University of Mumbai



No. UG/ 119 of 2019-20

CIRCULAR:-

Attention of the Principals of the affiliated Colleges, the Head of the University Departments and Directors of the recognized Institutions in Science & Technology Faculty.

They are hereby informed that the recommendations made by the Board of Studies in Microbiology, at its meeting held on 22nd May, 2019 have been accepted by the Academic Council at its meeting held on 26th July, 2019 **vide** item No. 4.12 and that in accordance therewith, the revised syllabus of Ph.D. course work in Microbiology has been brought into force with effect from the academic year 2019-20, accordingly. (The same is available on the University's website www.mu.ac.in).

MUMBAI – 400 032 18th September, 2019 (Dr. Vinod P. Patil) I/c REGISTRAR

To

The Principals of the affiliated Colleges, the Head of the University Departments and Directors of the recognized Institutions in Science & Technology Faculty. (Circular No. UG/334 of 2017-18 dated 9th January, 2018.)

A.C./4.12/26/07/2019

No. UG/ 119 -A of 2019-20

MUMBAI-400 032

18th September, 2019

Copy forwarded with Compliments for information to:-

- 1) The I/c Dean, Faculty of Science & Technology,
- 2) The Chairman, Board of Studies in Microbiology,
- 3) The Director, Board of Examinations and Evaluation,
- 4) The Professor-cum-Director, Institute of Distance and Open Learning (IDOL),
- 5) The Director, Board of Students Development,
- 6) The Co-ordinator, University Computerization Centre,

(Dr. Vinod P. Patil) I/c REGISTRAR

AC 26/7/19 Item No. 4.12

UNIVERSITY OF MUMBAI



Syllabus for Approval

Sr. No.	Heading	Particulars
1	Title of the Course	PhD. Course Work in Miaobiolog
2	Eligibility for Admission	MSc (55%). PET Exam.
3	Passing Marks	40/100
4	Ordinances / Regulations (if any)	VCD No Exam Thesis Unix (VCD) 947 of 2018 dt 15 Tune 2018.
5	No. of Years / Semesters	2 Semesters.
6	Level	P.G. / U.G./ Diploma / Certificate (Strike out which is not applicable)
7	Pattern	Yearly / Semester (Strike out which is not applicable)
8	Status	New-/ Revised (Strike out which is not applicable)
9	To be implemented from Academic Year	From Academic Year 2019-20

Date:

Signature: Shalkera (D.) Z. P. Bhather Name of BOS Chairperson / Dean : Prof

UNIVERSITY OF MUMBAI



Revised Syllabus for Ph.D. COURSE WORK

in

MICROBIOLOGY

Program: Ph.D

Course code: DSMD

Paper DSMB 101 and 102

With effect from the academic year 2019-2020

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

Course work for PhD degree in Microbiology

Ph.D Course work In Microbiology

(for students admitted after 15th June 2019 onwards)

Course code: DSMD

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

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.). A candidate shall ordinarily work at a recognized place of research which includes the University Departments, research Institutes and Affiliated Colleges recognized as "Research Centre" by the University.

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

The course work for Ph.D. in Microbiology shall have two courses of 6 credits each namely Course-I (DSMB-101) and course-II(DSMB-102) The mode of assessment for the evaluation of coursework is mentioned in the Guidelines for the common Ph.D. course work for Science subjects.

Before submitting the Research Proposal to the University for Topic Approval the selected Ph.D. candidate shall make the Power Point Presentation of his / her Research Proposal in front of the **Evaluation Committee**". This evaluation committee shall constitute:-

- 1. Head of the Department
- 2. Research Guide/s- under whom candidate/s is /are selected
- 3. Senior Faculty from the Department
- 4. Subject experts from outside research institutes who are also recognized Ph.D. Guides, either in service or retired.

After incorporating the suggestions (if any) of the evaluation committee, the corrected final copy shall be submitted to the University for consideration by R.R.C. Letter from the concerned Research Centre duly signed by all the members of evaluation committee regarding the presentation made by the candidate shall be attached along with the proposal copy to be submitted for topic approval.

The course work for Ph.D in Microbiology would be as follows

Paper Course	Title	Max Credits
Paper DSMB 101	Research Methodology and Computer Applications	6
Paper DSMB 102	Active participation and Academic development	6

Paper Course	Title and	Particulars	Period of	Topics
	Max Credits		completion	
Paper DSMB 101	Research Methodology & Computer Applications (6 credits)	 Lectures to be conducted Test /assignments will be done by respective resources persons The grades will be finalised after a combined assessment by the college/institute RAC and the Head of dept The final grades will be communicated to the University 	to be completed in a formal way during the initial 1 st . or 2 nd . Semester at Recognised Research centres or University depts. or Premier Institutions like IIT, BARC HBNI ICSSR, IIM etc	 As per detailed syllabi submitted below OR Courses relevant to the syllabi can be selected by the respective RAC from SWAYAM, MOOC NPTEL, Coursera and students can join them online. Evaluation certificate from the respective agency will be mandatory for the transfer of 6 credits when such online courses are selected
Paper 2 DSMB 102	Active participation & Academic Development (6 credits)	1. Poster/oral paper presentations in an ISBN recognised Conference of National and International repute. 1 credit /presentation (Max- 1 credit) + Attending training for advanced techniques in reputed institutes / laboratories for 1 week period -1 credit (max -1 credit) + Publication of two paper in UGC recognised/ approved journals 2 credit /paper (Max 4 credits)	Before the submission of thesis preferably In the first two years of the degree To be published before the submission of the synopsis	

Detailed Syllabi for DSMB 101

Unit	Topics	Lectures	credit
Unit-I	Basics of research methodology	15L	01
	Strategies, planning and analysis	01	
	Objectives of research	03	
	- Short term goals and long term goals		
	- Research design-		
	- Repeatability, reproducibility and reliability		
	- Experimental protocols		
	Literature search,	02	
	-Reference management		
	-Systematic literature search		
	- Scientific Search techniques		
	How to formulate query	01	
	Methodology filters	01	
	Impact factor	01	
	Principal bibliographic databases	01	
	Citation style		
	Plagiarism	01	
	Ethics of animal research -CPCSEA, institutional ethics committee,	01	
	OECD guidelines	J1	
	Basic principles of human research ethics- International regulation		
	Guidelines for writing scientific proposal, scientific reports,	03	
	scientific paper, identification of good journal, Guidelines for		
	writing good thesis.		
Unit-2	Introduction to Biostatistics in Research	15L	01
	Sampling	04	
	Collection of data, classification & representation		
	Measurement scales, variables & their measurements		
	Measures of central tendency -mean, median, mode, geometric mean	03	
	Measures of dispersion- Range, Q.D., M.D., variance, standard	02	
	deviation	-	
	Correlation and Regression analysis: Correlations and regressions-:	06	
	Relation between two variables, scatter diagram, definition of		
	correlations& their equations, interpretation of regression		
	coefficients, principles of least squares, Two regression lines, curve		
	fitting Karl Pearson's coefficient of correlation, Spearman's		
	coefficient of correlation		
Unit-3	Theory of probability	30L	02
	A. Parametric tests		
	Large sample Tests	03	
	i. Testing significance of single population mean		
	ii. Testing significance of two population mean		
	Small sample Tests	05	
	i. Testing significance of single population mean		
	ii. Testing difference between two independent normal		
	population mean iii. Testing difference between two correlated normal		
	population mean		
	iv. Testing significance of correlation coefficient		
	 γ2 test 		
	i. Testing single population variance	05	
	ii. Testing Goodness of fit	Ì	1

	 iii. Testing association between two attributes Clear explanation of assumptions is necessary F-test- Testing equality of variance ANOVA- one-way classification, two way classification 	02	
	B. Introduction to non -parametric tests	05	
	The Wilcoxon signed-Rank test for location Testing signed appropriate representation and the second signed signed and the second signed sig		
	i. Testing single population meanii. Testing difference between correlated(match pair)		
	population means		
	iii. Testing difference between two independent		
	population means	03	
	The Mann-Whitney Test(Mann-Whitney-Wilcoxon test -	03	
	for equality of medians)	02	
	The Kolmogorov-Smirnov Goodness- of -Fit Test	03	
	The Kruskal-Wallis One-Way Analysis of Variance by		
	Ranks The Friedman True Wey Analysis of Veriance by Bonks	02	
	The Friedman Two-Way Analysis of Variance by Ranks		
Unit -4	Soft skills and other skill enhancement for research	15L	02
	Scientific communication, presentation skills, body	05	
	language,		
	• Use of graph software e.g. graph pad, statistical software-	05	
	SPSS, SAS(training in these software)		
	Computation skills, use of excel, Corel draw, Photoshop etc	05	
	Use and validation of high-end instruments and interpretation of data	15	
	► HPLC,		
	> HPTLC,		
	> GLC,		
	Microscopy		
	> FTIR,		
1	> NMR.		1

References

- 1) Research Methodology in medical and Biological sciences -edited by Petter Laake, Haakon Benestad and Bjorn Reino Olsen, Academic Press
- 2) Research Methodology: A guide for Researchers in Agricultural Science, Social Science and other related fields. Pradip kumar Sahu. Springer 2006
- 3) Ranjit Kumar, 2005 Research Methodology- A step-by-step Guide for beginners, 3rd edition, Sage publications
- 4) Fundamentals of Research methodology and statistics- Yogesh Kumar Singh, New Age International Publishers
- 5) Biostatistics: A foundation for analysis in health sciences. Daniel WW, Cross CL. 10thEdn, Wiley.2013
- 6) Fundamentals of Biostatistics. Rosner B. 7thEdn. Duxbury Thomson 2011
- 7) Introductory Applied Biostatistics D'Agostino RB., Sullivan LM., Beiser AS., Thomson Brooks/Cole 2006
- 8) Animal Cell Culture, Third Edition : A Practical Approach Edited by John R. W. Masters , Oxford University Press
- 9) Cell and Tissue Culture: Laboratory Procedures in Biotechnology, Edited by Alen Doyle &J.Bryan Griffiths, John Wiley and Sons
- 10) Principles of Instrumental analysis by Skoog, 7th edition, Cengage learning

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- 1. The record of the evaluation is to be maintained till the learner clears his/her PhD degree from the university.
- 2. After completion of the course-work, guiding teacher will submit the certificate of completion of course work to the University in the prescribed format:

Name of	the	research	centre
	Cer	tificate	

				Certif	icate					
This	is to	certify	that	Mr/Ms/Mrs(Su	rname)				(First	name)
		(Sec	ond na	ame)	has b	een a	regular	student	of Ph.	D. with
registı	ation nu	mber			. He/Sh	e has a	attended 1	he course	e work co	onducted
at the	recogniz	zed researc	h centi	re/department from	1			to		
during	the yea	r	Не	She has successfu	lly com	pleted	the Ph.I). course	work pr	escribed
by the	Univers	ity of Mun	nbai. H	He/She secured	grade	in	point	scale.	-	
Date:		Guidi	ng teac	cher		Н	lead of th	e Departi	ment/prin	ıcipal
Seal		Nat	ne:				Name	•	-	_