GW | Public Policy & Public Administration

Trachtenberg School of Public Policy & Public Administration

PPPA 6002 • Research Methods & Applied Statistics • Fall 2023

Sections

- Sec 10: Thursday 1:15–3:05, Rome 459
- Sec 11: Wednesday 1:15-3:05, Funger 220
- Sec 12: Wednesday 6:10-8:00, MPA 309
- Sec 13: Thursday 6:10-8:00, MPA 309

Instructors

- *Part 1: Research Methods (through week 7)*

  Bill Adams (adams@gwu.edu): All sections. Office hours immediately after class, plus Wed/Thurs 4-5:30 (campus office) and Tues 4-6:00 (Zoom) billzoom.youcanbook.me

- *Part 2: Applied Statistics (starting week 8)*

  Dylan Conger (dconger@gwu.edu): Sec 10 & 13. Zoom office hours by appointment during Tues 2-4:00 and at other times. Send email to make an appointment.

  Robert Olsen (rolsen@gwu.edu): Sec 11 & 12. Zoom office hours by appointment during Tues 3-5:00 and at other times. Send email to make an appointment.

Labs

- Sec 10: Thursday 3:45–5:00, Rome B104
- Sec 11: Wednesday 3:30-5:00, Gov 103
- Sec 12: Wednesday 8:10-10:00, Rome B104
- Sec 13: Thursday 8:10-10:00, Rome B104

Course Materials

- Blackboard: course announcements, PowerPoints, readings, videos, assignments, links, and datasets.
- SPSS software (available through GW)
- Optional textbook (see Part 2 Additional Information below)

Learning Objectives

PPPA 6002 focuses on practical skills for conducting and evaluating empirical and quantitative research, along with a brief look at qualitative methods. It also covers the widely used statistical software, SPSS, and foundational univariate, bivariate, and multivariate statistics. At the conclusion of the course, students should know how to:

1. Formulate problem statements, research questions, and testable hypotheses
2. Consider ethical issues in research on human participants
3. Evaluate various sampling techniques
4. Evaluate surveys and other data collection methods
5. Evaluate RCTs and non-experimental designs, such as NEC, time series, and correlational designs
6. Conduct basic statistical analyses using SPSS
7. Interpret univariate and bivariate statistics, such as t-tests, chi square, correlation, and regression
8. Interpret multivariate statistical techniques, such as multiple regression and partial tables analysis
9. Describe, present, and interpret data in visual and numeric forms

Assignments and Grades

Part 1:	*Part 2:*
Weekly worksheets = 10%	Weekly worksheets = 10%
Quiz = 10%	Research memo = 20%
Research plan = 10%	Exam for Part 2 = 20%
Exam for Part 1 = 20%	

Lowest overall grade (no rounding) for an A is 95.00; A- 90.00; B+ 87.00; B 83.00; B- 80.00; C+ 77.00; C 73.00; and C- 70.00.

Research Project Assignment

This project offers an opportunity to develop your skills in generating relevant statistics and interpreting them using a pre-approved dataset. The assignment has two parts, a research plan and a research memo. More details will be provided during the second week of class.

Class Participation

Your engagement each week is vital to making this course work effectively. This entails not only attending class regularly, but also participating in discussions, and keeping on top of communications — including checking announcements in Blackboard and responding promptly to emails.

Part 1: Additional Information

Office Hours: To meet during online office hours or in person, you will be able to select your most convenient time at billzoom.youcanbook.me. If the issue is time sensitive, please email adams@gwu.edu.

Suggested Steps:

(1) Closely review the week's narrated PowerPoint in Blackboard.

(2) Then in Blackboard go to the week's readings section to read the articles and watch the short videos.

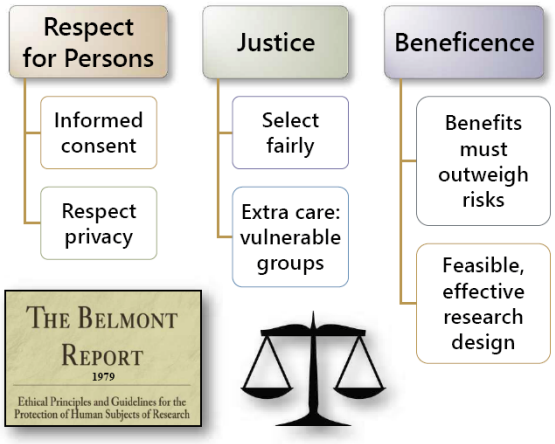
(3) Study the week's key concepts as listed in the syllabus. Make it priority to draw on the PowerPoint talk and the supplemental materials to fully understand and be able to apply these concepts. Please bring any questions for the Q&A in the regular class session or for chats with the instructor or TA.

(4) If you joined a team, Zoom with your team to review the key concepts and discuss the worksheet.

(5) Upload your answers to the weekly worksheet by the day before our class meeting. Answers should be concise but usually more than a few words.

(6) Be sure to have a convenient copy of the worksheet questions and your answers for the class discussion.

(7) Class attendance is extremely important.



Part 2: Additional Information

Textbook: Textbook: Part 2 has no required textbook. However, the following optional text might be helpful: Healey, Joseph, and Donoghue, Christopher. *Statistics: A Tool for Social Research and Data Analysis* (11th ed., 2021). Please do not purchase this book until later in September after receiving an email with more details.

SPSS: Available through the CCAS Cloud and on the computers in the labs. You do not need to rent or purchase SPSS, but if you do want a copy, it is available through gwu.onthehub.com.

Lab Sessions: The TA will assist with SPSS, the worksheets, and your research project. Lab attendance is encouraged but not mandatory.

Worksheets: You are encouraged to work with classmates, but please still turn in your own solutions.

Take Home Final Exam: The exam will draw primarily from material covered in Part 2. Questions will be posted on Blackboard at the start of class, and you will submit your answers before the end of the class.

Lab TAs

- Sec 10: Will Kimball <will_kimball@gwu.edu>
- Sec 11: Julia McNicholas <jmcnicholas@gwu.edu>
- Sec 12: Aisha Shafi <aisha.shafi@gwu.edu>
- Sec 13: Taylor Elop < taylor_elop@gwu.edu>

Sessions (Thurs & Weds)		Assignments Due	Labs
Week 1 (8/24 & 8/30)	Research ethics, research questions, and literature reviews	Worksheet #1	None
Week 2 (8/31 & 9/6)	Measurement validity and reliability; Levels of measurement	Worksheet #2	None
Week 3 (9/7 & 9/13)	Questionnaire design and sampling	Worksheet #3	For help with Research Plan
Week 4 (9/14 & 9/20)	Causal inference and RCT designs; NEC, time series, correlational designs	Worksheet #4	For help with Research Plan
Week 5 (9/21 & 9/27)	Qualitative research, focus groups, and meta-analysis	Worksheet #5 & Research Plan	Quiz
Week 6 (9/28 & 10/4)	Univariate descriptive statistics	Worksheet #6	Intro to SPSS
Week 7 (10/5 & 10/11)	*Part 1 Exam*	Worksheet #7	None
Week 8 (10/19 & 10/18)	Refresher on normal curve; Intro to sampling distribution	None	For help with Worksheet 8
Week 9 (10/26 & 10/25)	Estimation; confidence intervals	Worksheet #8	For help with Worksheet 9
Week 10 (11/2 & 11/1)	Difference of means; t-test	Worksheet #9	For help with Worksheet 10
Week 11 (11/9 & 11/8)	Contingency tables; chi-square test	Worksheet #10	For help with Worksheet 11
Week 12 (11/16 & 11/15)	Bivariate regression & correlation	Worksheet #11	For help with Worksheet 12
Week 13 (11/30 & 11/29)	Controlling for variables: partial tables analysis & multiple regression	Worksheet #12	For help with Worksheet 13
Week 14 (12/7 & 12/6)	Review for final examination	Worksheet #13 & Research Memo	More exam review
Week 15 (12/14 & 12/13)	*Part 2 Exam*		

❶ Introduction to 6002, plus Research Ethics; Research Questions; and Literature Review

• *Blackboard recorded lecture, readings, and videos*

Belmont Report and key principles of research ethics
Special attention to informed consent, minimizing risk, privacy, and extra care for vulnerable groups

Institutional Review Board (IRB)
Necessity for citation attribution
Confirmation bias

Theory-building research steps
Applied research steps

Theory; Hypothesis
Independent variable (X); Dependent variable (Y)
Empirical research

Basic structure of the written research report:
Intro & problem statement; lit review; methodology; findings; discussion
Writing a problem statement

Main goals of literature review
Tips for upgrading the literature review

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❷ Levels of Measurement; Measurement Validity and Reliability

• *Blackboard recorded lecture, readings, and videos*

Cases (observations) in rows
Variables in columns; values in cells

Aggregate data
Ecological fallacy

Levels of measurement:
Nominal, Ordinal, Interval, Scale
Interval and ratio often called scale (or interval)
Nominal and ordinal often called categorical
Suitable stats vary depending on measurement level

Operationalize concepts; operational definition

Measurement reliability = consistency
Measurement validity = accuracy

Subjective validity: face validity
Empirical validity: concurrent & predictive validity

Unobtrusive measures
Multiple measures

Secondary data analysis – pros and cons
Scrutinize secondary data before using it

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❸ Question and Questionnaire Design; Survey Sampling Systems

• *Blackboard recorded lecture, readings, and videos*

Principles for designing good individual questions
Ways to filter or minimize "random responses"

Best practices for overall questionnaire flow:
Short intro; easy start; broader to more detailed; sensitive questions later; demographics at end

Closed-ended vs. open-ended questions
Likert item (strongly agree/agree/disagree/strongly disagree)

Census vs. sample
Random vs. nonrandom samples
Nonrandom (nonprobability) sampling such as convenience, snowball, and purposive sampling

Simple random sampling
Systematic random sampling
Stratified random sampling
(Proportionate vs. nonproportionate)

Sampling frame (source/list used to draw sample)

Nonresponse bias vs. response bias
Evaluating response rates; how high is high enough?

Survey participation as a quick cost-benefit decision
Best practices for improving survey response rates
Weighting the sample to reflect the population
Determining the optimum size of a completed sample
Benchmark confidence intervals (95% level) for
n=100 (±10%); 600 (±4%); 1100 (±3%)

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❹ Causal Inference and RCT Designs

• *Blackboard recorded lecture, readings, and video*

Three elements of causal inference...
1) X & Y covary; association; concomitant variation
2) X before Y; direction; time sequence; temporal order
3) Rule out Zs; no plausible alternative; nonspuriousness

Correlation does not prove causation!
Post hoc, ergo propter hoc fallacy

Campbell & Stanley's design diagraming system
Single group posttest only
Single group pretest-posttest (aka before-and-after)
Static group design (nonequivalent comparison design)

Antecedent variables
Intervening variables
Major threats to internal validity:
- History
- Maturation
- Practice
- Instrumentation
- Regression to the mean
- Selection
- Intra-group history
- Attrition/Mortality (and how to deal with attrition)
- Reactivity

"Intent to treat" analysis includes all those assigned to treatment despite attrition in participation

Randomized, controlled trial (RCT) = true experiment

Elements of an RCT:
(1) random assignment of subjects from pool to groups and (2) random assignment of X to groups

Reason for the power of RCTs:
Comparability of the groups (i.e., only real difference between the groups is X, so X is the best explanation for differences in the groups)

Classic experimental design
(aka pretest-posttest control-group design)

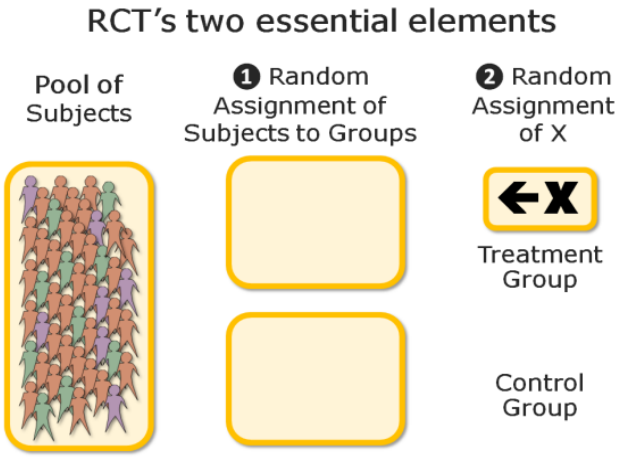
Posttest only experiment
(aka posttest-only control-group design)

RCT variations:
"Control group" may get something
May have more than one X (factorial designs)
Can assign collectivities (instead of individuals)
Groups not always assigned 1:1 (e.g., may be 2:1)

Factorial designs (simple or complex)
Multiple Ys
Complex X

External validity (generalizability)
Random selection from the relevant population strengthens *external* validity.
Random assignment from pool of subjects to groups strengthens *internal* validity.

Reactivity
Hawthorne effects
Placebo
Try to avoid between-group reactivity as well as other types of reactivity (e.g., with X and staff)



❺ NEC, Time Series, Correlational Designs

• *Blackboard recorded lecture, readings, and videos*

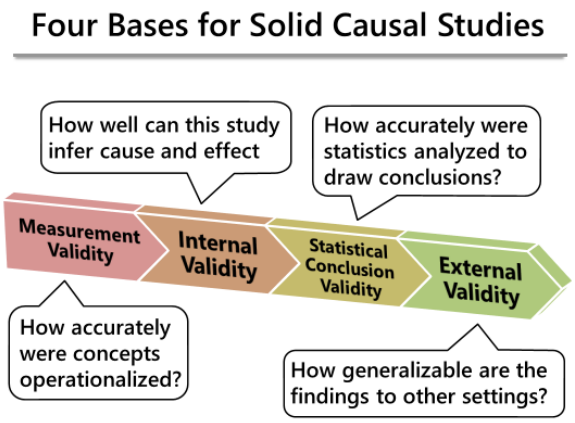
Practical reasons why RCTs may not be conducted
Quasi-experiments (vague term)
Causal comparative (another term for studies that try to infer causality when groups not randomly assigned)
Nonequivalent comparison group (NEC) designs
Pretest-posttest nonequivalent comparison design
Posttest only nonequivalent comparison group design

Key internal validity threat to NEC designs: selection
Retrospective matching design
Natural experiments (strict vs. broad usage)

Time series (aka longitudinal) research
Why superior to "single group pretest-posttest"?
Key internal threat to time series study: history
Simple interrupted time series
Reiterative time series; Multiple time series

Deceptive time series charts (truncated base)
Panel data vs. cross-sectional data
Retrospective pretests (aka proxy pretests)

Process and logic of correlational designs
Crucial role of controlling other factors;
not crudely looking at results from a single X
Key internal threat to correlational studies: selection
Hard to statistically control for all Zs, especially threats from motivation and self-selection (thus specification error, aka omitted variable bias); different controls can yield widely varying results
Correlational research
(aka) nonexperimental field studies



❻ Qualitative and Other Research

• *Blackboard recorded lecture, readings, and videos*

Overall assessment of causal designs:
Lab RCTs: usually strong on internal validity but weak on external validity
Nonexperimental field studies: often strong on external validity but weak internal validity
Field RTCs: strong in both internal and external validity but often not feasible to conduct

The logic of inferring causality by coupling lab experiments with nonexperimental field studies

Four big validity issues:
Measurement validity
Internal validity
Statistical conclusion validity
External validity

Meta-analysis purpose and strengths
Steps in conducting a meta-analysis

Qualitative Research
More exploratory than hypothesis testing
Small, purposive sample, not large random
Extended, intense observations or interviews
Unstructured or semi-structured data gathering
Essay reports with little or no quantitative data
Often explore the researchers' subjective impact

Focus groups purposes:
Probing attitudes, reaction testing, brainstorming
Focus group steps: recruit relevant people; get 10-12; 1½-2 hours; semi-structured format with mostly open-ended topics; neutral facilitator.

Mixed Methods Research
Using both qualitative & quantitative approaches,
For example, qual, then quant, then qual.

Semi-structured interviews
Some general best practices

Case studies:
Usually mixed methods
Approaches to selecting cases

❼ Univariate Descriptive Statistics

• *Blackboard recorded lecture, readings, and videos*

Good data analysis requires good data, plus awareness that: all summary statistics are reductionist, context dictates interpretation, minor differences should not be exaggerated, correlation does not prove causation, start with univariate analysis before multivariate.

Nominal univariate statistics – percent and mode
Interpretation pitfalls include:
Misleading pictograms; confusing absolute and relative percent; misinterpreting mode as midpoint; and misleading modal composites
Plurality vs. majority
Major measures of central tendency:
mean and median, plus trimmed mean
Mode (not necessarily a central tendency)

Major measures of dispersion:
standard deviation and interquartile range
Positive skew (high values pull mean above median)
Negative skew (low values pull mean below median)

Normal curve
± 1 standard deviation = 68.3% of normal curve
± 2 standard deviations = 95.4% of normal curve
± 3 standard deviations = 99.7% of normal curve

Value of examining frequency distribution charts
Descriptive vs. inferential statistics

	Mean	Standard deviation
Population	μ "mu"	σ "sigma"
Sample	$\bar{x}$ "x-bar"	s

Boxplots, stem-and-leaf plots
Histograms, bar charts, pie charts

❽ Intro to Part 2: Normal Distribution and Sampling Distribution

• *Optional: Healey & Donoghue, Chapters 5 & 6*

Inferential v. descriptive statistics

Refresher on normal distribution

Working with a normal distribution – area under the curve

Standard normal and z-scores

Sampling distribution

Central limit theorem

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❾ Estimation and Confidence Intervals

• *Optional: Healey & Donoghue, Chapter 7*

Recap on sampling distribution

Introduction to estimation

The logic of a confidence interval

Confidence intervals around means

Confidence intervals around proportions

Properties of estimators

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❿ Difference of Means and t-test

• *Optional: Healey & Donoghue, Chapter 9*

Difference of means

Confidence interval around difference of means

Two sample hypothesis test –introduction to hypothesis testing

Concept of "statistical significance"

Conveying statistical significance in tables

Limitations of hypothesis testing

⓫ Contingency Tables and Chi-square

• *Optional: Healey & Donoghue, Chapter 11*

Conditional values

Contingency tables

Chi square (χ^2) test

Strength of relationship

⓬ Bivariate Regression and Correlation

• *Optional: Healey & Donoghue, Chapters 12 and 13*

Scatterplots (positive, negative, or no relationship)

Bivariate regression

Correlation coefficient (r)

⓭ Controlling for Variables: Partial Tables and Multiple Regression

• *Optional: Healey & Donoghue, Chapters 14 and 15*

Refresher on confounder "Z Variables"

Refresher on contingency tables

Partial tables analysis

Refresher on bivariate regression

Introduction to multiple regression

⓮ Part 2 Exam Review

Notifications on Electronic Course Materials

Recording Synchronous Class Sessions

The Family Educational Rights and Privacy Act (FERPA) (20 U.S.C. § 1232g; 34 CFR Part 99) is a Federal law that protects the privacy of student education records. Consistent with FERPA, please note:

Our synchronous class lectures/discussions may be video recorded. Thus, as part of this course, you may be recorded. The recording will only be made available to students enrolled in this class for the duration of this semester. If you do not wish to be recorded, please contact both the instructor and the GW Privacy Office (privacy@gwu.edu) the first week of class (or as soon as you enroll in the course, whichever is latest) with your privacy concern.

Limits on Use of Electronic Course Materials and Class Recordings

Students are encouraged to use electronic course materials, including recorded class sessions, for private personal use in connection with their academic program of study. Electronic course materials and recorded class sessions should not be shared or used for any non-course related purposes. Students who impermissibly share any electronic course materials are subject to discipline under the Student Code of Conduct.

Please contact the instructor if you have questions regarding what constitutes permissible or impermissible use of electronic course materials and/or recorded class sessions.

Standard Policies

1. **The Syllabus**: This syllabus is a guide to the course. Sound educational practice requires flexibility, and the instructor may therefore, at her/his discretion, change content and requirements during the semester.

2. **Incompletes**: A student must consult with the instructor to obtain a grade of "I" (incomplete) no later than the last day of classes in a semester. At that time, the student and instructor will both sign the CCAS contract for incompletes and submit a copy to the School Director. Please consult the TSPPPA Student Handbook or visit the website for the complete CCAS policy on incompletes.

3. **Submission of Assignments**: It is the responsibility of the student to ensure that the instructor receives each assignment by verifying uploads to Blackboard.

4. **Policy on Late Work**: All work must be turned in by the assigned due date in order to receive full credit for that assignment, unless an exception is expressly made by the instructor.

5. **Academic Honesty**: The GW Code of Academic Integrity is at studentconduct.gwu.edu/code-academic-integrity. All exams and other graded work products are to conform to the Code. It defines "academic dishonesty" as "cheating of any kind" and "misrepresenting one's own work, taking credit for the work of others without crediting them and without appropriate authorization, and the fabrication of information."

6. **Changing Grades after Completion of the Course**: No changes can be made to grades after the conclusion of the semester, other than in cases of clerical error.

7. **Religious Holidays**: Religiously observant students should notify the instructor the first week of classes regarding any session that will be missed; the courtesy of an absence without penalty will be extended.

8. **Accommodation for Students with Disabilities**: To receive accommodations on the basis of disability, please provide documentation from the GW's Disability Support Services, Rome Hall 102 (202-994-8250). See also: disabilitysupport.gwu.edu.

9. **Mental Health Services**: The Colonial Health Center offers assistance to address students' personal, social, career, and study skills problems, along with emergency mental health consultations and counseling services as well as referrals. See: counselingcenter.gwu.edu.

10. **Community Values**: Higher education works best when it becomes a vigorous and lively marketplace of ideas in which all points of view are heard. Free expression in the classroom is an integral part of this process. Higher education also works best when we approach the enterprise with empathy and civility toward others, irrespective of identity or viewpoints. We value civility because that is the kind of community we want, and civility enables more effective intellectual exploration and growth.

Grade Descriptions and Expectations

A (Excellent): Exceptional work for a graduate student. Shows a consistently strong command of the material.

A- (Very Good): Very strong work for a graduate student. Shows a strong understanding of analytical approaches and meets professional standards.

B+ (Good): Sound work for a graduate student. This grade indicates the student has at least accomplished the basic course objectives.

B (Adequate): Minimal competent work for a graduate student with some evident weaknesses. Shows competence in most course objectives, but the understanding or application of some important issues is incomplete.

B- or lower (Inadequate): Weak work for a graduate student. Understanding of key issues is incomplete.

A cumulative GPA of B- or lower will lead to academic probation.

PPPA 6002. Research Methods and Applied Statistics *(bulletin.gwu.edu/courses/pppa)*

Development of skills and knowledge for conducting original research and critically evaluating empirical studies. Various research designs and data collection techniques are examined. Focus on computerizing data sets for quantitative analysis, analyzing strength of relationships, selecting appropriate statistical techniques, and testing statistical hypotheses.

Average Minimum Independent Weekly Work

In addition to an average of three hours weekly of direct class and lab instruction, this course requires a minimum weekly average of six hours of independent reading, research, and learning.

Caution Using Artificial Intelligence Tools in Graduate School

Be Careful

- AI results can be inaccurate, incomplete, or otherwise problematic!
- Some free AI tools (including free ChatGPT) do not use current data.
- AI tools are known to sometimes fabricate nonexistent citations! Double check any references.
- Students remain responsible for all content they submit for evaluation.
- Be careful not to let AI stifle your own creativity and independent thinking.

Academic Integrity Issues

❶ Papers:

Text submitted for evaluation is represented as the student's own intellectual product. Students may not submit content (e.g., ideas, text, images) for evaluation as if it were original if the content was actually generated, in whole or in part, by artificial intelligence tools. However, such GAI content may be used carefully with proper attribution.

Content drawn from ChatGPT or other AI tools should include a citation. See bit.ly/CiteAI for preferred citation formats.

For the record, the following would constitute a "failure to attribute" under GW's *Code of Academic Integrity*:

A student types a prompt into ChatGPT and incorporates all or part of the generated content (directly or paraphrased) into an essay submitted for evaluation — without proper attribution to ChatGPT.

❷ Tests

The use of AI tools during any test, exam, or quiz taken in the classroom is a violation of GW's *Code of Academic Integrity* — unless the test is "open book" and AI tools are explicitly allowed.

Regarding "take-home" tests, faculty practices may vary so make no assumptions. Be sure to clarify the instructor's exact policies regarding the use of AI tools. Specifically in 6002:

In Part 1 of 6002, the quiz and the exam will be in class and "closed book" so AI cannot be used. In Part 2, the use of AI will also be prohibited on the examination.