Certificate in Biostatistics

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DEPARTMENT OF EPIDEMIOLOGY AND BIOSTATISTICS
BELAGAVI

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Mission

"To strengthen research in each and every KLE constituent units,
And
Sensitize faculty for quality research culture of Internationally established standards"

Preamble

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Biological sciences have very large variability, and it is difficult to understand completely all the parameters contributing for the event under study. In this situation applied statistics, as a science, has a great role to play for identifying the variables and their contributions in health and disease.

Statistics has been responsible for accelerating progress in all applied sciences by defining the correct methods of planning, collecting, analyzing and interpreting data for establishing cause and effect relationship.

No science can be learned or progress without continuous updates, hence collecting meaningful information, organizing information, and interpretation of the process and its outcome, is always the necessity of all applied sciences, so the applied statistics does not need introduction.

Department of Epidemiology and Biostatistics

The Department of Epidemiology and Biostatistics is aimed to help in meeting the mandatory need of teaching and research of applied statistics in various Graduate, Post Graduate, Post P.G. and Ph.D. Courses offered by KLEs J. N. Medical College, Belagavi, KLEs V.K. Institute of Dental Science, Belagavi, KLEs College of Pharmacy, Bangalore, KLEs College of Pharmacy, Belagavi, KLEs College of Pharmacy, Hubli, KLEs Institute of Physiotherapy, Belagavi, KLEs Institute of Nursing, Belagavi, and KLEs BMK Ayurveda College of Belagavi.

Department of Epidemiology and Biostatistics has been offering the following courses with required qualification from academic year 2014:

✓ B. Sc. Biostatistics & Population Sciences (3 Years) – 12th Standard (Pre-University) with Statistics or Mathematics, Biology alongwith Mathematics are also eligible.

- ✓ M.Sc. in Biostatistics (2 Years) – Three years graduate degree with statistics or mathematics,
- ✓ M. Sc. in Population Studies (2 Years) (Hybrid Mode – Offline & Online) - Three years graduate degree in any subject with Statistics/ Mathematics or graduates in Health Science subjects including Nursing and Pharmacy.
- ✓ Ph.D. in Biostatistics – Candidates with Post Graduation in Statistics or Mathematics from a recognised University.

Other Courses
- ✓ Certificate Course in Biostatistics (Hybrid Mode – Offline & Online) – designed to meet the research need of Research Scholars and faculty.
- ✓ P.G. Diploma in Biostatistics (Hybrid Mode – Offline & Online) - Medical and Allied subject graduates interested to pursue research career, with at list one paper in Statistics at Graduation level or Certificate in Biostatistics from any University.
- ✓ Intensive Course in Biostatistics & Research Methodology (Regular 4 Weeks/Part Time 6 Weeks, through contact teaching modules) – This is a skill enhancement course, and can be attended by any graduate desirous to develop research aptitude.

Its faculty with necessary knowledge and skills to deal with statistical analyses in applied research, and to train in quantitative analysis, along with risk managerial skills in their field of interest is well equipped. Substantial facilities are available for higher education.

Certificate in Biostatistics

The syllabus of the Certificate Course in Biostatistics, besides compulsory biostatistics subject matters, includes subjects of interest; Research Methodology. The Course is tailored, to provide sufficient knowledge to Health discipline; faculty/ scholars/ and P.G. students to plan, conduct, analyse, and interpret research findings.

What will they learn

Students will gain specialized knowledge and skills required to design, monitor and manage research in medical and allied fields.

Careers in health and medicine teaching and research

Certificate Course in Biostatistics, will add value to Medical practice, Healthcare and Research.

Eligibility

Graduates/ Interns / Post Graduates and PhD in Medical Health Sciences with minimum 50 percent marks for general category, and 45 percent for SC, ST and OBC will qualify for admission to P.G. Diploma (Biostatistics) course.

OR

Graduates in Pharmaceutical/ Pre & Paramedical/ Life sciences and Public Health /Interdisciplinary and Allied Health Sciences with a paper in Statistics/ Mathematics from any recognized University with minimum 50 percent marks for general category, and 45 percent for SC, ST and OBC will qualify for admission to P.G. Diploma (Biostatistics) course.

Total Intake – 21

Selection Procedure - Selection will be by personal interview

Evaluation and teaching schedule

The course will include theory classes followed by practical assignments comprised of four papers of approximately 400 hours duration. The practical assignments will be evaluated for the Internal Assessment marks. Average marks obtained in practical assignments, and examination as replica of final examination before final examination in each semester, will be the Internal Assessment marks.

Attendance

Students are expected to have 80% of total attendance in theory and practical's. However, students will be expected to cover missed theory and practical classes, by giving extra time after discussing with the concerned teacher.

Medium of instruction: English

Course Fees: As per University norms

Duration of course: One Semester - Six months (Hybrid Mode – Offline & Online)

Mode of Online Teaching: Online teaching will be through

        1) Live online classes and (Imparts)

        2) Healthy group discussions and debates (LMS)

Mode of Offline Teaching: Two week offline teaching will be conducted in the department of Epidemiology and Biostatistics for exposure of contents, concept of subjects and hands on training. Student's attendance should not be less than 85% for each paper (subject), appearing for the University Examination. Failing to which student has to reappear for the course.

Examination pattern

Theory				
Type of questions	**No. of questions**	**Questions to be answered**	**Marks per question**	**Total marks**
Long Essay	**03**	**02**	**20**	**2 x 20=40**
Short answer	**07**	**05**	**08**	**5 x 08=40**
Sub Total: 4 papers of 80 marks each (4 x 80=320)				320
Theory's Internal assessment (4 x 20=80)				80
Practical Assessment				
Details	**Practical quality**	**Analysis/ interpretation**	**Defense**	**Total**
Report	**20**	**60**	**20**	**100**
G. Total				**500**

Note:

1. In Internal assessment 35% marks are essential to appear for University Examinations.
2. Practical examination, with at least two Examiners (1 internal + 1 external) from the faculty of Department of Epidemiology and Biostatistics.

Internal Assessment

For internal assessment 35% marks are essential to appear for University theory examinations.

Evaluation

Minimum 50% overall, 50% marks in theory, and practical, and 35% in Internal Assessment is eligibility to appear for University Examination, together shall qualify to pass the Certificate Course in Biostatistics.

Results
A candidate who scores less than 50% of the total marks in an individual subjects, has to reappear for the same subject in subsequent examination conducted by the university.

- Class shall be awarded asper University rules

  Grade percent marks

  A+   90% and above

  A   75% and above but less than 90%

B 60% and above but less than 75%

C 50% and above but less than 60 %

Syllabus

Paper - 1: Basic Statistics,	Total (48Lectures + 32Practical)/Week
Basic Statistics Types of Data; Concepts of a Statistical Population and Sample (1) Types of scales - Nominal, Ordinal, Ratio and Interval (2). **Collection and Scrutiny of Data** Primary data - Designing Questionnaire & Proforma, Checking their Accuracy & Consistency (3). Secondary data - its major sources including some Government Publications (1). **Tabulation** Construction of tables with one or more factors of classification (6). **Diagrammatic and graphical representation** Frequency distributions, Cumulative frequency distributions and their Graphical representation, Histogram, Frequency Polygon, Frequency Curve, Ogives, Population Pyramid and Box Plot (10). **Analysis of Quantitative Data** Univariate data-Concepts of Central Tendency, Location (5), Dispersion and Relative Dispersion, Skewness and Kurtosis (10). **Analysis of Qualitative Data** Measures of Central Tendency & Dispersion (4), Consistency of Categorical data, Independence and Association of Attributes. Measures of Association. Rates, Odds Ratio and Relative Risk (6).	**Practical:** **Tabulation** Construction of tables with one and more factors of classification (6). **Diagrammatic and graphical representation**: Frequency distributions (2), Cumulative frequency distributions and their Graphical Representation, Histogram, Frequency Polygon and Ogives. Stem and Leaf Chart. Box Plot (10). **Analysis of Quantitative Data** Measures of Central Tendency, Location (5), Skewness and Kurtosis, and their measures including those based on Quantiles and Moments (2), Dispersion and relative Dispersion, (4). **Analysis of Categorical Data** Measures of Central Tendency & Dispersion (4), Measures of Association for two - three-way classified data. Odds Ratio and Relative Risk (4).

Paper – 2: Sampling Techniques and Research Methodology, Total (48Lectures + 32Practical)/Week	
Sampling Techniques Concepts of Sample and Population (1), Simple Random Sampling (3), Stratified Sampling (4), Cluster Sampling (3), Systematic Sampling (1), Multistage Sampling (1), Inverse Sampling (1), Non-probability (Quota, Purposive) Sampling Techniques (1) Including methods of Point and Interval Estimations for these techniques (4). **Research methodology** Concepts and definitions (4), Formulation of Objectives (4), Study Designs with basic Analytical Methods for their analyses (8), Sample Size Estimation, Feasibility, Drawing conclusions (5), Critical Appraisal of Published Articles (2), Methods of data collection (2), Questionnaire Development and pre-testing of Questionnaire (2), Internal & External Validity of questions(2).	**Sampling Techniques** Simple Random Sampling (2) Stratified Sampling (3), Cluster Sampling (2), Systematic Sampling (2), Multistage Sampling (1) Inverse Sampling (1) Methods of Point and Interval Estimations for these techniques (8) **Research methodology** Critical appraisal of published articles (4), Methods of data collection (4) Study Designs and their analyses (5)

Paper-3: Statistical Inference and Sampling Distribution Total (48Lectures + 32Practical)/Week	
Methods in statistical Inference	**Methods in statistical inference**
Concept of a Statistics and its Sampling Distributions (2),	Standard errors of Sample Mean and Difference of Means (2)
Point estimate of a Parameter(1),	Sample Proportion and Difference of Proportions (4)
Bias and Standard Error of Estimate (1)	
Standard Errors of Sample Mean (2)	
Sample Proportion and its Standard Error (1)	**Sampling distributions & Tests**
	Binomial Distribution (2)
Sampling Distribution & Tests	Poisson Distribution (2)
Binomial Distribution (3)	Normal Distribution (4).
Poisson Distribution (3)	F statistics (2),
Normal Distribution (4) Statistical Tests and Interval Estimations (2)	Fisher's Z transformation (2),
Null and Alternative Hypotheses (2)	Testing for the Mean and Variance of univariate Normal Distributions (2),
Types of Errors, p- values (3)	Testing of equality of two Means (2), Testing of equality of two Variances (2)
Chi-square test (3)	Correlation Coefficient (2),
t-test (1),	Pearson's Chi-square test for Independence & Goodness of Fit (2).
and F test (3)	
Testing for the Mean and Variance of univariate Normal Distribution (2), Testing of Equality of two Means (2)	
Testing of equality of two Variances of two univariate Normal Distributions and related Confidence Intervals (2)	
Testing for the significance of sample Correlation Coefficient in sampling from bivariate Normal distribution (2)	
Large Sample Tests	
Use of Central Limit Theorem of large numbers Z test (3)	
Chi-square test for Goodness of Fit (2)	
Contingency table and test of Independence in Contingency table (4).	

Paper-4: Correlation, Regression and Survival Analysis	Total (48Lectures + 32Practical)/Week
Scatter Diagram (2),	Scatter Diagram (2)
Product Moment Correlation Coefficient & its properties, Partial Correlation Coefficient and Coefficient of Determination (4)	Product Moment Correlation Coefficient, Coefficient of Determination, Partial and Multiple Correlation Coefficients (2)
Principle of Least Squares, Fitting of Linear Regression (6)	Principle of Least Squares, Fitting of Linear Regression (4)
Rank Correlation — Spearman's and Kendall's measures (5)	Rank Correlation — Spearman's and Kendall's measures (4)
Multiple Regression (10),	Multivariate data: Multiple Regression (5)
Survival Analysis (7)	Survival Analysis (5)
Multicollinearity and Homoscedasticity and adjusting for them in Regression Models (2)	Multicollinearity and Homoscedasticity and adjusting for them in Regression Models (1)
Logistic Regression (6)	Logistic Regression (4)
Principal Component Analysis with its uses, including their utility in Health and Disease (6)	Principal Component Analysis (4)

Mathematical Analysis
References

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2. Burkill, J. C. (1980): A First Course in Mathematical Analysis, Vikas Publishing House.
3. Deshpande, J. V. (1981): Text Book of Mathematical Analysis, Tata McGraw Hill.
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5. Khuri, A. I. (1983): Advanced Calculus with Applications in Statistics, Wiley.
6. Searle, S. R. (1982): Matrix Algebra Useful for Statistics, Wiley,
7. Shanti Narayan, (1998): Matrix Algebra, S. Chand & Co.

Basic Statistics
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1. Bhat B.R, Srivenkatramana T and Rao Madhava K.S.(1996): Statistics: A Beginner's Text, Vol. I, New Age International (P) Ltd.
2. Croxton F.E, Cowden D.J and Kelin S (1973): Applied General Statistics, Prentice Hall of India.
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2. Cooke, Cramer and Clarke (): Basic Statistical Computing, Chapman and Hall.
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5. Spiegel, M. R. (1967): Theory & Problems of Statistics, Schaum's Publishing Series.

Suggested readings

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6. Pauli, H.G. Training in research methodology: (Advisory Committee on Medical Research, 25th Session, Geneva, 10-13 October 1983). Geneva: World Health Organization, 1983.
7. Health Research Methodology, A Guide for Training in Research Methods, World Health Organization, Oxford University Press, 1993.
8. Armitage, P., Statistical Methods in Medical Research, London, Blackwell Scientific Publications, 1989.
9. Altman, D.G., Practical Statistics for Medical Research, London, Chapman and Hall, 1992.
10. Indrayan A, Basic Methods of Medical Research, Third Edition, AITBS Publishers, J-5/6 Krishna Nagar, Delhi – 110051, India.

Sampling
1. Cochran W.G and Cox G.M (1957): Experimental Designs, John Wiley and Sons.
2. Das M.N and Giri (1986): Design and Analysis of Experiments, Springer Verlag
3. Murthy M.N(1967): Sampling Theory and Methods, Statistical Publishing Society, Calcutta.
4. Sampath S. (2000): Sampling Theory and Methods, Narosa Publishing House.
5. Sukhatme B.V(1984) : Sample Survey methods and Its Applications, Indian Society of Agricultural Statistics.
6. Des Raj (2000) : Sample Survey Theory, Narosa Publishing House.
7. Goon A.M.,Gupta M.K.,Das Gupta.B. (1986): Fundamentals of Statistics, Vol.II, World Press, Calcutta.
8. Kempthorne O. (1965): The Design and Analysis of Experiments, Wiley Eastern.

Multivariate
1. Draper, N.R., and Smith, H., Applied Regression Analysis, New York, John Wiley & Sons, 1981.
2. Hand, D.J., and Taylor,C.C., Multivariate Analysis of Variance and Repeated Measures, London, Chapman and Hall, 1987.
3. Maxwell, A.E., Multivariate Analysis in Behavioural Research, London, Chapman and Hall, 1977.
4. McCullagh, P., and Nelder, T.A., Generalized Linear Models, London, Chapman and Hall, 1990.
5. Cochran, W.G., and Cox, G.M. Experimental Designs, Bombay; Asia Publishing House, 1962.

Library

Sufficient number of books is available in the University/ Departmental Library.