BALL STATE UNIVERSITY

EDPS 642: Analysis of Variance

College of Education, Ball State University Fall 2026

Course Credit: 3 credit hours

Instructor: Lilian Tetteh, Ph.D.
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Office: TC 549

Office Hours: **Mondays 10:00am - 12:00pm & Thursdays 1:30 AM - 3:30 PM**
Students are welcome to stop by my office during these hours. If you prefer to meet virtually, please email me, and I will send you a Zoom link.

Scheduled Appointments
If you would like to guarantee a meeting or need to meet outside of office hours, please email me in advance to schedule either an in-person or online appointment at a mutually convenient time.

Course Modality/Structure Asynchronous

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Course Description

This course extends students' knowledge of elementary descriptive and inferential statistics with an emphasis on statistical methods commonly used in educational research. Topics include nonparametric statistical procedures, comparisons of means, analysis of variance (ANOVA), and analysis of covariance (ANCOVA). The course emphasizes the conceptual understanding and appropriate application of statistical methods for educational research rather than software-specific data analysis techniques.

Course Rationale: This course prepares students to apply intermediate statistical methods to real-world educational and social science research while developing the critical skills needed to interpret, evaluate, and communicate research findings effectively.

Student Learning Outcomes

Upon successful completion of this course, students will be able to:

- Select appropriate statistical analyses for a variety of educational research questions and study designs.
- Explain the assumptions, strengths, and limitations of commonly used statistical procedures.
- Evaluate whether the assumptions of statistical tests are met and justify the selection of appropriate analyses.
- Conduct and accurately interpret statistical results.
- Report results in accordance with APA format and reporting guidelines.
- Critically evaluate and defend statistical decisions in educational research.
- Interpret and critically evaluate published educational research that uses intermediate statistical methods.

Required Software CLICK ME and LOGIN with your BSU Username and Password

Students are required to have access to SPSS for this course. Click the provided link, log in using your **BSU username and password**, and follow the instructions to request and download the software. Please ensure that SPSS is installed and functioning on your computer.

Required Textbook

Field, A. (2017). *Discovering Statistics Using IBM SPSS Statistics* (5th North American ed.). Sage Publications.

Highly Recommended Reading

Howell, D. C. (2007) Statistical Methods for Psychology (7th Edition). Belmont, CA: Cengage Wadsworth.

Additional required and recommended readings will be posted in the corresponding module folders on Canvas.

Prerequisites: Successful completion of **PSYSC 241**, **EDPS 641**, or a satisfactory score on the placement test. **The placement test must be completed by August 29.** *Students are also expected to have a working knowledge of basic arithmetic and elementary algebra.*

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Learning Objectives and Activities

This course is organized into **five learning modules**, each designed to build students' conceptual understanding and practical application of intermediate statistical methods. Each module includes a combination of readings, lectures, class activities, and assessments to reinforce learning.

Weekly Learning Activities

For each learning module, students are expected to complete the following:

- **Read** the assigned textbook chapters and any supplemental readings.
- **Review** the lecture materials and instructional videos.
- **Attend and actively participate** in class discussions and hands-on learning activities.
- **Complete** all assigned learning activities, quizzes, homework, and module assessments by the specified deadlines.
- **Seek clarification** by asking questions during class, office hours, or via email whenever additional support is needed.

Review Sessions

Throughout the semester, designated review sessions will be held to reinforce key concepts and statistical procedures covered in previous modules. These sessions provide opportunities to synthesize course content, address questions, work through practice problems, and prepare for quizzes, projects, and examinations.

Topics in Learning Modules

- ***Module 1: Comparing Two Means (t-Tests)***
  - Independent-Samples *t-Test*
  - Paired-Samples *t-Test*
  - Statistical Power and Assumptions
  - Nonparametric Alternatives
- ***Module 2: One-Way Analysis of Variance (ANOVA)***
  - The F-Test
  - Multiple Comparison Procedures
  - Computer Applications of One-Way ANOVA
- ***Module 3: Nonparametric Analysis of Variance***
  - Kruskal–Wallis Test for *k* Independent Groups
  - Multiple Comparisons for Kruskal–Wallis Test
- ***Module 4: Factorial ANOVA***
  - Two-Way ANOVA
  - Main Effects
  - Interaction Effects
  - Multiple Comparisons for Significant Interactions
  - Computer Applications of Factorial ANOVA
- ***Module 5: Repeated Measures ANOVA***
  - Between-Subjects Effects
  - Within-Subjects Effects
  - Mixed-Effects Designs
- ***Module 6: Analysis of Covariance (ANCOVA)***
  - Covariates and Covariance
  - Analysis of Covariance
  - Computer Applications of ANCOVA

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Assessment and Grading

Learning Objectives Aligned with Assessment Plan

Learning Objectives	Assessment Methods
Identify the purposes and applications of intermediate statistical methods in educational research.	Module Quizzes, Review Exams
Demonstrate conceptual and procedural knowledge of statistical methods covered in the course.	Module Quizzes, Review Exams
Select appropriate statistical analyses based on research questions and study designs.	Core Assignment (CA), Review Exams, Extended Assignments (EA)
Conduct statistical analyses and accurately interpret statistical results.	Core Assignment (CA)
Report statistical findings using APA Style guidelines.	Core Assignment
Critically evaluate published educational research using intermediate statistical methods.	Extended Assignments (EA)
Develop and justify statistical analysis plans for educational research.	Extended Assignments (EA)

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Assessment Components

Module Quizzes

Students will complete an online quiz at the end of each learning module to assess their conceptual understanding and application of the statistical methods covered. Each quiz will consist of 10 questions drawn from the assigned readings, lecture materials, and class activities.

Format: *Canvas Online Quiz (10 questions per module)*

Grading: 10 *points × 5 modules = 50points*

Core Assignment (CA)

Students will conduct statistical analyses using statistical software, demonstrating the computational procedures and rationale for the statistical methods covered in each module.

Format: PDF, Microsoft Word

Grading: 20 points × 5 modules = 100points

Review Exams

Two comprehensive review exams will assess students' mastery of course concepts and procedures.

Coverage: Review Exam 1: ***Modules 1–3***

Review Exam 2: ***Modules 4–5 (Comprehensive)***

Format: Canvas Online Exam

Grading: 75 points × 2 = 150 points

Extended Assignments (EA)

All students will complete two extended assignments. EA1 requires a critique of the statistical methods used in a published educational research article. EA2 requires students to design a statistical analysis plan for an original educational research study, including research questions, hypotheses, justification of the selected analysis, assumptions, interpretation plan, and APA-style reporting.

Format: Word document (2–3 pages)

Grading: 25 points × 2 = 50 points

Summary of Assessment

Summary of Assessment

Assessment	Points
Pretest	50
Module Quizzes (5)	50
Core Assignment (5)	100
Review Exams (2)	150
Extended Assignments (2)	50
Total	***400***

Course Grading Scale

Letter Grade	Range	Letter Grade	Range
A	100% – 94%	C	<77% – 74%
A-	<94% – 90%	C-	<74% – 70%
B+	<90% – 87%	D+	<70% – 67%
B	<87% – 84%	D	<67% – 64%
B-	<84% – 80%	D-	<64% – 61%
C+	<80% – 77%	F	<61% – 0%

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Course Policies

Assignment Submission

All assignments must be submitted electronically through the appropriate assignment link on Canvas by the posted deadline. Assignments submitted via email will not be accepted unless prior approval has been granted by the instructor. Each assignment must include the student's **full name**. ***Assignments submitted without a name will incur a 0.5-point deduction.***

Assignment Format and Evaluation

The point value, submission requirements, and due dates for each assignment are provided in the corresponding assignment instructions. Detailed grading rubrics are available within the respective assignment on Canvas. Student work will be evaluated based on ***accuracy, completeness, clarity, organization, adherence to assignment requirements, and, where applicable, APA Style guidelines***. ***Students are expected to carefully proofread all assignments before submission.*** Written work should reflect graduate-level standards of writing, including proper grammar, spelling, punctuation, and professional presentation.

Academic Integrity

Students are expected to uphold the highest standards of academic honesty. All assignments, quizzes, examinations, projects, and other course activities must represent each student's own original work unless collaboration is explicitly authorized by the instructor.

Assignments may be submitted through plagiarism-detection software (e.g., Turnitin or other university-approved plagiarism detection services). Students are expected to submit original work and properly cite all sources. Any form of cheating, plagiarism, unauthorized collaboration, fabrication, or other violations of the University's Academic Integrity Policy may result in penalties including, but not limited to:

- A score of zero on the assignment or examination;
- A failing grade (**F**) for the course; and/or
- Referral for additional disciplinary action in accordance with university policies.

Late Assignment Policy

Assignments are due by the date and time specified in the course schedule or as posted on Canvas. Technology failures, internet connectivity issues, lost files, or other avoidable technical problems are ***NOT*** acceptable reasons for late submissions. Students are encouraged to maintain backup copies of all coursework and submit assignments well before the deadline. Assignments submitted without prior instructor approval will incur a **10% deduction** if submitted within **seven (7) calendar days** after the due date. *Assignments submitted more than **seven (7) days late** will not be accepted. Students experiencing documented extenuating circumstances should contact the instructor **before the assignment deadline**, whenever possible, to discuss alternative arrangements.*

Course Communication

Official course announcements, assignment updates, schedule changes, and other important course information will be communicated during class, through Canvas, and/or via students' official university email accounts. Students are responsible for monitoring Canvas and their university email regularly and are accountable for all information communicated through these channels.

Changes to the Syllabus

The instructor reserves the right to modify the course syllabus, schedule, assignments, grading policies, or other course requirements as necessary to enhance student learning or respond to unforeseen circumstances. Any changes will be communicated during class, through Canvas, and/or via students' official university email accounts. Students are responsible for staying informed of all announced updates, regardless of class attendance.

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EDPS 642 Course Schedule				
Module	**Learning Module / Topics**	**Assessment**	**Due Date**	**Reading**
Module 1 08/25 – 08/28	**Course Introduction** • Syllabus Overview • Review of Research Design • Review of Descriptive Statistics • Review of Hypothesis Testing and *t*-Tests	Pretest Quiz 1 CA 1	08/27 **11:59pm**	Field, Chapter 3, 4, 9 Howell, Chapter 1,2,3,4,7
Module 2 09/01 – 09/11	**Comparing Two Means (*t*-Tests)** • Independent-Samples *t*-Test • Paired-Samples *t*-Test • Statistical Power and Assumptions • Nonparametric Alternatives • Computer Applications	Quiz 2 CA 2	09/13 **11:59pm**	Field, Chapter 5,9,15 Howell, Chapter 8, 18
Module 3 09/15 – 09/18	**Comparing Several Means (One-Way ANOVA)** • One-Way ANOVA • The *F* Test • Multiple Comparison Procedures • Computer Applications	Quiz 3 CA 3	09/20 **11:59pm**	Field, Chapter 10 Howell, Chapter 11, 12
Module 4 09/22 – 10/02	**Nonparametric ANOVA** • Kruskal–Wallis Test • Multiple Comparisons • Computer Applications	Review Exam 1 (Modules 1–3) Extended Assignment 1 (EA1)	10/04 **11:59pm**	Field, Chapter 15 Howell, Chapter 18
Module 5 10/06 – 10/16	**Factorial ANOVA** • Two-Way ANOVA • Main Effects • Interaction Effects • Computer Application	Quiz 4 CA 4	1 0/18 **11:59pm**	Field, Chapter 12 Howell, Chapter 13
Module 6	**Repeated Measures ANOVA**			Field, Chapter 13, 14, 15

10/20– 10/ 30	• Between-Subjects Effects • Within-Subjects Effects • Mixed-Effects Designs	Quiz 5 CA 5	11/01 **11:59pm**	Howell, Chapter 14
Module 7 **11/03 – 11/ 13**	**Analysis of Covariance (ANCOVA)** • Covariates and Covariance • Analysis of Covariance • Computer Applications	Review Exam 2 (Modules 4–6) Extended Assignment 1 (EA1)	11/15 **11:59pm**	Field, Chapter 16 Howell, Chapter 11
11/17 – 11/ 20	**Review and Catch up**			
12/2 – 12/ 11	Revision and Resubmission of CA, and Extended Assignments (as permitted by the instructor)		12/08 11.59m	

NOTE:

Revision and Resubmission

Following each Review Exam, students will have an opportunity to revise and resubmit selected ***Core Assignments (CA1 and CA2)*** based on the instructor's feedback. *The purpose of this process is to reinforce statistical concepts, strengthen analytical skills, and improve scholarly writing through reflection and revision. Students are strongly encouraged to meet with the instructor during office hours or by appointment to discuss feedback and strategies for improvement.*
Format: Revised assignment submitted according to the original assignment instructions.
Grading: Students may recover up to 90% of the original point value for each eligible Core Assignment through satisfactory revision and resubmission.

Quiz Corrections (Correction Notes)

To encourage mastery of course concepts, students may complete ***Correction Notes (CN)*** for previously completed quizzes. Students will identify incorrect responses, explain why the original answer was incorrect, provide the correct solution, and briefly justify their reasoning. Because quiz concepts are reinforced in the Review Exams, completing Correction Notes serves as an effective study strategy while promoting deeper conceptual understanding.
A template and examples for completing Correction Notes will be provided on Canvas.
Format: Canvas Quiz Correction Notes (submitted after each quiz or during designated revision periods)
Grading: Students may recover up to 90% of the original point value for each eligible quiz by submitting satisfactory Correction Notes by the designated deadline.

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Ball State University Policy

University Statement

We are committed to ensuring that all members of the community are welcome, through valuing the various experiences and worldviews represented at Ball State and among those we serve. We promote a culture of respect and civil discourse. If you need course adaptations or accommodations because of a disability, please contact the instructor of record as soon as possible. Ball State's Disability Services Office coordinates services for students with disabilities; documentation of a disability needs to be on file in that office before any accommodations can be provided. Disability Services can be contacted at 765-2855293 or dsd@bsu.edu.

Freedom of Expression

In this course, we are committed to fostering a learning environment that values intellectual diversity, encourages free expression, and promotes open inquiry. As members of the Ball State Community, we treat each person in the Ball State community with civility, courtesy, compassion, and dignity and respect and learn from differences in people, ideas, and opinions. Please review Ball State University's Statement on Freedom of Expression, the resources on Ball State's Freedom of Expression webpage, and Ball State's Beneficence Pledge.

Attendance

Attendance Students are expected to come to each class lecture prepared and ready to participate in class discussion and in class activities. If a student must miss a class, please let the instructor know the reason for the absence and, if necessary, provide documentation University policies regarding student absences. ***Attendance will be recorded for every class meeting.***

Title IX

Ball State University is committed to providing a safe and inclusive learning environment for all students. If you or someone you know has experienced sexual harassment—including sexual assault, dating violence, domestic violence, or stalking, please know that you are not alone. The University offers support services and resources. For more information or to report an incident, please visit bsu.edu/titleix or contact the Title IX Coordinator at 765-285-1545 or at titleix@bsu.edu

As your instructor, I am a mandatory reporter under the Title IX policy and required to report any information I receive about possible sexual harassment. This includes information shared in class discussions, assignments, or private conversations.

What happens after I report? The Title IX Coordinator will email the person who experienced sexual harassment (complainant) and invite them to schedule a meeting. If the complainant **chooses** to meet with the Title IX Coordinator,

- Title IX Coordinator will offer supportive measures (e.g., counseling, extensions on deadlines, course-related adjustments, changes to work or class schedules, and/or referrals to campus offices), review the policy, and discuss options to move forward.
- If a complaint is filed by the complainant or the University, an investigation will begin following University policy.

University Grade Appeal Policy

If you believe you received a final course grade that does not reflect your performance due to fairness or a procedural issue, you have the right to file an appeal within 5 school days after final grades are posted by the Office of the Registrar. Review the University Grade Appeal Policy and Process.]

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Student Academic Ethics Policy

Honesty, trust, and personal responsibility are fundamental attributes of the university community. Academic dishonesty and other forms of academic misconduct threaten the foundation of an institution dedicated to the pursuit of knowledge and will not be tolerated. To maintain its credibility and reputation, and to equitably assign evaluations of scholastic and creative performance, Ball State University is committed to maintaining a climate that upholds and values the highest standards of academic integrity. Visit the VPAA's academic integrity website (Students tab) for resources on understanding academic integrity, citing sources properly, and avoiding inadvertent academic dishonesty. To learn about BSU's academic integrity expectations and students' rights, please read the University Student Academic Ethics Policy.

Academic integrity violations include giving or receiving an unfair academic advantage (cheating), presenting someone else's ideas or work as your own (plagiarism), and falsifying academic records. Unless otherwise indicated, you must work independently by yourself. Check with me if you are unsure whether something constitutes academic dishonesty. Examples of academic integrity violations include but are not limited to:

- Using resources not authorized by the faculty member (including devices, AI tools, hidden notes, and open books).
- Using commercial study websites to find answers to graded assignments (Chegg, Course Hero, StudyPool, OneClass, etc.).
- Without the instructor's written permission, giving away, buying, or selling graded assignments class notes, exams, study guides, or other course materials to other students or to third-party vendors (Course Hero, Chegg, 24HourAnswers, etc.).
- Working with another person on any assignment other than authorized group projects.
- Sharing or allowing others to access your files, whether done with permission or not.
- Reusing your own work from another semester, course, or section.
- Sharing answers with others during exams (passing notes, texting, whispering, gesturing)
- Discussing exam questions and answers with students who have not taken the exam.
- Soliciting others to complete work for you.

Generative AI Statement

Some Use of Generative AI Permitted Under Some Circumstances or With Explicit Permission

During this class, we may use ChatGPT or other generative AI applications. You will be informed as to when, where, and how these tools are permitted to be used, along with guidance for attribution. [Indicate your expectations regarding use of applications with AI built-in features]. Any use outside of this permission constitutes a violation of Ball State University's Student Academic Ethics Policy.

So – here is my thought on AI…some of you are going to use it, some of you won't – no matter what my policy is. So – if you use it – tell me how you used it. If I find it to be "over the line" I'll tell you and/or adjust a grade based on it. You may not use it to "generate" your reading evidence and receive full credit. You can do that and get partial credit – but only fully independent reading evidence will be granted full points. It is also important to review the rubrics for assignments – there will be some situations (eg., Reading Evidence) where the proliferation of AI has adjusted my scoring potential – that is, you cannot get top scores in some cases without "proving" that you have not used AI. ***When in doubt – ask ahead of time, and I'll help you navigate. It is NOT OK (in my view) to have an AI device write for you, or complete a response to a question that I have posed in a quiz, test, or project…It IS ok to have an AI device provide you with a summary, alternative way to understand something, or be used to find resources.***

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Student Support Services

The Learning Center

The Learning Center offers free Tutoring and Academic Coaching for many courses at Ball State. Students can make appointments for online (Zoom) or in-person (NQ 350) appointments. To make an appointment, visit myballstate.bsu.edu and click on "Navigate" in the Academic Tools section, or just go directly to bsu.navigate.eab.com.

Testing accommodation for students with disabilities are available for students who have received the appropriate documentation from Disability Services. Tests may be administered in the Learning Center. Supplemental Instruction is available in select courses. If you have an SI leader for your course, that person will provide students with information the first week of school regarding weekly study sessions. For more information about Learning Center programming, visit bsu.edu/learningcenter or call 765-2851006. Follow us on Instagram: BallStateLC.

The Writing Center

All writers improve with practice and feedback, so as a student in this course, you are encouraged to use the Writing Center (in Robert Bell 295 during weekdays, Bracken Library First Floor West in the evenings, or online during any of our regularly scheduled hours) to get additional feedback on your writing. The Writing Center offers free planning, feedback, and accountability sessions (in person and online) to all students composing essays, reports, reflections, research projects, web content, lesson plans, slideshows, poster presentations, resumes, and other digital or print texts. To schedule a free appointment to discuss your writing, go to bsu.edu/writingcenter. Online and in-person appointments are available; however, plan ahead because appointments book quickly!

The Basic Needs Hub

If you are having difficulty affording enough food, do not have a safe and reliable place to sleep, and/or experiencing an emergency or crisis, help is available through the Basic Needs Hub. The Basic Needs Hub has information, resources, and provides individualized support to students. To talk with a supportive staff member about your experience, receive one on one assistance, or learn more about resources, you can submit a Basic Needs Assistance Form.

The Counseling Center

The Ball State University Counseling Center offers free and confidential services to all students. The Counseling Center is located in Lucina Hall, Room 320. To schedule an appointment, you can contact us at 765-285-1736. Ball State also offers a 24/7 Crisis Line, which can be reached at 765-285-HOPE (4673). The Crisis Line is a mental health resource for those who are struggling with any mental health concerns, including thoughts of self-harm and/or suicide.
At the Ball State Counseling Center, we see students for a variety of reasons, some of which include homesickness, relationship concerns, anxiety, and depression. At your first appointment, you will work with a therapist to create a plan that will connect you with resources that best fit your needs. We assist students with getting connected to therapy at our Center as well as connecting students to self-help resources, other on-campus resources, and community-based resources. All Ball State students also have access to several on-demand, self-help resources through a variety of different platforms. All of these resources, including a direct link to our website, can be found **here**.

The Speaking Center

The Speaking Center is a free resource available to all members of the BSU community wanting to improve their public speaking abilities. We offer personalized coaching designed to help you become a

more confident and effective speaker. Our trained coaches provide constructive feedback and support throughout the entire speech preparation process, whether you are in the early stages of brainstorming ideas and organizing your thoughts, or you need to practice your delivery and refine your message.

The Center is in the David Letterman Communication and Media Building, room 302. To schedule an appointment, please access us through your Navigate app or use this direct link to sign up for a time**.** Appointments are available both in person and on Zoom. Appointments are available in person, on Zoom, and in virtual reality (VR) for those interested in practicing in an immersive speaking environment.

Canvas and Student Privacy

Canvas Accessibility

Canvas provides a user experience that is easy, simple, and intuitive. Special attention has been paid to making Canvas screen-readable. The Rich Content Editor encourages users to create accessible content pages (i.e. text formatting is accomplished using styles). Canvas is designed to allow limited customization of colors and schemes to be accessible for all users. The National Federation of the Blind granted Canvas the Gold Level Web Certification in 2010. ***Find more information by visiting the Canvas Voluntary Product Accessibility Template (VPAT).***

FERPA and Privacy

As a student, your educational records are considered confidential. Under FERPA (Family Educational Rights and Privacy Act), your records are confidential and protected. Under most circumstances, your records will not be released without your written and signed consent. However, some directory information may be released to third parties without your prior consent unless a written request to restrict this is on file. *You can learn more about student rights to privacy by reading* ***Ball State's FERPA and Privacy and Protection.***

Video Conferencing Recording

In this class, software may be used to record live class discussions. As a student in this class, your participation in live class discussions may be recorded. These recordings typically will be made available only to students enrolled in the class, to assist those who cannot attend the live session or to serve as a resource for those who would like to review content that was presented. Students who prefer to participate via audio only will be allowed to disable their video camera so only audio will be captured. Students who prefer to listen only must disable their audio capability and visual camera. If you have concerns, please discuss these options with me.

Plagiarism Detection

The campus subscribes to Turnitin, a plagiarism prevention service, through Canvas. You may need to submit written assignments to Turnitin. Student work will be used for plagiarism detection and for no other purpose. The student may indicate in writing to the instructor that he/she refuses to participate in the plagiarism detection process, in which case the instructor can use other electronic means to verify the originality of their work.