GUJARAT TECHNOLOGICAL UNIVERSITY

BIO MEDICAL ENGINEERING (31)
STATISTICS FOR BIOMEDICAL ENGINEERS
SUBJECT CODE: 2713107
SEMESTER: I

Type of course: Core Subject

Prerequisite: Calculus, Linear algebra, Probability theory

Rationale: To explain various statistics techniques for design of biological experiments, especially in medicine, pharmacy; the collection, summarization, and analysis of data from those experiments; and the interpretation of, and inference from, the results.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total
L	T	P	C	Theory Marks		Practical Marks				Marks
				ESE (E)	PA (M)	PA (V)		PA (I)		
						ESE	OEP	PA	RP	
3	2	0	4	70	30	30	0	10	10	150

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1	Introduction of Statistics, Mathematical Statistics, Bio Statistics, Descriptive Statistics, Data types, Measures of location, Arithmetic Mean, Median, Measures of Spread, Variance and Standard Deviation, Graphically Summarize Method, Case Study.	8	15%
2	Definition of Probability, Law of Probability, Conditional Probability, Discrete Probability Distributions, Radom Variables, Continuous Probability Distributions, Standard Normal Distribution, Case Study.	9	20%
3	Overview of Estimation, Estimation of the Mean of a Distribution, Variance of a Distribution, Binomial Distribution, Poisson Distribution, Case Study.	7	20%
4	Hypothesis Testing, One-Sample Inference and Mean of a Normal Distribution: Single-Sided Alternatives, Two-Sided Alternatives, Z-test, Power test, Bayesian Inference, Two-Sample Inference, t-test, f-test, Case study.	9	20%
5	Overview of Regression and Correlation Methods, Fitting Regression Lines:-The Method of Least Squares, F -Test for Simple Linear Regression, t-Test for Simple Linear Regression, Partial and Multiple Correlation, Rank Correlation, Design and Analysis Techniques for Epidemiologic Studies	9	25%

Reference Books:
1. Fundamentals of Biostatistics, 6th edition by Bernard Rosner, 2005, 896 pages. ISBN-10: 0534418201 ISBN-13: 978-0534418205
2. Introduction to Statistics for Biomedical Engineers - Kristina M. Ropella
3. A foundation for analysis in the health sciences by Wayne S. Daniel, Biostatistics: John Wiley & Sons, 6th Ed.,
4. Primer of biostatistics by Stanton A. Glantz,,Mc Graw Hill , 2nd Ed

Course Outcome:

After learning the course the students should be able to:

1. Understand basic concepts, ideas, and techniques often used in statistics, especially biostatistics;
2. Develop appreciation of (i) variation, (ii) importance of design to the overall quality of a study, (iii) impact of assumptions on data analysis and interpretation, and (iv) artifacts and caveats in data analysis and interpretation;
3. Carry out simple exploratory/graphical/formal/diagnostic analysis; and Know when and where to seek statisticians' help.
4. To understand concepts and interpretation of statistical results

List of Open Source Software/learning website:

1. Resources from Vanderbilt Biostatistics: Main education page | General statistics ideas
2. Glossary of Statistical Terms: http://biostat.mc.vanderbilt.edu/twiki/pub/Main/ClinStat/glossary.pdf
3. HyperStat Online (by David Lane): http://davidmlane.com/hyperstat
4. SticiGui (by Philip Stark): http://www.stat.berkeley.edu/~stark/SticiGui/
5. Electronic Statistics Textbook (by StatSoft): http://www.statsoft.com/textbook/stathome.html
6. Electronic Encyclopedia of Statistical Examples and Exercises (EESEE): http://www.whfreeman.com/eesee/ [A good site for learning statistics with lots of examples.]