

Course Title:	Survival Analysis and Modeling
Course Code:	BSTA-303
Semester:	VI
Credit Hours:	03

Learning Outcomes

By the end of this course, students will be able to:

1. build and apply different types of survival models along with their applications.
2. know in detail about the Markov jump process as well its practical framework.
3. learn about different graduation methods and census formulae for various variables.

Course Outline

Unit – I

1.1 Introduction to Survival Analysis

Overview of Survival Analysis, Importance and Applications in Medical and Public Health Research, Key Concepts: Time-to-Event Data, Censoring, Survival Function, Hazard Function, Relationship Between Survival and Hazard Functions. Types of Censoring: Right, Left, Interval.

1.2 Descriptive Methods in Survival Analysis

Kaplan-Meier Estimator for Survival Functions, Kaplan-Meier Plots and Interpretation, Median Survival Time and Confidence Intervals, Cumulative Hazard Function.

1.3 Comparison of Survival Curves

Log-Rank Test for Comparing Survival Curves, Generalized Wilcoxon (Breslow) Test, Tarone-Ware Test.

Unit – II

2.1 Cox Proportional Hazards Model

Introduction to Cox Proportional Hazards Model, Fitting the Cox Model, Interpretation of Regression Coefficients and Hazard Ratios, Checking Proportional Hazards Assumption, Model Diagnostics and Goodness-of-Fit.

2.2 Competing Risks

Introduction to Competing Risks, Cumulative Incidence Function, Fine-Gray Subdistribution Hazard Model.

2.3 Parametric Survival Models

Overview of Parametric Models: Exponential, Weibull, Log-Normal, Log-Logistic. Fitting and Comparing Parametric Models, Advantages and Disadvantages of Parametric vs. Semi-Parametric Models. Model Selection Criteria: AIC, BIC

2.4 Survival Analysis in Clinical Trials

Application of Survival Analysis in Clinical Trials, Interim Analysis and Sequential Monitoring, Handling Censored and Truncated Data in Clinical Trials. Reporting and Interpretation of Survival Analysis Results.

- **Teaching-learning Strategies:**

Class Lecture method, which includes seminars, discussions, assignments and projects. (Audio-visual tools are used where necessary)

- **Assignments-Types and Number with calendar:**

According to the choice of respective teacher.

- **Assessment and Examinations:**

According to the University's Semester Rules.

Sr. No.	Elements	Weightage	Details
1.	Midterm Assessment	35%	It takes place at the mid-point of the semester.
2.	Formative Assessment	25%	It is continuous assessment. It includes: Classroom participation, attendance, assignments, and presentations, homework, attitude and behavior, hands-on-activities, short tests, quizzes etc.
3.	Final Assessment	40%	It takes place at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.

Textbook:

Chowdhury, R., & Huda, S. (2023). Survival Analysis and Applications Using SAS and SPSS. In *Statistical Approaches for Epidemiology: From Concept to Application* (pp. 235-255). Cham: Springer International Publishing.

Crowder, M. J. (2012). *Multivariate survival analysis and competing risks*. CRC Press.

Guo, S. (2010). *Survival analysis*. Oxford University Press.

Klein, J. P., Van Houwelingen, H. C., Ibrahim, J. G., & Scheike, T. H. (Eds.). (2014). *Handbook of survival analysis*. Boca Raton, FL.: CRC Press.

Kleinbaum, D. G., & Klein, M. (1996). *Survival analysis a self-learning text*. Springer.

Landau, S., & Everitt, B. S. (2003). *A handbook of statistical analyses using SPSS*. Chapman and Hall/CRC.

Liu, X. (2012). *Survival analysis: models and applications*. John Wiley & Sons.

Moore, D. F. (2016). *Applied survival analysis using R* (Vol. 473, pp. 1-10). Cham: Springer.