

Course Code: APSY-357
Course Title: Statistics in Psychology

Credit Hours: 3
(Major Course)

Introduction

The course is designed to help students develop the conceptual background and practical skills necessary to critically evaluate the statistics encountered in their coursework and in everyday life, and to begin conducting statistical analysis of empirical data. The goal will be to go beyond rote memorization of abstract formulas and for students to develop an appreciation for the critical role that statistics plays in psychological science, both research and practice.

Course Objectives

1. This course is designed to train the students in theoretical as well as applied statistics with particular reference of issues in psychological research. The statistical analysis is pivotal part of psychological research and students need to have a grasp over the concepts, theoretical rational of use of certain statistical analysis and also to learn to carry out these analyses.

Learning Outcomes

Upon completion of this course the student will be able to:

1. understand types of statistics and apply appropriate statistics keeping in view the type of data
2. apply statistical techniques for data analysis in accordance with objectives and hypotheses being formulated in research.

Contents

Unit-I

1.1 Introduction

- 1.1.1 Defining statistics; Importance of statistics in Psychology; Descriptive statistics and graphic representation of data; Data: Types of data; Frequency distribution: Cumulative frequency distribution; Histogram, Polygon, Pictograph, Bar Diagram, Pie Chart; Measures of central tendency; Measures of dispersion: Mean, Mode, and Median: Range, Mean Deviation, Quartile Deviation, Variance, and Standard Deviation

Unit-II

2.1 Normal & Binomial Distribution

- 2.1.1 Normal distribution: Its properties and application: Binomial distribution: Its properties and application.

Unit-III

3.1 Sampling Distributions and related concepts

- 3.1.1 Introduction, sample design and sampling frame, bias, sampling and non-sampling errors, sampling with and without replacement, Determining sample size, Sampling distributions for single mean and proportion, Difference of means and proportions.

Unit-IV

4.1 Testing Hypotheses

Unit-V

5.1 Inferential Statistics

- 5.1.1 Basic assumptions / rationale and when to use which inferential statistic
- 5.1.2 Critical Region, One Tailed & Two Tailed Tests
- 5.1.3 Type One and Type Two (I & II) Errors, Level of Significance: concept of alpha and P value

Unit-VI

6.1 Parametric Statistics

- 6.1.1 Rationale and basic considerations/ assumptions
- 6.1.2 t-test analysis: Independent sample, paired sample, one sample
- 6.1.3 Analysis of Variance: One way ANOVA, Two Way ANOVA
- 6.1.4 Correlation, Regression: Linear Regression, Multiple Regression
- 6.1.5 Correlation & Causation, Pearson Product moment Correlation, Z – Test

Unit-VII

7.1 Non Parametric Statistics

- 7.1.1 Rationale and basic considerations/ assumptions
- 7.1.2 Spearman's Rank Order Correlation, Chi Square Test (Contingency Table and Proportions)
- 7.1.3 Yates Correction, Non Parametric tests, Wilcoxon test, Mann Whitney test, Sign test, Kruskal Wallis

Teaching Strategies

Lectures, tutorials and semester work

Semester Work will include Assignments, Quizzes, Presentation, Class Projects, Class participation

The learning goal through Sessional work would be to promote acquisition of factual information/ subject matter/ course content, Application of knowledge and enhancing the synthesizing and generalization capacity of the students.

Assessment and Examinations:

Sr. No.	Elements		Details
1.	Midterm Assessment		It takes place at the mid-point of the semester.
2.	Formative Assessment		It is continuous assessment. It includes: classroom participation, attendance, assignments and presentations, homework, attitude and behaviour, hands-on-activities, short tests, quizzes etc.
3.	Final Assessment		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.

Suggested Readings:

• Books

- Alder, H.L. & Accsstes, E.B. (1999). *Introduction to probability and statistics*. San Francisco: Froeman and Company.
- Boslaugh, S., & Watters, P. A. (2008). *Statistics in a nutshell: A desktop quick reference*. UK: O'Reilly Media.
- Casella, G., & Berger, R. L. (2002). *Statistical inferences* (2nd ed.). Australia: Thomson Learning
- Corder, G. W. (2009). *Nonparametric statistics for non-statisticians*. London: Wiley.
- Downic, N. M. & Heath, R.W. (1990). *Basic statistical methods*. New York: Harcourt Brace & Jakanovich
- Field, A. (2009). *Discovering statistics using SPSS* (3rd ed.). Los Angeles: Sage.
- Gelfand, H. (2010). *Mastering APA style* (6th ed.). Los Angeles: Sage.
- Gravetter, F. J., & Walliam, L. B. (2000). *Statistics for the behavioral sciences* (5th ed.). Australia: Wadsworth Thomson Learning
- Gupta, S. (2009). *Business statistics*. India: Biyani Shikshan Samiti Retrieved from <http://www.gurukpo.com/ADMIN/Bookpdf/23.pdf>
- Howell, D.(2002). *Statistical methods for psychology* (5th ed.). Singapore: Luxury Press.
- King, B.M., Minimum, E.W. (2009). *Statistical reasoning in psychology and education* (3rd ed.). New York: John Wiley & Sons, Inc.
- Klotz, J. H. (2006). *A computational approach to statistics*. UK: Wisconsin
- Mangel, S. K. (2004). *Statistics in psychology and education* (2nd ed.). India; Prentice-Hall of India Pvt. Limited
- McClane, J. T. (2000). *A first course in statistics* (7th ed.). USA: Prentice Hall
- Moore, D. S., & McCabe, G. P. (1998). *Introduction to the practice of statistics* (3rd ed.). New York: Longmans.
- Muhammad, F. (2005). *Statistical methods and data analysis*. Pakistan: Kitab Markaz
- Neave, H. R. (2011). *Statistical tables: For mathematicians, engineers, economists, and the behavioral and management sciences* (2nd ed.). New York: George Allen & Unwin
- Pelosi, M. K., & Sandifer, T. M. (2003). *Elementary statistics*. USA: John Wiley & Sons, Inc.
- Sinha, B. J. (2000). *Encyclopedia of statistics, psychology and education*. New Jersey: Anmol Terry Sircich Upper Saddle River
- Tabachnick, B. G. (2013). *Using multivariate statistics* (6th ed.). Boston: Pearson.
- Weiers, R. M. (2011). *Introduction to business statistics* (7th ed.).USA: South Western Cengage Learning.
- Winer, S.B. (1990). *Statistical principles in experimental design*. NY: McGraw Hill Book Company.

• Journal Articles / Reports

- MacRae, A. W. (2019). Descriptive and inferential statistics. In *Companion Encyclopedia of Psychology* (pp. 1099-1121). Routledge.
- Ferrari, C., Macis, A., Rossi, R., & Cameletti, M. (2018). Multivariate Statistical Techniques to Manage Multiple Data in Psychology. *OA J Behavioural Sci Psych*, 1(2), 180006.
- Dombrowski, S. C., McGill, R. J., & Canivez, G. L. (2018). Hierarchical exploratory factor analyses of the Woodcock-Johnson IV Full Test Battery: Implications for CHC application in school psychology. *School Psychology Quarterly*, 33(2), 235.
- Peneva, I., & Yordzhev, K. Study on: Essence and Conditions for Application of Parametric and Nonparametric Statistical Methods. *Recent Advances in Science and Technology Research*, 115.
- Myers, N. D., Ntoumanis, N., Gunnell, K. E., Gucciardi, D. F., & Lee, S. (2018). A review of some emergent quantitative analyses in sport and exercise psychology. *International Review of Sport and Exercise Psychology*, 11(1), 70-100.

- Kelter, R. (2021). Analysis of type I and II error rates of Bayesian and frequentist parametric and nonparametric two-sample hypothesis tests under preliminary assessment of normality. *Computational Statistics*, *36*(2), 1263-1288.
- Howard, G. S. (2019). The present and future of methodology and statistics in psychology. *The Humanistic Psychologist*, *47*(1), 26.
- Amrhein, V., Trafimow, D., & Greenland, S. (2019). Inferential statistics as descriptive statistics: There is no replication crisis if we don't expect replication. *The American Statistician*, *73*(sup1), 262-270.
- Trafimow, D., & MacDonald, J. A. (2017). Performing inferential statistics prior to data collection. *Educational and Psychological Measurement*, *77*(2), 204-219.
- MacRae, A. W. (2019). Descriptive and inferential statistics. In *Companion Encyclopedia of Psychology* (pp. 1099-1121). Routledge.
- Pek, J., Wong, O., & Wong, A. (2018). How to address non-normality: A taxonomy of approaches, reviewed, and illustrated. *Frontiers in psychology*, *9*, 2104.