BCB744 Biostatistics Exam Rubric (2025)

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General Structure of the Rubric

Each Task is evaluated under the following axes:

1. Technical Accuracy (50%)
2. Depth of Analysis (20%)
3. Clarity and Communication (20%)
4. Critical Thinking (10%)

Each subcomponent is marked on a 0–100 scale, then scaled to its proportion of the task weight. For example, Task 5 is worth 30% of the total mark, so a sub-question like 5.1 (one of five) may contribute up to 6% if evenly weighted.

## Task 1: Initial Processing [10%]

Weight within task:

* 1.1 Extraction and Restructuring (50%)
* 1.2 Conversion and Summarisation (50%)

Rubric:

* Technical Accuracy (50%)
  + Correct unpacking of NetCDF variables (names, dimensionality): 15%
  + Time conversion handled correctly (POSIX timestamps): 10%
  + Data reshaped into appropriate long format: 15%
  + Presence of appropriate columns (year, quarter, etc.): 10%
* Depth of Analysis (20%)
  + Efficient use of methods (e.g. hyper\_tibble() or expand.grid() vs brute loops): 10%
  + Use of Cartesian indexing or equivalent vectorised operation: 10%
* Clarity and Communication (20%)
  + Code is readable, well-commented: 10%
  + Summary of the resulting data structure shown and interpretable: 10%
* Critical Thinking (10%)
  + Indicates understanding of spatial × temporal structure and mentions NA implications: 10%

## Task 2: Exploratory Data Analysis [10%]

2.1 Weighted Mean Time Series

* 1. Weighted mean across time: 15%
  2. Time series for 100 pixels: 15%

2.2 Summary Statistics:

* 1. Descriptive stats: 20%
  2. Visualisations: 20%
  3. Interpretation: 20%

2.3 Observation Density Map: 10%

Rubric:

* Technical Accuracy (50%)
  + Proper handling of weights and NA filtering: 10%
  + Correct aggregation logic (quarter, pixel, etc.): 10%
  + Appropriateness of visualisation syntax and ggplot conventions: 10%
  + Use of statistical descriptors (mean, sd, skew, etc.) correctly: 10%
  + Map projection/geodesic coordinates and section overlay accuracy: 10%
* Depth of Analysis (20%)
  + Commentary on skewness, kurtosis, and statistical implications: 10%
  + Recognition of seasonal/temporal signals in plots and stats: 10%
* Clarity and Communication (20%)
  + Plot labels, axes, titles intelligible and precise: 10%
  + Logical narrative supporting visualisations/statistics: 10%
* Critical Thinking (10%)
  + Justification of metric choices, handling of anomalous years: 5%
  + Suggestions of ecological explanations (e.g., photoperiod, storminess): 5%

## Task 3: Inferential Statistics I [20%]

Weight within task:

* 1. Hypotheses: 10%
  2. Model selection and justification: 20%
  3. Assumption testing: 20%
  4. Result interpretation and diagnostics: 50%

Rubric:

* Technical Accuracy (50%)
  + Correct use of linear model and specification (additive, no interaction): 20%
  + Explicit assumptions tested (normality, homogeneity): 10%
  + Proper model diagnostics and visual checks: 10%
  + Use of correct significance thresholds and p-value interpretation: 10%
* Depth of Analysis (20%)
  + Justification for using aggregate means vs raw data: 10%
  + Consideration of alternative models (e.g., GAMs): 10%
* Clarity and Communication (20%)
  + Hypotheses stated cleanly, concisely: 10%
  + Figure/Table references integrated smoothly in the narrative: 10%
* Critical Thinking (10%)
  + Recognition of model limitations and implications (e.g. low R²): 10%

## Task 4: Spatial Assignment [10%]

4.1 Section Assignment: 5%

4.2 Bioregion Assignment: 5%

Rubric:

* Technical Accuracy (50%)
  + Correct application of Haversine formula or great-circle logic: 20%
  + Accurate section\_id assignment: 10%
  + Bioregion mapping via join or merge: 10%
  + Correct data columns preserved/renamed: 10%
* Depth of Analysis (20%)
  + Efficiency of matching routine (e.g., mapply() or vectorised join): 10%
  + Consideration of spatial boundaries (e.g., limiting to section 1–22): 10%
* Clarity and Communication (20%)
  + Annotated code, explanation of proximity logic: 10%
  + Output (head(), summary(), tail()) shows assignment integrity: 10%
* Critical Thinking (10%)
* Considers effect of section resolution or mapping error: 10%

## Task 5: Inferential Statistics II [30%]

Each sub-task contributes approximately 6% unless reweighted explicitly.

Rubric per sub-task (5.1–5.5):

* Technical Accuracy (50%)
  + Model type (ANOVA, LM, ANCOVA) appropriate: 15%
  + Correct test execution (summary, diagnostics): 15%
  + Assumptions evaluated, violations addressed: 10%
  + Non-parametric alternative proposed when appropriate: 10%
* Depth of Analysis (20%)
  + Explicit rationale for model choice: 10%
  + Discussion of structure in data (nesting, lack of interaction): 10%
* Clarity and Communication (20%)
  + Hypotheses clearly and formally stated: 10%
  + Visualisations appropriately labelled and explained: 10%
* Critical Thinking (10%)
  + Insight into ecological implications of findings (e.g., BMP trend): 10%

Add 1–2 bonus marks if:

* Multicollinearity (e.g., VIF) or autocorrelation (e.g., DW test) is discussed
* Advanced diagnostics (e.g., Breusch–Pagan, TukeyHSD) are used correctly

## Task 6: Write-up [10%]

Rubric:

* Technical Accuracy (50%)
  + Consistent reference to previous results, correct figure/table interpretation: 25%
  + Accurate paraphrasing of statistical results: 15%
  + Adherence to 2-page length limit, integration of material: 10%
* Depth of Analysis (20%)
  + Rich synthesis across Tasks 2–5, not isolated repetition: 10%
  + Conceptual connection of seasonality, trend, and spatial heterogeneity: 10%
* Clarity and Communication (20%)
  + Coherent scientific writing style, flowing paragraph structure: 10%
  + Effective integration of figure references and literature: 10%
* Critical Thinking (10%)
  + Limitations clearly acknowledged and reflected on: 5%
  + Forward-looking ecological insight or recommendation offered: 5%