Z-401 BIOSTATISTICS Cr. 2(2+1)

Course Objectives:

1. To provide knowledge about the importance and use of statistics in life sciences.
2. To familiar students with the methods of data analysis pertaining to their research work and to assess the significance of their experimental designs.

Course Outcomes:

Students who successfully complete this course will be able to:

1. **DESCRIBE** the roles biostatistics serves in zoology and biomedical research.
2. **EXPLAIN** general principles of study design and its implications for valid inference.
3. **ASSESS** data sources and data quality for selecting appropriate data for specific research questions.
4. **TRANSLATE** research objectives into clear, testable statistical hypotheses.
5. **DESCRIBE** basic principles and the practical importance of key concepts.
6. **APPLY** numerical, tabular, and graphical descriptive techniques commonly used characterize and summarize data.

Course Contents:

1. **Introduction:**

- Definition, branches of statistics,
- Scope and importance of statistics

2. **Data:**

- Population and sample, variable, categorical and non-categorical data,
- Scales of measurements, errors of measurements

3. **Presentation of data:**

- Descriptive statistics

- Tabulation of data
- Parts of table and construction of table.
- Diagrams and graphs, pictogram, historigram, line chart, histogram, applications and uses of histogram
- Construction of histogram, comparison of data using histogram,
- Bar Chart, Multiple Bar Chart, Pie Chart, Gantt Chart, Timeline, Infograph, Pedigree Chart

4. Frequency distribution:

- Empirical FD, relative FD, Cumulative FD, Class frequency, Class limits, Class boundaries, Class mark, Class interval, Midpoints.

5. Measures of Central Tendency:

- Types of averages, arithmetic mean for grouped and ungrouped data, harmonic mean for grouped and ungrouped data, geometric mean for grouped and ungrouped data, median, quartiles, deciles, percentiles and mode.
- Advantages and disadvantages of arithmetic mean, harmonic mean, geometric mean, median and mode.

6. Measures of Dispersion:

- Range, grouped and ungrouped data, coefficient of range
- Mean deviation of grouped and ungrouped data. Coefficient of mean deviation.
- Standard deviation and variance of grouped and ungrouped data, variance and standard deviation of population and sample data.

7. Probability:

- Definition, properties, experiment and random experiment, event, outcome, trial, multiplication rule, sample space and sample point, mutually exclusive event, combinations and permutations, probability distribution, binomial experiment

8. Tests of Significance:

- Hypothesis testing
- Steps of hypothesis testing
- Z-test
- T-test, types,
- Chi-square
- ANOVA, its uses and LSD
- Correlation
- Regression

Practicals/Tutorials:

1. Data collection, arrangement and frequency table
2. Data presentation in table, graphs (simple bar chart, multiple bar chart, component bar chart)
3. Construction of timeline, pedigree chart, organogram, Gantt chart, infogram
4. Calculating arithmetic mean, harmonic mean and geometric mean, median and mode from ungrouped and grouped data
5. Calculating mean deviation, standard deviation and variance from ungrouped and grouped data
6. Probability distribution
7. Z-test
8. T-test
9. ANOVA
10. Correlation
11. Regression

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work: 25 marks
Midterm Exam: 35 marks
Final Exam: 40 marks

Text and Reference Books:

1. Field A. (2013) Discovering Statistics with IBM SPSS Statistics. 4th Edition. SAGE Publication Ltd.
2. Belle V. B, Fisher, L.D., Heagerty, P.J., Lumley, T. (2004) Biostatistics – A methodology for the health sciences. 2nd Edition. Wiley-Interscience
3. Quinn, G. (2002) Experimental Design and Data Analysis for Biologists. Cambridge University Press
4. Campbell, M.J., Swinscow, T.D.V. (2009) Statistics at Square One. 11th Edition. BMJ Books.

Z-403 MOLECULAR BIOLOGY Cr. 3 (2+1)

Course Objectives:

1. To impart knowledge about chemical, physical and biological properties of nucleic acids.
2. To understand different molecular mechanisms and their regulation in prokaryotes and eukaryotes.

Course Learning Outcomes:

Upon successful completion of the course, the student will be able to:

1. **EXPLAIN** how the structure and chemistry of nucleic acids relate to their functions, relative stability and interactions with proteins.
2. **UNDERSTAND** the regulation of proteins and nucleic acids interaction
3. **COMPARE & CONTRAST** mechanisms of DNA Replication, Transcription, Translation, Repair, recombination, Gene regulation, RNA processing in Erokaryotes and Eukaryotes.
4. **APPLY** molecular knowledge to identify human genetic disorders and to understand underlying molecular mechanism

Course Outline:

1. Introduction

- Introduction to nucleic acids
- Chromosome structure, Chromatin,
- DNA forms, structures and packaging
- RNA types and structures

2. Replication

- DNA Replication in Prokaryotes
- DNA Replication in Eukaryotes
- Enzymology of replication
- DNA damage and repair

3. Transcription

- Types of RNA polymerases in prokaryotes and eukaryotes
- Synthesis of mRNA, rRNA and tRNA with special reference to enzymes involved
- RNA processing
- Split genes, concept of ribozymes
- Genetic Code

4. Translation

- Role of Ribosomes
- Mechanism of Translation in prokaryotes and eukaryotes
- Various factors, and Posttranslational processing

5. Mutation

- Types of Mutations
- Base-Analogue Mutagens
- Chemical Mutagens

6. Gene expression and control

- Control of gene expression in Prokaryotes.
- Inducible and repressible operons.
- Control of gene expression in Eukaryotes.

Practicals:

1. Preparation of different stock solutions used in molecular biology (solution used in PCR, electrophoresis, DNA isolation, RNA isolation and Protein isolation.
2. Isolation of DNA from human blood.
3. Quantification of DNA and RNA through spectrophotometer.
4. DNA amplification through polymerase chain reaction.
5. Separation of different sized DNA fragments on agarose gel.

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work: 25 marks
Midterm Exam: 35 marks
Final Exam: 40 marks

Text and Reference books:

1. Weaver, R.F. 2020 Moleculer Biology, McGraw. Hill Companies. Inc. 6th Edition.
2. Alberts, B., Bray, D., Lewis, J., Raff, M., Roberts, K., Watson, J.D. 2017. Molecular Biology of the Cell. 6th Edition. Garland Publishing Inc., New York.
3. Harvey Lodish, Arnold Berk, Chris A. Kaiser, Monty Krieger, Anthony Bretscher, Hidd Ploegh, Angelika Amon, Kelsey C. Martin. 2016. Molecular Cell Biology. W. H. Freeman Publishers, Scientific American Inc.
4. Geoffrey M.C., Robert E.H. 2007. The cell: A Molecular Approach, Sinauer Associates, INC.
5. Karp, J. 2005. Cell and Molecular Biology, Concepts and Experiments, Jhon Wiley and Sons, INC.
6. De Robertis, E. D. P. 2017. Cell and Molecular Biology, 8th edition, Lea & Febiger, New York.

Z-402	تدریسِ ترجمہ قرآن سورۃ الزمر تا سورۃ ق	**Cr: 0(0+0)**
ES...	**Special Paper / Thesis/ Research Project / Internship (Univ. Option)**	**Cr: 3(2+1)/3**
ES...	**SPEICAL PAPER /UNIV. OPTION**	**Cr. 3 (2+1)**
ES...	**SPEICAL PAPER /UNIV. OPTION**	**Cr. 3 (2+1)**