UNIVERSITY OF MUMBAI

ACADEMIC YEAR (2020 – 2021)

Sr. No.	Heading / Contents	Particulars
1.	Title of the Course	Ph.D.(Tech) Course work in Pharmaceutical Sciences
2.	Eligibility for Admission	As per University of Mumbaicircular No. Exam./Thesis/Univ./VCD/947 of 2018 and/ or guidelines/ordinances published from time to time
3.	Duration of Ph.D.(Tech.) in PharmaceuticalSciencesProgramme	University of Mumbai circular No. Exam./Thesis/Univ./VCD/947 of 2018 and/ or guidelines/ordinances published from time to time
4.	Passing Marks in Course Work	As per University of Mumbai circular No. Exam./Thesis/Univ./VCD/947 of 2018and/ or guidelines/ordinances published from time to time
5.	Course work (No. of Years/ Semesters)	2 Semesters
6.	Levels	P.G.
7.	Pattern	Semester
8.	Status	Revised
9.	To be Implemented	From Academic Year 2020-2021

Name of BOS Chairman: DrSupriyaShidhaye **/ Dean: Dr. AnuradhaMajumdar**

UNIVERSITY OF MUMBAI

Revised Syllabus for Ph.D.(Tech)Course Work in Pharmaceutical Sciences Programs

Course Code: Ph.D.C.

With effect from the academic year 2020–2021

VCD No: Exam/thesis/Univ/VCD/947 of 2018 dated 15th June 2018

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1. Preamble

The University of Mumbai offers research programmes in different subjects and in interdisciplinary areas under the various faculties leading to the degree of Doctor of Philosophy (Ph.D.). The Course work in Ph.D. is mandatory for all candidates admitted for the Ph.D. Programme at the University of Mumbai.

The Ph.D.(Tech) Program in Pharmaceutical Sciences University of Mumbai has a mission to develop high quality scientific specialists having strong base of principles of Pharmaceutical sciences and the scientific methods, deep understanding of their chosen areas of specialization, the motivation to learn continually, interact with multi- disciplinary groups and to handle new challenges offered by the front-end technologies.

The Ph.D. (Tech) course work in Pharmaceutical Sciences shall consist of the following papers:

- **Ph.D. C 101 : Research Methodology**
- **Ph.D. C102: Biostatistics**
- **Ph.D. C103: Subject Specific Course**
- **Ph.D.C104 : Subject Specific Course**
- **Ph.D.C105 : Research & Publication Ethics**

Research Methodology paper is designed to provide the candidate with a solid foundation and prepare him/her for the actual Ph.D. Research work.

The essence the goal of Biostatistics is to disentangle the data received and make valid inferences. Subject specific course work will enhance the knowledge of the research student in the core area ofspecialization.

Candidates can also opt for topics from various online courses available in SWAYAM and related platforms and get benefit of credit transfer. Hence, a good degree of flexibility and options have been provided in the course work to enable candidates to choose topics most relevant to their research area.

The Ph.D. course work is designed to impart knowledge and consolidate concepts and intellectual skills through courses which help the scholars to develop the capacity for free and objective enquiry, courage and integrity, awareness and sensitivity to the needs and aspirations of the society. The course work provides the candidates an enabling research experience thus helping them to enter their professional life with right perspective and knowledge related to their respective fields of specialization.

It is envisaged that the overall Ph.D. course work in Pharmaceutical scienceswill provide the necessary ground work and prepare the candidate to successfully take up the subsequent Ph.D. research work.

Ad Hoc Board of Studies in Pharmacy

Dr. AnuradhaMajumdar	Dean	Science & Technology
DrSupriyaShidhaye	(Chairman)	
DrShreerang Joshi	(Member)	
Prof K G Akamanchi,	(Member)	
Dr Krishna Iyer	(Member)	
Dr Mohan Kale	(Member)	
DrRajaniAthawale	(Member)	
DrMeenaKanyalkar	(Member)	

2. Branches of Ph.D. in Pharmaceutical Sciences:

- Pharmaceutics
- Pharmaceutical Chemistry
- Pharmacology
- Pharmacognosy
- Pharmaceutical Analysis
- Quality Assurance

3. Ph.D. (Tech) Course Work Structure (Faculty: Pharmaceutical Sciences)

Credit requirements, number, duration, syllabus, minimum standards for completion, etc. for Ph.D.Tech (Pharmaceutical Sciences) program shall be as under

- Ph.D. (Tech)course work shall be of 14 credits out of which 12 credits arerequired to be completed during the initial one or two semestersof the Ph.D. (Tech)programmeand completion of 2 credits of Research & Publication Ethicsis a pre-requisite and mandatory requirement for registration for Ph.D Tech.

- The 12 Credits to be completed before award of Ph.D Tech. Tech are divided further in such a way that 6 credits shall be assigned to Research methodology& Biostatistics which could cover areas such as quantitative methods, qualitative methods, computer applications & review of published research in the relevant field, training, field work, etc. The remaining 6 credits shall be distributed as 4 for advance course suggested by the guide from the syllabus of university of Mumbai for M Pharm program and 2 credits for coursework as per the recommendation by guide i.e, project work or adopting course from SWAYAM platform.
- 'Research and Publication Ethics' course of 2 credits is a mandatory requirement and is pre-requisite for registration for Ph.D.Tech. The courses from SWAYAM portal shall be explored for supplementary learning or for credit transfer for the course of 'Research and Publication Ethics'.
- All courses prescribed for Ph.D. (Tech)course work shall be conformity with the credit hour instructional requirement and shall specify content and instructional and assessment methods. They shall be duly approved by the respective Board of Studies.
- The courses shall be arranged in a formal way by the University through University Departments and also at identified institutions where experts in the areas of course work shall deliver requisite number of lectures. Record of attendance of the students shall be kept. The attendance of a candidate less than that prescribed by the University shall make the course null & void for the candidate
- The Department where the student pursues research shall prescribe the courses relevant to the student based on the recommendation of the Research Advisory Committee (RAC) of the research center.
- The course work may be completed either at the research Centre/s or University departments or premier institutions such as IIT, HBNI, BARC, TISS, ICSSR, TIFR, IIM etc. or fromSWAYAM Portal provided it is conducted in formal way.
- The grades in the course work, including research methodology courses shall be finalized after a combined assessment by the RAC and the Department and the final grades shall be communicated to the Head of Centre and to the University.

- Ph.D Tech. student has to obtain a minimum of 55% of marks or its equivalent grade in the UGC 7 point scale (or an equivalent grade/CGPA in a point scale wherever grading system is followed) in the course work in order to be eligible to submit the synopsis of dissertation/ Thesis and submit the dissertation/thesis.

Course Work Structure for Ph.D. (Tech). Program inPharmaceutical sciences under Faculty of Science and Technology, University of Mumbai (With effect from Academic Year 2020-21)

CODE	NAME OF COURSE	CONTACT HOURS/WEEK	CREDITS	MIDTERM TEST	END SEMESTER EXAM	TOTAL
Ph.D. C101	Research Methodology	04	04	20	80	100
Ph.D. C102	Biostatistics	02	02	10	40	50
Ph.D. C103	Advance course suggested by the guide from the syllabus of university of Mumbai for M Pharm program	As per syllabus 04	04	20	80	100
Ph.D. C104	Coursework like project work suggested by Guide or Course from SWAYAM Platform	02	02	10	40	50
Ph.D. C105	Research and Publication Ethics or same course from Swayam platform for supplementary or for credit transfer	02	02	10	40	50
	Total	**14**	**14**	**70**	**280**	**350**

4. Syllabus for the Course Work Subjects:

Course Code	Course Name	Credits
Ph.DC101	**ResearchMethodology**	**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 andcritical 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 assignmentproblems.	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 EasternLimited.
3. Kumar, Ranjit, 2005, Research Methodology-A Step-by-Step Guide for Beginners, (2nd.ed), Singapore, PearsonEducation.
4. Shrivastava, Shenoy& Sharma, Quantitative Techniques for Managerial Decisions,Wiley
5. Goode W J &Hatt P K, Methods in social research, McGrawHill
6. Basic Computer Science and Communication Engineering – R. Rajaram(SCITECH)

Course Code	Course Name	Credits
Ph.DC102	**Biostatistics**	**02**

Module	Detailed content	Hrs.
1.	Introduction to the course, Data representation and plotting, Arithmetic mean , Geometric mean, Measure of Variability, Standard deviation	2
2.	SME, Z-Score, Box plot, Kurtosis, R programming	2
3.	Correlation and Regression, Interpolation and extrapolation,Nonlinear data fitting, Concept of Probability: introduction and basics	3
4.	counting principle, Permutations, and Combinations, Conditional probability, Conditional probability and Random variables, Random variables, Probability mass function, and Probability density function, Expectation, Variance and Covariance	4
5.	Binomial random variables and Moment generating function,	3

	Probability distribution: Poisson distribution and Uniform distribution, Normal distribution and Exponential distribution	
6.	Sampling distributions and Central limit theorem, and Sampling distributions of sample mean, Confidence intervals,	2
7.	Test of Hypothesis ,p-value, T-test	2
8.	Chi-square test, ANOVA, Block Design	2
9.	Concept of optimization : Optimization parameters, Factorial design, Optimization technology & Screening tech. Innovative Uses of Computers in R&D, The Ethics of Computing in Pharmaceutical Research, Computers in Market analysis	10

References:

1. Introduction to Probability & Statistics - Medenhall, Beaver, Beaver 14th Edition
2. Introduction to Probability and statistics for engineers and scientists, S M Ross, 3rd Edition
3. Computer Applications in Pharmaceutical Research and Development,SeanEkins, 2006, John Wiley & Sons.
4. Computer-Aided Applications in Pharmaceutical Technology, 1st Edition,JelenaDjuris,Wood Head Publishing.

Course Code	Course Name	Credits
Ph.D C103	Advance course suggested by the guide from the syllabus of university of Mumbai for M Pharm program (PG)	**04**

Relevant PG course in the research domain area of research candidate at any PG center affiliated to University ofMumbai. Details of the module, content and Hrs is as per in the

prescribed syllabus for the course recommended from university of Mumbai for M Pharm program

Course Code	Course Name	Credits
Ph.D.C104	**Course work like project work suggested by Guideor**Course from SWAYAM Platform	**02**

This course is to be suggested by guide/supervisor in specific domain area of research undertaken by the research candidate in line with any of the following:

i. Minimum four assignment problems from same domainarea

OR

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

OR

iii. One course project from same domainarea

OR

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

OR

v. One course based in the Project area from Online SWAYAM portal

Course Code	Course Name	Credits
Ph.D.C105	**Research and Publication Ethics**	**02**

This is pre-registration mandatory course work, a course on Research and Publication Ethics (RPE), as per UGC Circular D.O.No.F.1-1/2018(Journal/CARE) of Dec 2019. RPE is to be conducted by the Research centre/department.

Pre-Registration Course Work In Research and Publication Ethics (RPE)

Course Code	Course Name	Credits
Ph.DC105	**Research and Publication Ethics**	**02**

Module	**Detailed Content**	**Hrs. (30hrs)**
	THEORY (RPE 01 – 03)	
RPE 01	**Philosophy and Ethics:** 1. Introduction to Philosophy: Definition, nature and scope, concept, branches 2. Ethics: definition, moral, philosophy, nature of moral judgement and reactions	03
RPE 02	**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, salami slicing, 5. Selective reporting and misinterpretation of data	05
RPE 03	**Publication Ethics:** 1. Publication ethics: definition, introduction and importance 2. Best practices/ standards setting initiatives	07

	and guidelines: COPE, WAME, etc. 3. Conflicts of interest 4. Publication misconduct: definition, concepts, 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 – 06)		
RPE04	**Open Access Publishing :** 1. Open Access Publications and initiatives 2. SHERPA/ RoMEO online resource to check publisher copyright & self-achieving policies 3. Software tools to identify predatory publications developed by SPPU 4. Journal finder/ journal suggestion tools viz., JANE, Elsevier Journal Finder, Springer Journal Suggester, etc.	04
RPE 05	**Publication Misconduct:** (A) Group Discussions (02 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 (02 hrs) Use of plagiarism software like Turnitin, Urkund and other open source software tools.	04
RPE 06	**Databases and Research Metrics:** (A) Databases (04 hrs) 1. Indexing databases 2. Citation databases: Web of Science, Scopus etc. (B) Research Metrics (03 hrs) 1. Impact factor of Journal as per Journal Citation Report, SNIP, SJR, IPP, Cite score. 2. Metrics: h-index, g index, i10 index, all metrics	07

Pedagogy:

- Class room teaching, guest lectures, group discussions, and practical sessions.

5. Evaluation and Assessment Methods for Course Work:

The rules and regulations regarding the eligibility and process of the entrance examination, interview, registration and course work for the Ph. D. programme are given in the **VCD No:Exam/Thesis/Univ/VCD/947 of 2018 dated 15th June 2018 & re-promulgation dated 15th Dec. 2018.**

Minimum attendance, evaluation and the mode of assessment for the evaluation of coursework will be as per the University of Mumbai circular No. Exam./Thesis/Univ./VCD/947 of 2018 and/ or guidelines/ordinances published from time to time

Kindly Note:

1. The record of the evaluation is to be maintained till the candidate is awarded his/her Ph.D. (Tech) degree by the University.
2. After completion of the course-work, the certificate of completion of course work shall be submitted to the University as per the prescribed format

Name of the research centre

Certificate

This is to certify that Mr./Ms./Mrs. (Surname) …….. (First name)…….. (Middle name)……..has been a regular student of Ph.D. (Tech) He /She has attended the course work in **Pharmaceutical Sciences** conducted at the recognized research centre /department from…… to ……during the year ……

He /She has successfully completed this course as part of the pre-registration course work prescribed by the University of Mumbai.

He /She secured ……. grade in ……..point scale.

Date: Guiding teacher Head of the Department/Principal

Seal Name: Name:

Name of the research centre

Certificate

This is to certify that Mr./Ms./Mrs. (Surname) ……. (First name)…….. (Second name)……..has been a regular student of Ph.D. (Tech) He/ She has attended the course work on **Research and Publication Ethics (Course code: Ph.D.C105)** conducted at the recognized research centre/department from…… to……during the year …… He/ She has successfully completed this course as part of the pre-registration course work prescribed by the University of Mumbai. He/ She secured ……. grade in ……..point scale.

Date:	Guiding teacher	Head of the Department/Principal
Seal	Name:	Name: