- Cornell, John A. (2002). Experiments with Mixtures, John Wiley & Sons.
- Myers, R. H. and Montgomery, D. C. (2016). Response Surface Methodology: Process and Product Optimization using Designed Experiments, 4 th edition John Wiley & Sons.

SUGGESTED READINGS

- Chakrabarti, M.C. (1962). Mathematics of Design and Analysis of Experiments, Asia Publishing House, Bombay.
- Dean, A. and Voss, D. (2017). Design and Analysis of Experiments, Springer 2 nd edition. First Indian Reprint 2006.
- John, P.W.M. (1971). Statistical Design and Analysis of Experiments, Macmillan Co., New York.
- Kshirsagar, A.M. (1983). A Course in Linear Models, Marcel Dekker, Inc., N.Y.
- Montgomery, D. C. (2005). Design and Analysis of Experiments, 6th ed., John Wiley & Sons.
- Raghavarao, D. and Padgett, L. V. (2005). Block Designs: Analysis, Combinatorics, and Applications, World Scientific.
- Raghavarao, D. (1970). Construction and Combinatorial Problems in Design of Experiments, John Wiley & Sons.
- Wu, C. F. J. and Hamada, M. (2011). Experiments: Planning, Analysis and Parameter Design Optimization, John Wiley & Sons.

Note: Examination scheme and mode shall be as prescribed by the Examination Branch University of Delhi, from time to time.

DISCIPLINE SPECIFIC ELECTIVE COURSE –5C : ADVANCED THEORY OF BIOSTATISTICS

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Advanced theory of Biostatistics	**4**	**3**	0	**1**	Studied Biostatistics	Basic knowledge of survival analysis and survival models

Learning objectives:
The learning objectives include:

- Comparison of Survival in two groups
- Epidemiological Study and epidemic models.
- Independent and dependent risks in Competing risk theory.
- Concept of Relative Risk, Odds Ratio and Attributable Risk.
- Concept of Clinical trials.

Learning Outcomes:
After completing this course, students should have developed a clear understanding of:

- Different methods for comparing survival rates of two groups of patients.
- Concept of Prospective, Retrospective and cross-sectional studies. Different epidemic models.
- Distinction between Relative Risk, Odds Ratio and Attributable Risk and their confidence interval.

SYLLABUS OF DSE–5c

Theory

UNIT I **(11 hours)**

Comparison of Survival in two groups:

Log-rank test, Gehan's generalized Wilcoxon test, Cox-Mantel test, Mantel-Haenszel Test, Comparison of two exponential survival distributions: Likelihood ratio test, Cox's F-test, Concept of covariates and proportional hazard, Cox's proportional hazard model.

UNIT II **(12 hours)**

Epidemiological Study:

Prospective study, Retrospective study, cross-sectional study and their comparison. Sensitivity, specificity and predictivity of medical tests. Likelihood ratio of a positive and negative test result. Epidemic Model: Concept of epidemic and epidemic models, Simple Stochastic Epidemic model (including derivations), Duration of an epidemic. General epidemic model & Carrier-borne epidemic model (concept and definition only)

UNIT III **(16 hours)**

Competing Risk Theory:

Concept of Competing risk theory with independent and dependent risks. Bivariate Normal dependent risk model and its derivations. Concept of risk, hazard and odds, definition of relative risk (RR), relative risks in independent sample, attributable risk in independent samples, definition of odds ratio (OR), odds ratio in two independent samples, confidence interval and test of hypothesis for relative risk and odds ratio (independent samples)

UNIT IV **(6 hours)**

Clinical Trials:

Planning and designing clinical trials, Phase-I, Phase-II and Phase-III clinical trials. Single, double and triple blinding.

PRACTICAL/LAB WORK (30 HOURS)

List of Practicals:

1. Comparison of survival of two groups using Log-rank test.
2. Comparison of survival of two groups using Gehan's generalized Wilcoxon test.
3. Comparison of survival of two groups using Cox-Mantel test.
4. Comparison of survival of two groups using Mantel-Haenszel test.
5. Comparison of survival of two groups using Likelihood ratio test.
6. Comparison of survival of two groups using Cox's F-test.
7. Computation of Sensitivity and specificity of a medical test.
8. Computation of likelihood ratio of a medical test.
9. Computation of positive and negative predictivities and hence predictive validity of a medical test.
10. Calculation of relative risk and it's confidence interval.
11. Calculation of odds ratio and it's confidence interval.
12. Calculation of attributable risk and it's confidence interval.
13. Calculation of probability of r susceptible getting infected by time t.

Practical work to be conducted using electronic spreadsheet / EXCEL/ Statistical Software Package/ SPSS/ calculators.

ESSENTIALREADINGS:

- Biswas, S. (2007): Applied Stochastic Processes: A Biostatistical and Population Oriented Approach, Reprinted 2nd Ed., New Central Book Agency.
- Lee, E.T. and Wang, J.W. (2013): Statistical Methods for Survival data Analysis, 4th Ed., John Wiley & Sons.
- Indrayan, A. (2017): Medical Biostatistics, 4th Ed., Chapman and Hall/CRC.

SUGGESTEDREADINGS:

- Miller, R.G. (2011): Survival Analysis. John Wiley & Sons.
- Elandt-Johnson R.C (1971): Probability model and Statistical Methods in Medical Biostatistics, 2nd Ed., Chapman and Hall/CRC. Genetics, John Wiley & Sons.

Note: Examination scheme and mode shall be as prescribed by the Examination Branch University of Delhi, from time to time.

DISCIPLINE SPECIFIC ELECTIVE COURSE – 5D: RESEARCH METHODOLOGY

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Research Methodology	4	3	0	1	Class XII pass with Mathematics	Nil

Learning Objectives:

The learning objectives include

- To provide scientific approaches to develop the domain of human knowledge through empirical studies.
- To enable the student researchers to understand basic concepts and aspects related to research, data collection, analyses, interpretation and report writing.

Learning Outcomes:

After completion of this course, students should be able to understand:

- Research Methods.
- Research Problems.
- Research Designs.
- Comparative study of different methods of data collection.
- Guidelines for construction of questionnaires.
- Processing and Analysis of data.
- Interpretation and Report writing.