UNIVERSITY OF MUMBAI

RULES & REGULATIONS, STRUCTURES & SYLLABUS

for

Ph.D. COURSE WORK

under

FACULTY OF TECHNOLOGY

FOR ALL ENGINEERING DISCIPLINES

RULES & REGULATIONS

Revised rules for Ph. D under Faculty of Technology

The candidates who have registered for Ph.D. Program on or after 11th July 2009 are governed by UGC (MINIMUM STANDARDS AND PROCEDURE FOR AWARD OF M. Phil / Ph.D. DEGREE), REGULATION, 2009 PUBLISHED IN THE GAZETTE OF INDIA, DATED 11th July, 2009.

Based on and adhering to this, University of Mumbai has formulated the Revised rules for Ph.D. and circulated vide circular no.406 / 2009 dated 29th December 2009.

All the Procedures, rules and regulations regarding Short title, Applications, Commencement, Supervisor Eligibility Criterion, Procedure for Admission, Course work, Evaluation and Assessment methods etc. as laid down in these revised rules, are applicable to Ph. D. Programs under Faculty of Technology, University of Mumbai.

The following guidelines are a supplement to these rules and regulations; for only those sections, which require better and adequate comprehension.

1 - COURSE WORK:

TABLE- 1

STRUCTURE FOR Ph.D. COURSE WORK (common for all branches)

CODE	NAME OF COURSE	CONTACT HOURS	EXAMINATION SCHEME						CREDITS
			CONTINUOUS ASSESSMENT		END SEMESTER EXAM	TERM WORK	SEMINAR	TOTAL	
			Test 1 Marks	Test II Marks	Weightage (%)	Marks	Marks	Marks	
101	Research & Methodology	4	20	20	60	25	25	150	6
102	Quantitative Methods and Computer Applications in Research	4	20	20	60	25	25	150	6
103	Seminar	4	-	-	-	50	50	100	4
Total		12	40	40	120	100	100	400	16

R-1.1

After having been admitted, each Ph.D. student shall be required to undertake course work for a minimum period of one semester. The course work shall be treated as pre- Ph.D. preparation.

R-1.2

If found necessary, course work may be carried out by doctoral candidates in sister departments / institutes, recognized research centers either within or outside the University for which due credit will be given to them.

R-1.3

The Ph.D. Course work for all branches under Faculty of Technology shall be offered with credit system.

R-1.4

The total credit requirement for entire course work shall be of 16 credits. Students are required to earn these 16 credits in maximum three semesters.

R-1.5

The structure for Ph.D. course work for all branches under Faculty of Technology shall be as given in Table- 1.

2- AWARD OF GRADE:

SYSTEM OF EVALUATION

At the end of coursework, a student will be awarded a grade based on his/her performance in examination and/or assignments in every course registered by him/her. These grades are described by the letters S,A,B,C,D,E,F etc and a numerical equivalent as given below.

LETTER GRADE	NUMERICAL EQUIVALENT
S	10
A	9
B	8
C	7
D	6
E	5
F	0

The performance of student in a semester is indicated by a number called the Semester Performance Index (SPI).

The SPI is weighted average of the grade points obtained in all the courses taken by the student during the semester.

Example: Suppose in a given semester a student has taken five courses having credits c1, c2, c3, c4, c5 and his/her numerical equivalent of grades in those courses are g1, g2, g3, g4, g5 respectively.

Then his / her $$SPI = \frac{c1.g1 + c2.g2 + c3.g3 + c4.g4 + c5.g5}{c1+c2+c3+c4+c5}$$

SPI will be calculated (after Re examination, if any) up to two decimal places on the basis of final grades.

Grade points or SPI/CPI are not convertible in to percentages.

Minimum passing grade is E for undergraduate courses & D for post graduate courses.

Conversion of grades in to grade points

S	**10**
A	**9**
B	**8**
C	**7**
D	**6**
E	**5**
F	**0**

Subject Grade and SPI Calculations for F.E. Full Time Courses

(For maximum marks 150 for a subject)

1. **Deciding Number of Grades**
   a) Subject highest Marks > = 125, Consider (6+1) grades as (S,A,B,C,D,E & F)
   b) Subject highest Marks < 125, Consider (5+1) grades as (A,B,C,D,E & F)
   c) Subject highest Marks < 60, Consider Only 'F' Grade
   d) Minimum marks for passing =60

2. **Determination of Range for Grade**
   Range = (Highest marks obtained – Minimum Passing marks) / No. of possible grades

Note : The range obtained shall be rounded off to the next integer value.

Example for deciding Grade in each Paper for students

a) Let highest mark obtained by a student in the subject be 138

Range = (138-60) / 6= 78/6 = 12.66 Say 13

S	**126 to 138**
A	113 to 125
B	100 to 112
C	87 to 99
D	74 to 86
E	60 to 73

b. Let highest mark obtained by student in a subject be 105

Range = 105-60/5 = 45/5 = 9

A	**97 to 105**
B	88 to 96
C	79 to 87
D	70 to 78
E	60 to 69

3 COURSE WORK ASSESSMENTS:

The rules given below are specified for the examination scheme mentioned in typical Course Work Structure as given in Table- 1.

R-3.1 CONTINUOUS ASSESSMENT:

The continuous assessment of all the courses of Ph.D. course work shall be done by concerned and appropriate faculty of the Research Centre.

R-3.1.1 Theory Courses:

The continuous assessment of theory course shall be evaluated on the basis of the class tests/assignments/case studies/quizzes. There shall be minimum two class tests for each theory course as mentioned in scheme. It shall be of 20 marks. The marks obtained shall be displayed on the notice board within 10 days of conducting it.

R-3.1.2 Seminar:

The continuous assessment of seminar shall be based on the following heads;

Head Marks

- **a.** Performance of the student in the collection of the reference material and its understanding for seminar: 30 Marks
- **b.** Punctuality, Enthusiasm and aptitude of student in Preparing seminar / completing the report : 20 Marks
- **c.** Presentation of seminar and ability to answer the questions: 50 marks

3.2 END SEMESTER EXAMINATION (ESE)

R- 3.2.1

The End Semester Examination for the theory course shall be of 60 marks and two hours duration.

R -3.2.2

Grade **F** shall be awarded to a candidate in a course in which he/she could not appear for the end-semester examination. Such a student shall have to appear for the ESE as and when conducted by the appropriate authority.

R- 3.2.3

The concerned and appropriate faculty of the Research Centre will be responsible for paper setting, preparing the schedule of the examination, conducting the examination, assessment, awarding the grades for the ESE of the Course.

R- 3.2.4

End semester seminar presentation-

The Research Progress Monitoring Committee; duly constituted by the head of Research centre, shall review the End semester presentation and assign the marks based on the following heads,

a. Content and Quality of the seminar: 30 Marks

b. Presentation and Viva-Voce: 20 Marks

The examiners will prepare the mark / grade sheet in the format as specified by the University of Mumbai, authenticate it, seal it, and shall submit it to the Head of the concern Research Center.

4. RULES OF EXAMINATIONS & PERFORMANCE REQUIREMENTS

R- 4.1

To pass the examination of a course / seminar, student should earn passing grade in the examination of that respective course / seminar.

R -4.2

For successful completion of the course work, student should pass in all the courses/ seminar of the course work.

5. RESULT:

R- 5.1

Based on the performance of the candidate in the course work, the head of the research centre shall declare that the candidate has successfully completed the course work and accordingly inform University of Mumbai in due course of time.

6. EVALUATION AND ASSESMENT METHODS AFTER SUCCESFUL COMPLETION OF COURSE WORK:

R-6.1

Upon satisfactory completion of course work, the Ph.D. candidate / Research Scholar shall undertake research work.

R-6.2

The Research Progress Monitoring Committee; duly constituted by the head of Research centre, shall review the progress of research work undertaken by the Ph. D. scholar by every half yearly/yearly basis.

R-6.3

The Research Progress Monitoring Committee may constituted as below,

1. Chairman (from the Institute appointed by head of research centre)
2. Internal Examiner (from the same discipline of research appointed by head of research centre based on recommendation of guide).

3. External Examiner (Approved Ph.D. guide from the similar research discipline can be selected by Head of the research Centre)
4. Supervisor/Guide

R-6.4

The Research Progress Monitoring Committee may recommend for pre synopsis presentation, prior to submission of the thesis, based on satisfactory progress/ completion of research work. This presentation may be open to all faculty members and research students. The feedback and comments given by the committee may suitably be incorporated into the draft thesis under the advise of the supervisor.

R-6.5

Ph.D. candidates shall publish one research paper in a referred Journal with minimum impact factor of 0.7 and above before the submission of the thesis for adjudication, and produce evidence for the same in the form of acceptance letter or the reprint.

R-6.6

The thesis produced by the Ph.D. student shall be submitted to the University, to be evaluated by at least two experts / referees, out of whom one shall be from IITs and the other, shall be from outside the State.

R-6.7

On receipt of satisfactory evaluation reports, Ph.D. scholar shall undergo viva voce examination which shall also be openly defended.

R-6.8

The minimum duration for the Ph. D. program shall be two years from the date of registration at University of Mumbai to the date of submission of the thesis and maximum duration for the same shall be 5 years.

R-6.9

The extension of time duration can be sanctioned by head of research centre after receiving the application for the same from research scholar with recommendation from the guide/supervisor and Research Progress Monitoring Committee.

Ph. D. COURSEWORK

(Faculty of Technology, University of Mumbai)

1. RESEARCH METHODOLOGY

Contact Hours: 4 hrs/week **Continuous Assessment: 40 Marks**
Credits: 6 **End Semester Examination: 60 Marks**
TW + Seminar 50 Marks

1.1 Definition of research: Research – Definition; Concept of Construct, Postulate, Proposition, Thesis, Hypothesis, Law, Principle. Definition and Dimension of a Theory, Functions and Characteristics; Types of Theory: General Theory and Particular/ Empirical Theory. Cases and their Limitations; Causal Relations. Philosophy and validity of research. Objective of research.

1.2 Characteristics of research: Various functions that describe characteristics of research such as systematic, valid, verifiable, empirical and critical approach.

1.3 Types of research: Pure and applied research. Descriptive and explanatory research. Qualitative and quantitative approaches.

1.4 Research procedure: Formulating the Research Problem, Literature Review, Developing the objectives, Preparing the research design including sample Design, Sample size.

1.5 Considerations in selecting research problem: Relevance, interest, available data, choice of data, Analysis of data, Generalization and interpretation of analysis.

1.6 Outcome of research: Preparation of the Report on conclusions reached. Testing validity of research outcomes.Suggestions and recommendations, identifying future scope.

References:

- Dawson, Catherine, 2002, *Practical Research Methods,* New Delhi, UBS Publishers' Distributors.
- Kothari, C.R.,1985, *Research Methodology-Methods and Techniques,* New Delhi, Wiley Eastern Limited.
- Kumar, Ranjit, 2005, *Research Methodology-A Step-by-Step Guide for Beginners*, (2nd.ed), Singapore, Pearson Education.

2. QUANTITATIVE METHODS & COMPUTER APPLICATIONS IN RESEARCH

Contact Hours: 4 hrs/week **Continuous Assessment: 40 Marks**
Credits: 6 **End Semester Examination: 60 Marks**
TW + Seminar 50 Marks

Module – 1

2.1 Probability Distributions: Theoretical: binomial, poisson, normal, exponential, hyper geometric, uniform distributions

2.2 Sampling and Sampling Distributions: Probability and non-probability samples, sampling and non-sampling errors, sample size, sampling distributions: t, F and χ^2 distributions

2.3 Hypothesis Testing: Type I and II error, testing of mean, proportion, tests for equality of mean and variances of two populations, confidence interval, χ^2 test for goodness of fit, ANOVA (one way classification), Non parametric tests: sign test, U test

2.4 Correlation and Regression: Karl Pearson's and Rank Correlation coefficient, simple linear regression: least squares method

2.5 Management Decision Making: System approach, decision making under uncertainty and risk: decision tables and decision tree

Module - 2

2.6 Linear Programming: Graphical solution, simplex method, dual, sensitivity analysis, transportation and assignment problems

Module - 3

2.7 Computer Applications in research: Introduction to spreadsheet application, features and functions, using formulas and functions, data storing, features for statistical data analysis, generating charts/ graph and other features. Tools used may be Microsoft Excel, Open office or similar tool. Introduction to presentation tool, features and functions, creating presentation, customizing presentation, showing presentation. Tools used may be Microsoft Power Point, Open Office or similar tool. Introduction to Internet based searches, use of advanced search techniques.

References:

- *Shrivastava, Shenoy & Sharma, Quantitative Techniques for Managerial Decisions, Wiley*
- *Kothari C R, Research Methodology, Wiley Eastern*
- Goode W J & Hatt P K, Methods in social research, McGraw Hill
- Basic Computer Science and Communication Engineering – R. Rajaram (SCITECH)

3. SEMINAR

Contact Hours: 4 hrs/week **Continuous Assessment: 40 Marks**
Credits: 4 **Presentation: 60 Marks**

3.1 Formulating Problem Statement: Overview of research process: Formulating the Research Problem, Extensive Literature Review, Developing the objectives, preparing the Research Design including Sample Design, Collecting the Data, Analysis of Data, Generalization and Interpretation, preparation of the Report or Presentation of Results-Formal write-ups of conclusions reached.
Problem statement – Conditions and steps in selecting a research problem, Understanding the Key research area of interest, How to get new ideas (Criticizing a paper), Finding a good problem: Top-down and Bottom-up approach, Creative thinking techniques, Coming up with a problem statement
Defining objectives – How to find objectives, characteristics of objectives.

3.2 **Literature survey :** Overview – What is literature survey, Functions of literature survey, maintaining a notebook, developing a Bibliography Methods of data collection – Observation, survey, contact methods, experimental, determining sample design.
Searching for publications – Publication databases, search engines and patent databases, Find out the references for a given paper. The on-line Engineering bibliography, Survey papers, Finding material not on the web, Searching patents.

3.3 Guidelines to read research paper: Summarizing paper – Reading abstracts and finding ideas, conclusion, Advantages of their approach, the drawbacks of the papers and scope for future work. Generalize results from a research paper to related research problems Comparing the approach - Identify weaknesses and strengths in recent research articles in the subject.

3.4 Publishing research paper: How to write research paper - Structure of a conference and journal paper, how (and How Not) to write a Good Systems Paper: Abstract writing, chapter writing, discussion, conclusion, references, bibliography, and In-class discussion of technical writing examples, Poster papers, review papers, how to organize thesis/ Project report, How to write a research proposal? How research is funded?
Research ethics – Legal issues, copyright, plagiarism General advice about writing technical papers in English - Tips for writing correct English.

3.5 Presentation of scientific and engineering research work: Talk structure, basic presentations skills, INFLIBNET, Documentation and presentation tools – LATEX, Microsoft office, PowerPoint and SLITHY

Reference Books:

Lecture Notes and presentations