



# GUJARAT TECHNOLOGICAL UNIVERSITY

(Established Government of Gujarat under Gujarat Act No. : 20 of 2007)

(Accredited with A+ Grade by NAAC)

## ગુજરાત ટેકનોલોજીકલ યુનિવર્સિટી

(ગુજરાત સરકારના ગુજરાત અધિનિયમ ક્રમાંક : ૨૦/૨૦૦૭ દ્વારા સ્થાપિત)

GTU/Ph.D./CW\_Syllabus\_Revised/2024/ 1865

Date: 07/03/2024

### Annexure-I

## Gujarat Technological University

### Ph.D. course work

**Subject Name: Research Methodology**

**Subject Code: PHD2301**

**Teaching and Examination Scheme:**

Subject Code	Subject Name	Teaching Scheme		Credits	Evaluation Scheme			
		Theory (Total hours)	Self-Study* (Total hours)		University Exam Marks (External)	University Exam* (Hours)	CEC Marks (Internal)	Total (Marks)
PHD2301	Research Methodology	40	35	5	70	3 hours	30	100

\* University examination will be open book examination. Following materials, in hard copies only, will be allowed to carry by students in examination

- Textbooks/reference books
- Photocopy of content from the reference books
- Lecture note/presentation given by course instructors
- Lecture notes prepared by student

### Course Objective:

The objective of the course is to introduce the basic methods of conducting research, explore ideas in formulating research hypotheses and objectives, and sample framework for taking up research studies in a structured manner. Research Methodology as a subject should help researchers to prepare the literature in chronological order and should logically analyze the concerns. This subject should help in framing the research problems to enhance the scale of understanding. It should also help researchers to use tools, techniques, concepts and world's best practices to present unique research. It is intended to facilitate for the development of an insight into different statistical tools for data analysis, interpretation and presentation of reports.



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### Course Outcome:

At the end of the course students will be able to –

1. Prepare literature review report
2. Identify and formulate research problem
3. Prepare appropriate research design for his/her own research
4. Apply concepts of statistics, data interpretation and representation for his/her own research
5. Write research report, thesis, and project proposal

### Syllabus:

Module	Particulars	Teaching Hours
1	<b>Introduction to Research</b> <ul style="list-style-type: none"><li>• Definition and importance of research, role of research, various classifications of types of research, objectives of research, research process, phases of research</li><li>• Characteristics of scientific research</li></ul>	04
2	<b>Research Problem Formulation</b> <ul style="list-style-type: none"><li>• Sources of literature, review of research literature, purpose and use of literature review, preparation and presentation of literature review.</li><li>• Identification of research gaps, formulation of research problem and identification of research objectives</li></ul>	06
3	<b>Research Design</b> <ul style="list-style-type: none"><li>• Inductive reasoning, deductive reasoning, types of research design: qualitative (grounded theory, ethnographic, narrative, historical, case study and phenomenology), quantitative (descriptive, correlational, experimental, quasi-experimental), mixed method</li><li>• Data Collection: sources of data – primary and secondary, types of data – categorical (nominal and ordinal), numerical (discrete, continuous, ratio and interval) and methods of data collection: survey, interviews, group discussion, observation, records or experimental observations.</li><li>• Methods for qualitative research: types of questionnaire, design and validation of questionnaire.</li><li>• Statistical aspects in research design selection - mean, standard deviation, variance, Chauvenet's criterion, uncertainty analysis, Kline and McClintock method.</li></ul>	12
4	<b>Statistical methods for quantitative and qualitative research</b> <ul style="list-style-type: none"><li>• Probability and standard distribution: Meaning of probability and standard</li></ul>	08



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	<ul style="list-style-type: none"> <li>distributions, types of probability distribution, concept of random variables, discrete probability distribution, priori and posteriori probabilities, the binomial and Poisson distributions, the normal distribution, divergence from normality: skewness, kurtosis.</li> <li>Hypothesis Testing: hypothesis, types of hypotheses, level of significance, type I and type II errors, p-value and its interpretation, degrees of freedom, chi square test, student's t test, one way and two-way ANOVA, correlation, Karl-Pearson's coefficient of correlation, simple and multiple linear regression, non-parametric test: Kolmogorov - Smirnov one sample and two sample test, Wilcoxon signed rank test, Mann-Whitney U test, Kruskal-Wallis test. Basics of survival analysis. Exploring statistical software tools that are commonly used for data analysis and statistical modelling.</li> </ul>	
5	<b>Data interpretation and presentation:</b> <ul style="list-style-type: none"> <li>Various types of graphs, and charts and their uses</li> <li>Reporting of qualitative research using COREQ guidelines, presenting qualitative data with the use of matrices, diagrams, and thematic maps</li> </ul>	04
6	<b>Technical Writing:</b> <ul style="list-style-type: none"> <li>Report and thesis writing: significance, different steps for preparing the reports/thesis, structure, and components of report and thesis in detail</li> <li>Types of illustrations/figures and tables</li> <li>Preparation of the project proposal: title, description of problems, challenges and constraint, description of proposal including current knowledge and methodology, time frame and work plan, output/impact of project, budget and justification, references (list of experts working in this area)</li> </ul>	06
<b>Total Teaching hours</b>		<b>40</b>

# Student are required to carry out 35 hours of self-study work applying the theoretical aspects he/she studies in the course.

### Reference Books:

- Research Methodology, Methods & Techniques, C.R. Kothari, Viswa Prakashan.
- Research Design: Qualitative, Quantitative, and Mixed Methods Approaches by John W. Creswell
- Essentials of Research Design and Methodology by Geoffrey Marczyk, David DeMatteo, and David Festinger; Publisher – John Wiley & Sons, Inc
- Research Methodology from Philosophy of Science to Research Design by Alexander M. Novikov, and Dmitry A. Novikov; Publisher – CRC Press
- Qualitative Research: A Guide to Design and Implementation by Sharan B. Merriam, Elizabeth J. Tisdell
- The Craft of Research by Wayne C. Booth, Gregory G. Colomb, Joseph M. Williams

Page 3 of 8

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- Research Methods- A Process of Inquiry, Graziano, A. M., Raulin, M.L, Pearson Publications
- The Research Methods Knowledge Base by William M. K. Trochim (Author), James P. Donnelly
- Qualitative Inquiry and Research Design: Choosing Among Five Approaches by John W. Creswell
- Probability and Statistical Inference by Robert V. Hogg, Elliot a. Tanis and David L. Zimmerman , Pearson
- Testing Statistical Hypothesis by Lehmann, E and Romano, J.P., Springer
- Time Series by Kendall, M.G., Charles Griffin
- Introduction to Time Series Analysis and Forecasting by Peter J. Brockwell and Richard A. Davis, Springer
- Introduction to Statistical Time Series by Fuller, John Willy
- Multivariate Data Analysis- in practice, An Introduction to Multivariate Data analysis and Experimental Design by Kim H. Esbensen, Aalborg University, Esbjerg
- Introduction to Multivariate Analysis by Anderson, T.W., John Willy
- Applied Multivariate Statistical Analysis by Hardle, W. and simar, L., Springer
- How to Write a Thesis: Murray, R. Tata McGraw Hill
- Writing For Academic Journals, Murray, R., and McGraw Hill International.
- Writing for Publication, Henson, K.T., Allyn & Bacon



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## Annexure-II

### Gujarat Technological University

#### Ph.D. course work

**Subject Name:** Research and Publication Ethics (RPE)

**Subject Code:** PHD2302

**Teaching Scheme:**

Subject Code	Subject Name	Teaching Hours	Teaching Scheme (Credits)	Evaluation Scheme			
				University Exam Marks (External)	University Exam Hours	CEC Marks (Internal)	Total (Marks)
PHD2302	Research Publication & Ethics	30	2	35	1.5 hours	15	50

#### Course Objective:

The objective of the course is to introduce the basics of philosophy of science and ethics, research integrity, publication ethics. It is intended to help researchers identify research misconduct and predatory publications. This subject shall help researchers understand the use of indexing and citation databases, open access publications, research metrics (citations, h-index, Impact factor, etc.) and plagiarism tools.

The researcher shall also be made aware of moral & ethics in research conduction, drafting, presentation, publication and shall maintain originality and integrity at all levels of research and impact of research with different measuring indices.



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### Syllabus:

Module	Particulars	Teaching Hours
1	<b>Philosophy &amp; Ethics</b> <ul style="list-style-type: none"><li>• Introduction to Philosophy: definition, nature and scope, concept, branches</li><li>• Ethics: definition, moral philosophy, nature of moral judgements and reactions</li></ul>	3
2	<b>Scientific Conduct</b> <ul style="list-style-type: none"><li>• Ethics with respect to science and research</li><li>• Intellectual honesty and research integrity</li><li>• Scientific Misconducts: Falsification, Fabrication, and Plagiarism (FFP)</li><li>• Redundant Publications: duplicate and overlapping publications, salami slicing</li><li>• Selective reporting and misrepresentation of data</li></ul>	5
3	<b>Publication Ethics</b> <ul style="list-style-type: none"><li>• Publication Ethics: definition, introduction and importance</li><li>• Best practices / standards setting initiatives and guidelines: COPE, WAME, etc.</li><li>• Conflicts of interest</li><li>• Publication misconduct: definition, concept, problems that lead to unethical behavior and vice versa, types</li><li>• Violation of publication ethics, authorship and contributorship</li><li>• Identification of publication misconduct, complaints and appeals</li><li>• Predatory publishers and journals</li></ul>	7
4	<b>Open Access Publishing</b> <ul style="list-style-type: none"><li>• Open Access publications and initiatives</li><li>• SHERPA/RoMEO online resource to check publisher copyright and self-archiving policies</li><li>• Software tool to identify predatory publications developed by SPPU</li><li>• Journal finder/Journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer Journal Suggester, etc.</li></ul>	4
5	<b>Publishing Misconduct</b> <b>A. Group Discussions (2 hours)</b> <ul style="list-style-type: none"><li>• Subject specific ethical issues, FFP, authorship</li><li>• Conflicts of interest</li></ul>	4

Page 6 of 8

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	<ul style="list-style-type: none"><li>Complaints and appeals: examples and fraud from India and abroad</li></ul> <b>B. Software tools (2 hours)</b> <ul style="list-style-type: none"><li>Use of plagiarism software like Turnitin, Urkund, and other open source software tools</li></ul>	
6	<b>Databases and Research Metrics</b> <b>A. Databases (4 hours)</b> <ul style="list-style-type: none"><li>Indexing databases</li><li>Citation databases: Web of Science, Scopus, etc.</li></ul> <b>B. Research Metrics (3 hours)</b> <ul style="list-style-type: none"><li>Impact factor of Journal as per Journal Citation Report, SNIP, SJR, IPP, Cite Score</li><li>Metrics: h-index, g index, i10index, altmetrics</li></ul>	7
<b>Total Teaching hours</b>		<b>30</b>

### Course Outcome:

- Ph.D. Scholar shall be fully aware about the necessary tools & techniques to be used and importance of originality, integrity and ethics to be followed in research.





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Annexure-III

## Gujarat Technological University

### Ph.D. course work

**Subject Name: Self-Study Course (Domain Specific Course)**

**Subject Code: PHD2303**

**Teaching Scheme: Self-Study Course [PHD2303] a minimum of five (5) credits to be earned through MOOCs.**

The Self Study Course credits has to be earned through MOOCs. The MOOCs courses, totaling five credit, offered by any prestigious platform (e.g. SWAYAM etc), will be selected by enrolled Ph.D. Students in consultation with their supervisor. Each Ph.D. student is required to earn a minimum of five (5) credits through MOOCs to complete the Self Study Course [PHD2303] Course Work component.

For the Self Study Course [PHD2303], the Ph.D. students in consultation with their Supervisors can choose any of the below combinations to be able to fulfill the minimum requirements of five (5) credits;

- i) An eight (8) week course (Equivalent to 2 credits) and a twelve (12) weeks course (Equivalent to 3 credits)  
**OR**
  - ii) Two twelve (12) weeks courses (Each course equivalent to 3 credits, i.e., total 6 credits)
- 1) Ph.D. students enrolled in Batch 2023 and onwards will earn a minimum of five (5) credits through MOOCs for PH2303
  - 2) The respective certificates should be self-attested and certified by Supervisors towards the credits earned through MOOCs should be submitted to the University along with all other coursework documents.
  - 3) Fee for the MOOCs courses will be borne by the respective students.
  - 4) The first DPC to be additionally conducted by the respective DPC to review the progress of the Ph.D. Students in relation to the research problem, in the first semester itself.

  
6/3/24  
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Page 8 of 8

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