Savitribai Phule Pune University

(Formerly University of Pune)

Syllabus for Ph.D. Course work: Zoology
From the academic year 2021-22

Course Structure for Ph.D. in Zoology:

The syllabus will be applicable for all research centres offering Ph.D. programme affiliated to the Savitribai Phule Pune University. The course work shall be of 18 credits-

S.N.	Course Code	Name of the Course	Credits allotted
1	ZO-Ph.D. 001	Research Methodologies	04
2	ZO-Ph.D. 002	Advances in Biology	04
3	ZO-Ph.D. 003	Techniques in Zoology	04
4	ZO-Ph.D. 004	Field work, Seminar and other academic activities	04
5	ZO-Ph.D. 005	Research and Publication Ethics [Compulsory course approved by UGC.]	02

1. Course Code: ZO-Ph.D. 001
Title- Research Methodologies.
Credits: 04
This course is designed by the university and shall apply to all faculties available on the following link on the university website.
http://collegecirculars.unipune.ac.in/sites/documents/Revised%20PhdMPhilSyllabus2020/Research%20Methodology%20Revised%20Syllabus%20(%20Ph.D.%20Course)_08.092020.pdf

Purpose- This course is one of the common courses that will train the Ph.D. student to do research efficiently.
Need of the course - It is observed that most of the Ph.D. entrants are ill equipped to understand the philosophy behind the research. These students typically ask the supervisor to

provide them with some 'problem' for Ph.D. Here, the 'problem' means some kind of work which is not being carried out elsewhere. The real motivation that lies in understanding the difficulties faced in social, medical, defence context are not perceived. As a result, the student is trained in finding holes in the current research and fill them up with some publications. It is necessary to motivate the student to know what real problems are and why the research is needed there. The present course will help student develop the right concepts about research. Further, it is observed that many of the statistical techniques which are important in almost all the sciences for data analysis, are not followed while analysing the results. Thus, appropriate statistical analytical methods are important in analysing the data reliably. Structure of the course – The course is structured in to different modules. A given faculty is expected to choose certain modules suitable to their need. The contents are largely case based so that student understands the practical workability of the course.

S.N.	Contents	Time allotted
1	Module I - History of research. Indian, Egyptian, Greek ideas methodologies and research in agriculture, chemistry, metallurgy, medical. Ancient Indian research methodology applications.	10Hr
2	Module 2 - (Recommended for science, technology, engineering, economics, management, archaeology, behavioural science) Statistical analyses and its significance, Exploratory and confirmatory research, Planned and ad-hoc methods of data collection, Non-response and methods of recovering the missing response, Various software for statistical analysis. The module will consist of case studies of the research performed in various subjects using statistical methods, Error and noise analysis, curve fitting.	10Hr
3	Module 3 – (Recommended for arts, performing arts, languages, commerce) Creating questionnaire. Data analysis from answers, Selection of research topic (case study based). Selection of research topic (case study based)	10Hr
4	Module 4 – Literature search, selection of research topic (case study based), maintaining laboratory records (case study based). Safety in Laboratories, Ethical considerations, effective verbal and non-verbal communication, field data collection, safety in field.	10Hr
5	Module 5- Writing research paper and/or thesis, making a presentation, writing a research proposal, and patents in Science, technology	10Hr
6	Module 6- Writing research paper and/or thesis, making a presentation, writing a research proposal in arts, management, commerce faculty	10Hr

A student will **choose 4 suitable modules** depending on his/her faculty. The contact hours will be around 60 based on assignments and examinations. The examination for each module will be separately performed.

References:

1) 'History of the Scientific Methods' by Martin Shuttleworth, https://explorable.com/history-of-thescientific-method.
2) 'The Statistical Analysis of Experimental Data' by, John Mandel, ISBN: 0486646661, ISBN13: 9780486646664

Mode of examination-

The internal examination for each module will be separately conducted. The examination mode is decided by the instructor of that module.
The external examination will be conducted at the time of 4th half yearly progress review. The student's implementation of various aspects in research methodologies will be checked.

2. Course Code: ZO-Ph.D. 002
Title- Advances in Biology
Credits: 04

S.N.	Contents	Time allotted
1	Module 1. Biodiversity, genetic diversity, molecular diversity and taxonomy, DNA bar-coding, population genetics, conservation of diversity and endangered species. Evolution, Modern tools of Taxonomy (alpha beta and gamma level taxonomy), Application of molecular and computational tools for phylogeny, Effects of man-made alteration on biosphere. Gene therapy: Introduction, vectors in gene therapy, advances in gene therapy, safety assurances DNA analysis and diagnostics: Methods of DNA analysis, diagnosing infectious diseases, identifying genetic disease Transgenic animals: custom made animals,	15 Hrs.
2	Module 2. Field studies: Assessment of biodiversity in different types of ecosystems, sampling techniques and quantitative methods for biodiversity assessment	10 Hrs.
3	Module 3. Animal behaviour: Patterns of behaviour, genetic and neural basis of behaviour, biological rhythms, Exploitation of resources, communication, social behaviour, mate selection and parent caring.	15 Hrs
4	Module 4. Guidelines for Bio-safety, functioning of Institutional Bio-safety committee, Institutional Animal ethics committee, and Institutional ethical committee , CPCSEA guidelines for animal experimentation , ICMR guidelines for experiments involving humans, DBT guidelines for Biosafety practices to be followed.	10 Hrs
5	Module 5. Patents and Intellectual property rights, Licensing of technologies	10 Hrs

3. Course Code: ZO-Ph.D. 003
Title- Techniques in Zoology
Credits: 04

S.N.	Contents	Time allotted
1	Module 1. Microscopes and Microscopic techniques, commonly used techniques in research -Histology and histochemistry, Developmental biology, Immunology, Physiology and Cell and Molecular biology.	20 Hrs.
2	Module 2. Techniques used for purification and characterization of biomolecules: Centrifugation, Ultrafiltration, Chromatography, electrophoresis, spectrophotometry, GC-MS, LCMS, NMR, MALDI-TOF MS. Flow cytometry. Radioisotopes in biology.	20 Hrs
3	Module 3. Model organisms used in biological research- eight model organisms to be discussed with respect to their availability, culture/breeding, pros and cons of their use, Biology of the organisms their special features and contribution to science.	20 Hrs

4. Course Code: ZO-Ph.D. 004
Title- Field work, Seminar and other academic activities
Credits: 04

S.N.	Contents	Time allotted
1	Module 1. Writing research proposal- Title, Research Context and Rationale, Research questions, Methodology, Plan of work, Significance of research, Bibliography.	15 Hrs.
2	Module 2. Communication skills (Writing and Oral)- Listening, Speaking and Reading, Basic Grammar, Building Vocabulary, presentation skills and ethics, Public speaking, workplace communications. Writing CV and reports. Use of ICT in presentations.	15 Hrs.
3	Module 3. Field work- Need, importance, objectives, types, Outcomes, keeping record of field visits.	15 Hrs.
4	Module 4. Design and conduct minimum 2 practicals for PG students.	15 Hrs.

Research and Publication Ethics:
Two Credit course, approved by UGC and compulsory for all Ph.D. students. The link for the same is given below.
http://sppudocs.unipune.ac.in/sites/circulars/MPhilPhDAdmission%20Circulars/Research%20and%20Publication%20Ethics.pdf?Mobile=1&Source=%2Fsites%2Fcirculars%2F%5Flayouts%2Fmobile%2Fdispform%2Easpx%3FList%3Df5fad69e%252Dd3e8%252D4ac5%252D90f6%252D0786c34fce20%26View%3D0ea15891%252D5dd2%252D436a%252Dbe77%252D0bedc1d2817a%26ID%3D186%26CurrentPage%3D1

Suggested References:

1. Sethi, J & et al. A Practice Course in English Pronunciation, Prentice Hall of India, New Delhi.
2. Sen, Leena. Communication Skills, Prentice Hall of India, New Delhi.
3. Prasad, P. Communication Skills, S.K. Kataria & Sons.
4. Bansal, R.K. and J.B. Harrison. Spoken English, Orient Language.
5. Roach Peter. English Phonetics and Phonology.
6. A.S. Hornby's. Oxford Advanced Learners Dictionary of Current English, 7th Edition.
7. McCarthy, Michael. English Vocabulary in Use, Cambridge University Press
8. M. Ashraf Rizvi, Effective Technical Communication, Tata McGraw Hill
9. Working in English, Jones, Cambridge
10. Business Communication, Raman –Prakash, Oxford
11. Speaking Personally, Porter-Ladousse, Cambridge
12. Speaking Effectively, Jermy Comfort, et.al, Cambride
13. Creative English for Communication, Krishnaswamy N, Macmillan.
14. Writing Skills, Coe/Rycroft/Ernest, Cambridge
15. Principles of Biochemistry, Lehninger C Rs. Publ. 7th edition (2017).
16. Biochemistry, L. Stryer, W.H. Freeman, San Francisco (2008).
17. Schaum's Outline Series of Theory and Problems of Biochemistry
18. Problem Approaches in Biochemistry. Wood and Hood.
19. Biochemistry by Voet and Voet, 4th edition (2010)
20. Physical Biochemistry by D. Freifelder IInd Edition
21. Biochemical techniques by Wilson and Walker,
23. Biophysical techniques by Upadhye and Upadhye,
24. Molecular cell biology 4th ed. Lodish B. Ball, 4th edition
25. Molecular Biology of the cell– Bruce Alberts – J.D. Watson et al 4th edition (2002)
26. Cell and Molecular Biology – DeRobertis and Saunders, 8th edition (2017).
27. The cell – C.P. Swanson, Prentice Hall (1989)
28. Cell Biology – C.J. Avers, Addision Wesley Co. (1986).
29. Biochemical Techniques Theory and Practice: J.R. Robyt and B.J. White
30. Computing for Biologists- A. Fielding, Addison Wesley Pub.
31. Principles of Environmental Science-Watt, K. E. F. (1973) McGraw-Hill Book Company.
32. Environmental Science –Noble, B.J. Kormandy, E.J. (1981). The way world works, Prentice-Hall Inc., N.J.
33. Environmental Science-Turk A., Turk J. Wittes J.T. and Wittes, R.E.
34. Environmental Issues: Measuring, Analyzing, Evaluating, Abel, Daniel C. McConnell, Robert L. Abel, Daniel C. Edi. 2 Prentice Hall Publication
35. Krishnamurthy, K.V. (2003) An Advanced Textbook on Biodiversity – Principles and Practice. Oxford and IBH Publishing, New Delhi.

Note: Latest edition of the suggested books may be used

Board of Studies in Zoology
SPPU-Pune