Item Response Theory (IRT) for Psychometrics Training Course

Professional Development Training Course Outline

Category	Research and Data Analysis	**Duration**	5 Days
Base Fee	$1,500 USD	**Delivery Mode**	Online / On-site Hybrid

Course Introduction

In the rapidly evolving field of educational measurement, health assessment, and psychological evaluation, Item Response Theory (IRT) has emerged as a powerful statistical framework. Item Response Theory (IRT) for Psychometrics Training Course is designed to provide professionals and researchers with advanced analytical skills and a deep understanding of IRT models, application strategies, and software integration to drive evidence-based decisions in test development and psychometric analysis. Through data-driven case studies, participants will gain hands-on experience in interpreting item-level responses, estimating latent traits, and implementing IRT in both classical and contemporary testing environments.

This course focuses on latent trait modeling, test reliability, differential item functioning (DIF), and test equating using IRT. It integrates cutting-edge tools such as R, Python, and commercial software like IRTPRO and Mplus to prepare learners for real-world psychometric challenges. Whether you're developing psychological scales, educational assessments, or health outcome measures, this course will strengthen your capacity to apply IRT principles for measurement accuracy, fairness, and predictive validity.

Programme Curriculum

Item Response Theory (IRT) for Psychometrics Training Course

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Course Objectives

1. Understand the fundamental concepts of Item Response Theory and its evolution.
2. Differentiate between Classical Test Theory (CTT) and IRT in psychometric analysis.
3. Apply the 1PL, 2PL, and 3PL IRT models for test item calibration.
4. Evaluate model fit using statistical indices and visual diagnostics.
5. Analyze item characteristic curves (ICCs) and information functions.
6. Conduct Differential Item Functioning (DIF) analysis using IRT methods.
7. Perform computerized adaptive testing (CAT) using IRT algorithms.
8. Utilize IRT in scale development for educational and psychological testing.
9. Implement IRT models using R packages (e.g., ltm, mirt, TAM) and Python libraries.
10. Design test equating and linking strategies using IRT.
11. Conduct person fit analysis and interpret reliability estimates.
12. Use IRT in validation and refinement of patient-reported outcome measures.
13. Integrate machine learning with IRT models for predictive psychometrics.

Target Audience

1. Psychometricians
2. Educational Measurement Experts
3. Clinical Researchers
4. Assessment Developers
5. Data Scientists in Education/Health
6. Graduate Students in Psychology/Education
7. Test Developers and Analysts
8. Government and NGO Monitoring & Evaluation Specialists

Course Duration: 5 Days

Course Modules

Module 1: Foundations of IRT and Psychometrics

- History and principles of Item Response Theory
- Key differences between IRT and Classical Test Theory
- Assumptions and prerequisites of IRT
- Overview of latent traits and item characteristics
- Key terminology: discrimination, difficulty, guessing
- **Case Study**: Comparing CTT vs IRT in a school-based assessment

Module 2: 1PL, 2PL, and 3PL IRT Models

- Mathematical formulations of IRT models
- Estimating item parameters using MLE and Bayesian methods
- Model comparison and fit statistics
- Interpretation of item characteristic curves
- Choosing the right model for your data

- **Case Study**: Fitting 1PL and 2PL models in psychological tests

Module 3: Software Tools for IRT Analysis

- Introduction to R packages (mirt, ltm, TAM)
- Implementing IRT in Python with pyirt
- Using commercial tools: IRTPRO, Mplus, BILOG-MG
- Importing and cleaning data for IRT analysis
- Visualizing ICCs and test information functions
- **Case Study**: IRT modeling of a national examination using R

Module 4: Differential Item Functioning (DIF)

- Understanding measurement bias and fairness
- Methods for detecting DIF: Mantel-Haenszel, logistic regression
- Impact of DIF on test validity
- Interpreting output from DIF analyses
- Reporting DIF findings for stakeholders
- **Case Study**: Gender-based DIF analysis in standardized testing

Module 5: Computerized Adaptive Testing (CAT)

- Concepts of adaptive testing and item banks
- IRT-based algorithms for item selection
- CAT implementation challenges and considerations
- Developing item exposure controls
- Evaluating CAT performance and test length
- **Case Study**: Simulation of a CAT for employee assessment

Module 6: Test Equating and Linking Using IRT

- Need for test equating in longitudinal assessments
- Anchor item strategies and linking coefficients
- IRT-based equating vs traditional methods
- Establishing score comparability across forms
- Interpreting and reporting equated scores
- **Case Study**: Equating multiple test forms for a national curriculum exam

Module 7: Person Fit and Test Reliability in IRT

- Person fit indices: outfit and infit statistics
- Estimating test reliability: marginal reliability, conditional SE
- Detecting aberrant response patterns
- Using IRT information for score precision
- Visualizing person-item maps
- **Case Study**: Analyzing test taker response patterns in health surveys

Module 8: Advanced Applications and Predictive IRT

- Integrating IRT with machine learning models
- Multidimensional IRT (MIRT) applications
- Longitudinal modeling using IRT
- IRT in patient-reported outcomes (PROMIS)
- Real-world big data applications in psychometrics
- **Case Study**: Predicting learner outcomes using IRT + AI analytics

Training Methodology

- Instructor-led sessions with interactive lectures
- Hands-on exercises using real-world datasets
- Live software demonstrations (R, Python, IRTPRO)
- Group discussions and peer collaboration
- Case-based problem-solving sessions
- Ongoing feedback and assessments throughout the course

Register as a group from 3 participants for a Discount

Send us an email: info@fineskilltrainingcenter.org or call *+254769199797*

Certification

Upon successful completion of this training, participants will be issued with a globally- recognized certificate.

Tailor-Made Course

We also offer tailor-made courses based on your needs.

Key Notes

a. The participant must be conversant with English.

b. Upon completion of training the participant will be issued with an Authorized Training Certificate

c. Course duration is flexible and the contents can be modified to fit any number of days.

d. The course fee includes facilitation training materials, 2 coffee breaks, buffet lunch and A Certificate upon successful completion of Training.

e. One-year post-training support Consultation and Coaching provided after the course.

f. Payment should be done at least a week before commence of the training, to Fineskill Training Center account, as indicated in the invoice so as to enable us prepare better for you.

Upcoming Scheduled Sessions

Start Date	End Date	Location	Price
23 Nov 2026	27 Nov 2026	Online	$1,000
23 Nov 2026	27 Nov 2026	Physical	$1,500
23 Nov 2026	27 Nov 2026	Physical	$3,000
23 Nov 2026	27 Nov 2026	Physical	$3,000
23 Nov 2026	27 Nov 2026	Physical	$6,000

Start Date	End Date	Location	Price
23 Nov 2026	27 Nov 2026	Physical	$4,500
23 Nov 2026	27 Nov 2026	Physical	$6,000
23 Nov 2026	27 Nov 2026	Physical	$6,000

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