amp; Applications of Tools &amp; Techniques in Biotech Research</b>	<b>17</b>
<ul style="list-style-type: none"><li>- Microscopic Techniques: Electron Microscopy, Confocal &amp; Fluorescence, histology and immunohistochemistry</li><li>- Chromatographic Techniques : GC – MS, LC – MS</li><li>- Molecular Techniques: Types of PCR, Real - Time PCR, Microarray, DNA Sequencing and Bioinformatics</li><li>- Protein Analysis; Western Blotting, ELISA, Mass Spectrometry</li><li>- Nanotechnology; Types of nanomaterials, their classification, properties, overview of synthetic and biological methods, applications</li></ul>	
<b>Module 4: Industrial Biotechnology</b>	<b>17</b>
<ul style="list-style-type: none"><li>- Genetically Modified Organisms in Agriculture, Environment and Health</li><li>- Molecular Diversity &amp; Taxonomy and Bio-prospecting</li><li>- Fermentation Technology - I, Biofuels, Single Cell Protein, secondary metabolites, biofertilizers</li><li>- Bioremediation, Vaccines and therapeutics</li><li>- Applications of biotechnology in food, agriculture, environment and health</li></ul>	