

SYLLABUS

COURSE NUMBER:	ERM-670
COURSE TITLE:	Computer-Based Testing: Methods and Applications
CREDITS:	3 credit hours
PREREQUISITES:	ERM-667 <i>Foundations of Educational Measurement Theory</i> and ERM-727 <i>Item Response Theory</i> ¹
PURPOSE:	This course is intended as a broad, graduate-level introduction to modern computer-based testing applications. It is intended for graduate students in an advanced measurement/psychometric track who have, as part of their background, graduate-level coursework in classical test theory and item response theory (IRT)
INSTRUCTOR:	Richard M. Luecht, PhD Professor and Chair, ERM Dept. 209 Curry Building Telephone: 336.334.3473 E-mail: rmluecht@uncg.edu
CATALOG DESCRIPTION:	Computer-based testing applications including automated test assembly, item banking, computer-adaptive and multistage testing, web-based testing, large-scale assessment development and support systems, and computer-based performance assessments. Covers state-of-the-art research and developments.

¹ A Routine Course Change Request is underway to renumber this ERM-727 course to ERM-629.

LEARNING
OUTCOMES:

During this course, students will be fully familiarized with state-of-the-art technological research and developments in computer-based testing, including computer-adaptive testing, computer-based performance assessments, computerized item banking, web-based testing and automated test assembly. Students will also learn about relevant theoretical psychometric issues (e.g., item selection algorithms and heuristics) and human factors engineering principles related to applications of technology in large-scale and small-scale testing environments (e.g., ITD³, a new highly efficient method of designing and implementing complex performance assessments, developed by the course instructor).

TEACHING
STRATEGIES:

The course will include lectures and discussions. The course will also include hands-on work with real computer-based testing software in the Center for Educational Research and Evaluation. Students will be expected to present class projects and possibly prepare posters or manuscripts for a research conference.

EVALUATION
METHODS:

Final grading for the course will be based on patterns of student work and assigned grades for three activities: (1) class participation and completion of homework; (2) a formal research proposal involving CBT; and (3) a class presentation (with handouts) reviewing current research in CBT, conducting a software review, or another [instructor-approved] topic related to assessment technology. Letter grades will be assigned according to the following rubric:

- A All work completed on time. The majority of work was of superior quality.
- A- All work completed on time. Submitted work was a mixture of good-to-superior quality.
- B Most work completed on time. No missing work. Submitted work was a mixture of fair-to-good work.
- C Work was habitually late or missing. Much of the submitted work was poor or of marginal quality.
- F Substantial portions of work were late or missing. The majority of work was poor (substandard).

TEXTBOOKS AND COURSE MATERIALS

1. C. Glas & W. J. van der Linden (Eds.). (2000). *Computer-adaptive testing: theory and applications*. Kluwer. (Recommended)
2. W. Ward & C. Mills (Eds.). (2001). *Innovations in Computer-Based Testing*. Hillsdale, NJ: Erlbaum. (Required)
3. W. J. van der Linden (Ed). *Applied Psychological Measurement*. Volume 22 (3), September 1998. *Special Issue: Optimal Test Assembly*. Thousand Oaks: Sage Publications. (Required)

Other journal articles and printed materials will be placed on electronic reserve in the UNCG Jackson Library.

COURSE TOPICS

- I. Computer-based testing
 - A. Multiple-choice CBT
 - B. Test delivery mechanisms and software
 - C. Item banking practices and procedures
 - D. Operational CBT support systems
 - E. High stakes CBT security issues

- II. Web-based testing (WBT)
 - A. Commercial authoring and delivery software
 - B. The examinee-as-client model
 - C. The test center-as-client model
 - D. Rendering technologies
 - E. Challenges of WBT

- III. Automated test assembly (ATA)
 - A. Understanding content constraints, statistical targets and auxiliary test specifications
 - B. Item bank inventory control processes
 - C. Manual test assembly approaches: constraints
 - D. Content balancing, blueprints and quality assurance
 - E. Classical test assembly mechanisms
 - F. IRT test information criteria
 - G. Heuristics vs. algorithms
 - H. Linear programming approaches to ATA (with relaxation methods)
 - J. Uses of network-flow algorithms in ATA
 - K. ATA heuristics (NWAD and WDM)

- IV. Modern computerized testing delivery models
 - A. Criteria for model selection in large-scale CBT
 - 1. Testing frequency and costs
 - 2. Dealing with exposure and other security risks
 - 3. Item banks: costs of item production and inventory control
 - 4. Content balancing and quality control with mass-produced tests
 - 5. Real-time scoring of complex performances
 - B. Computer-adaptive testing, stratified adaptive testing and variants
 - C. Computer-mastery testing
 - D. Content-balancing heuristics in real-time adaptive and mastery tests
 - E. Statistical exposure controls
 - F. Adaptive testlets and related modular technologies
 - G. Computer-adaptive sequential testing (CAST)
 - H. Interaction between ATA and testing models
 - 1. Scoring functions
 - 2. Item selection functions
 - 3. Quality assurance functions

- V. Integrated test design, development and delivery (ITD³; Luecht, 2000, 2001)
 - A. The ITD³ framework
 - B. Implementations of ITD³
 - C. The future of ITD³

ACADEMIC HONOR CODE

Students in this course are expected to be familiar with and adhere to the UNCG Academic Honor Policy described in the *Policies for Students* handbook. Students may be expected to sign an honor statement related to their independent work on examinations and course projects.

ATTENDANCE POLICY

Students are expected to attend all lectures and class discussions. Excused absences should have the prior approval of the course professor.