DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,
CHHATRAPATI SAMBHAJINAGAR.

Circular / Syll. Sec./ A.C. Res./ Curriculum/ 2026.

It is hereby inform to all concerned that, on the recommendation of Board of Studies, the Academic Council at it's Meeting held on 28th July, 2026 has accepted the *"Curriculum of Pre-Ph.D. Course Work as per Guidelines of University"*.

This is effective from the Academic Year 2026-27 and onwards as per appended herewith.

All concerned are requested to note the contents of this circular and bring notice to the students, teachers and staff for their information and necessary action.

University campus,
Chhatrapati Sambhajinagar-431 004.
Ref. No. Syll. Sec./A.C. Res./
Curriculum/ 2026/ 221-247

Date: 31/ 07/ 2026.

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Deputy Registrar
Syllabus Section

Copy forwarded with necessary action to:-

1] **The Head, all concerned departments,**
2] **The Director,** University Network & Information Centre, UNIC, with **a request to upload this Circular on University Website.**
3] **The Director, Board of Examinations & Evaluation,**
4] **Public Relation Officer** [PRO],

Dr. Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.

Dr.Babasaheb Ambedkar Marathwada University
Chhatrpati Sambhajinagar.



Pre.Ph.d.Courses Subject wise curriculum List
under the Faculty of Science & Technology

Sr.No.	Curriculum/Subject
1.	Biochemistry
2.	Biotechnology
3.	Botany
4.	Chemistry
5.	Computer Engineering
6.	Computer Science.
7.	Environmental Science
8.	Food Technology
9.	Geology
10.	Mathematics
11.	Microbiology
12.	Pharmacy
13.	Physics
14.	Statistics
15.	Zoology
16.	Civil Engineering
17.	Electronics Engineering
18.	Mechanical Engineering
19.	Nanotechnology
20.	Biophysics
21.	Pharmaceutical and Fine Chemical
22.	Forensic Science.
23.	Water and Land Managment

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Pre-Ph.D. Course Work in Statistics
Part I: Research Methodology in Statistics

Unit 1: Introduction to Research Methodology

1. Definition, meaning, objectives, characteristics and significance of research; types of research.
2. Research method and methodology; research and scientific method; research process.
3. What is a research problem? Selecting the problem; necessity of defining the problem.

Unit 2: Literature Review, Data and Sampling

1. Sources of scientific information; literature survey using databases such as PubMed, Scopus, Web of Science, and Google Scholar; bibliometric indicators:
   i. Impact Factor
   ii. h-index
   iii. Cite Score
2. Data types and data collection methods.
3. Sampling design; probabilistic and non-probabilistic sampling.

Unit 3: Statistical Methods in Research

1. Testing of hypothesis; t-test, F-test, Z-test and chi-square (χ^2) test.
2. Correlation and regression: simple and multiple.
3. Introduction to time series.

Unit 4: Research Ethics, Plagiarism and Scientific Writing

1. Research ethics and plagiarism.
2. Scientific writing; research publications; synopsis.
3. IPR; thesis writing.

Recommended Books:

1. Kothari, C. R. *Research Methodology: Methods and Techniques.*
2. Montgomery, D. C. *Design and Analysis of Experiments.*
3. Holmes, Moody, & Dine. *Research Methods for the Biosciences.* Amrita Vishwa Vidyapeetham.
4. Ruxton, G. D., & Colegrave, N. *Experimental Design for the Life Sciences.* Amrita Vishwa Vidyapeetham.
5. Daniel, W. W. *Biostatistics: A Foundation for Analysis in the Health Sciences.*
6. Day, R. A., & Gastel, B. *How to Write and Publish a Scientific Paper.*
7. Rajasekar, et al. *Research Methodology for Scientists.* arXiv.
8. Choudhary, B., & Choudhary, N. *Research Design, Statistics, and Report Writing.*

Chairman Member Member Member

18/11/2026
Dear
Faculty of Sci. & Tech.

Pre- Ph.D. Course Work in Statistics
Ph.D. Course Work

Unit 1: Regression and Time series

- Regression: Non-linear regression, ~~Regression tree,~~ CART boosted regression, Support vector regression, Random forest, Logistic regression, Poisson regression, Variable selection methods
- Time series: Moving average to ARMA, SARMA, ARIMA, Exponential smoothing, Non-linear time series, Multivariate time series, ARCH and GARCH methods

Unit 2: Optimization and Operations Research

- Programming problems: Linear PP, Non-linear PP, QPP, Network analysis: PERT, CPM, Inventory: Inventory models, Queuing theory: Queuing theory, Simulation: Simulation problems, Supply chain: Supply chain problems, Fuzzy optimization: Fuzzy optimization problems

Unit 3: Multivariate Analysis and Data Mining

- Multivariate analysis: Hotelling's T^2, MANOVA, PCA, Factor analysis, Data preprocessing: Data cleaning, Data processing, Outlier detection, Normalization and standardization, Classification and clustering: Data classification, Clustering, ANN, KNN, Model validation: Cross validation, ROC curve, Text mining: Text mining

Recommended Books / References

1. Hastie, T., Tibshirani, R., & Friedman, J. (2009). *The Elements of Statistical Learning: Data Mining, Inference, and Prediction* (2nd ed.). Springer.
2. Montgomery, D. C., Peck, E. A., & Vining, G. G. (2021). *Introduction to Linear Regression Analysis* (6th ed.). John Wiley & Sons.
3. Box, G. E. P., Jenkins, G. M., Reinsel, G. C., & Ljung, G. M. (2015). *Time Series Analysis: Forecasting and Control* (5th ed.). John Wiley & Sons.
4. Hyndman, R. J., & Athanasopoulos, G. (2021). *Forecasting: Principles and Practice* (3rd ed.). OTexts. https://otexts.com/fpp3/
5. Tsay, R. S. (2010). *Analysis of Financial Time Series* (3rd ed.). John Wiley & Sons.
6. Taha, H. A. (2017). *Operations Research: An Introduction* (10th ed.). Pearson.
7. Hillier, F. S., & Lieberman, G. J. (2021). *Introduction to Operations Research* (11th ed.). McGraw Hill.
8. Bazaraa, M. S., Sherali, H. D., & Shetty, C. M. (2006). *Nonlinear Programming: Theory and Algorithms* (3rd ed.). John Wiley & Sons.
9. Johnson, R. A., & Wichern, D. W. (2007). *Applied Multivariate Statistical Analysis* (6th ed.). Pearson Prentice Hall.
10. Han, J., Kamber, M., & Pei, J. (2012). *Data Mining: Concepts and Techniques* (3rd ed.). Morgan Kaufmann.

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