UNIVERSITY OF MUMBAI

Revised Syllabus for PhdCourse Work

(As per Credit Based Semester and Grading System with effect from the academic year 2021–2022**)

Course Work Structure for Phd Program in Faculty of Technology
Mumbai University
(With effect from Academic Year 2021-22)

CODE	NAME OF COURSE	CONTACT HOURS	CREDITS	EXAMINATION SCHEME				
				MID TERM TEST	END SEMESTER EXAM	TERM WORK	SEMINAR PRESENTATION	TOTAL
Phd101	Research Methodology	4	4	20	80	--	--	100
Phd102	Course suggested by Guide*	4	4	20	80	--	--	100
Phd103	Seminar	-	4	-	-	50	50	100
Phd104	Research & Publication Ethics (RPE)#	2	2	-	-	-	-	-
Total		10	14	40	160	50	50	300

(**As per new University of Mumbai Circular No. Exam/Thesis/Univ/VCD/947 of 2018 dated 15 December 2018)
(# As per new University of Mumbai Circular No Th/ICD/2021-22/1265 dated 13 July 2021)

Grading of Research Candidates Performance

Awarding of grades to research candidates based on their performance shall be done as per the applicable ordinances and regulations for undergraduate and Post graduate programs of Engineering under the Faculty of Technology. Semester Grade Point Index (SGPI) shall be also calculated based on the ordinances and regulations applicable for engineering programs under Faculty of Technology. Approved and recognized Research Centers shall prepare Phd course work grade card after successful completion of course work and issue to candidates and one copy to University concerned section for record.

Course Code	Course Name	Credits
PhdC101	**Research Methodology**	**04**

Module	Detailed content	Hrs.
1	**Definition and Characteristics of Research:** Research – Definition; Concept of Construct, Postulate, Proposition, Thesis, Hypothesis, Law, Principle. Philosophy and validity of research. Objective of research. Various functions that describe characteristics of research such as systematic, valid, verifiable, empirical and critical approach.	8
2	**Types of Research:** Pure and applied research. Descriptive and explanatory research. Qualitative and quantitative approaches. Formulating the Research Problem, Literature Review, Developing the objectives, Preparing the research design including sample Design, Sample size.	10
3	**Outcome of Research:** Relevance, interest, available data, choice of data, Analysis of data, Generalization and interpretation of analysis, Preparation of the Report on conclusions reached, Testing validity of research outcomes, Suggestions and recommendations, identifying future scope.	10
4	**Probability Distribution and Hypothesis Testing:** Theoretical: binomial, poisson, normal, exponential, hyper geometric, uniform distributions. Type I and II error, testing of mean, proportion, tests for equality of mean and variances of two populations, confidence interval, Z test and χ^2 test for goodness of fit, ANOVA (one way classification), Non parametric tests: sign test, U test.	14
5	**Correlation and Regression Analysis**: Karl Pearson's and Rank Correlation coefficient, simple linear regression: least squares method, Linear Programming:Graphical solution, simplex method, dual, sensitivity analysis, transportation and assignment problems.	10
6	**Management Decision Making & Computer Applications:** System approach, decision making under uncertainty and risk: decision tables and decision tree. Statistical data analysis: generating charts/ graph and other features. Introduction to tools: Tools used may be Microsoft Excel, Open office, Microsoft Power Point or similar tools.	8

References:
1. Dawson, Catherine, 2002, *Practical Research Methods,* New Delhi, UBS Publishers' Distributors.
2. Kothari, C.R.,1985, *Research Methodology-Methods and Techniques,* New Delhi, Wiley Eastern Limited.
3. Kumar, Ranjit, 2005, *Research Methodology-A Step-by-Step Guide for Beginners*, (2nd.ed), Singapore, Pearson Education.
4. *Shrivastava, Shenoy& Sharma, Quantitative Techniques for Managerial Decisions, Wiley*
5. Goode W J &Hatt P K, Methods in social research, McGraw Hill
6. Basic Computer Science and Communication Engineering – R. Rajaram (SCITECH)

Course Code	Course Name	Credits
PhdC102	**Course suggested by Guide***	**04**

This course is to be suggested by guide/supervisor in specific domain area of research undertaken by the research candidate.

Research candidates can undertake this course in consultation with guide/supervisor as per guidelines given below;

1. Relevant course shall be successfully completed in any institutes like IIT/BARC/TISS/TIFR/IIM etc., provided it is conducted in formal way and which has 4 credits.

<center>**OR**</center>

1. Relevant PG course in the research domain area of research candidate at any PG center affiliated to University of Mumbai.
   In this case, PG course as per University of Mumbai syllabus is of 3 credits. Thus additional work needs to be done for remaining 1 credits. (Any relevant PG course suggested by guide 3 credits + additional work suggested by guide for 1 credits).

   Additional work may be in line with any of the following guidelines:
   i. Minimum four assignment problems from same domain area

<center>**OR**</center>

   ii. Any relevant PG Laboratory course, as per University of Mumbai PG syllabus, suggested by guide

<center>**OR**</center>

   iii. One course project from same domain area

<center>**OR**</center>

   iv. One simulation based project in the domain area using relevant software tool.

Course Code	Course Name	Credits
PhdS103	**Seminar**	**04**

Following guidelines for credit seminar shall be followed:

1. Seminar should be based on thrust areas in specific research domain.
2. Research scholar should do literature survey, identify the topic for seminar and finalize the same in consultation with Guide/Supervisor.
3. Research scholar is expected to use multiple literatures and understand the topic.
4. Report should be compiled in the standard format as per University Guidelines for report writing and present in front of pair of Examiners appointed by the Head of the Department/Institute of respective Program.

Seminar should be assessed jointly by the pair of Internal and External Examiners

Following points must be assessed during the presentation of Credit Seminar
   i. Quality of Literature survey and Novelty in the topic
  ii. Relevance to the specialization
 iii. Understanding of the topic
  iv. Quality of Written and Oral Presentation

Course Code	Course Name	Credits
PhdS104	**Research & Publication Ethics (RPE)**	**02**

Course structure
- The course comprises of six modules listed in table below. Each module has 4-5 units.

Modules	Unit Titles	Teaching Hours
Theory		
RPE0l	Philosophy and Ethics	4
RPE02	Scientific Conduct	4
RPE03	Publication Ethics	7
Practice		
RPE04	Open Access Publishing	4
RPE05	Publication Misconduct	4
RPE06	Databases and Research Metrics	7
	Total	**30**

Syllabus in detail THEORY
- **RPE 01: PHILOSOPHY AND ETHICS (3 hrs.)**
1. Introduction to philosophy: definition, nature and scope, concept, branches
2. Ethics: definition, moral philosophy, nature of moral judgements and reactions

- **RPE 02: SCIENTIFICCONDUCT (5 hrs.)**
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, salami slicing
5. Selective reporting and misrepresentation of data

- **RPE 03: PUBLICATION ETHICS (7 hrs.)**

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 behavior and vice versa, types
5. Violation of publication ethics, authorship and contributorship
6. Identification of publication misconduct, complaints and appeals
7. Predatory publishers and journals
PRACTICE
- **RPE 04: OPEN ACCESS PUBLISHING(4 hrs.)**

1. Open access publications and initiatives
2. SHERPA/RoMEO online resource 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 Journal Finder, Springer Journal Suggester, etc.

- **RPE 05: PUBLICATION MISCONDUCT (4hrs.)**

A. **Group Discussions (2 hrs.)**

1. Subject specific ethical issues, FFP, authorship
2. Conflicts of interest
3. Complaints and appeals: examples and fraud from India and abroad

B. **Software tools (2 hrs.)**
Use of plagiarism software like Turnitin, Urkund and other open source software tools

- **RPE 06: DATABASES AND RESEARCH METRICS (7hrs.)**

A. **Databases (4 hrs.)**
1. Indexing databases
2. Citation databases: Web of Science, Scopus, etc.

B. **Research Metrics (3 hrs.)**
1. Impact Factor of journal as per Journal Citation Report, SNIP, SJR, IPP, Cite Score
2. Metrics: h-index, g index, ilO index, altmetrics

References
Bird, A. (2006). Philosophy of Science. Routledge.

MacIntyre, Alasdair (1967) A Short History of Ethics. London.

P. Chaddah, (2018) Ethics in Competitive Research: Do not get scooped; do not get plagiarized, ISBN:978- 9387480865

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.

Resnik, 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/research/resources/bioethics/whatis/index.cfrn Beall, J. (2012). Predatory publishers are corrupting open access. Nature, 489(7415), 179-179. https://doi.org/10.1038/489 1 79a

Indian National Science Academy (INSA), Ethics in Science Education, Research and Govemance(2019), ISBN:978-81-939482-l- 7. httj>://www.insaindia.res.in/pdf/Ethics Book.pdf