# MEASUREMENT & STATISTICS + *Quant Friends*

**College of Education**

## Quant Research Methods Courses: 2021-22

| FOCUS/AGENDA | RECOMMENDED COURSES |
|---|---|
| **Master's in Education** (in general) | **Edpsy 490, 538, 517** *and potentially 513 + EDSPE/EDLPS courses (this page)* |
| Design, implement, analyze a **small-scale survey project** | **Edpsy 490, 538, 513, 539** *and potentially 517 and 575/576/591* |
| Analysis of **education policy** data | **Edpsy 490, 538** *and EDLPS courses (this page)* |
| Educational **measurement**-oriented cognate (doctoral students) | **Edpsy 490, 538, 539, 591** *and potentially 558/559/561 or 592/593/594* |
| Educational **statistics**-oriented cognate (doctoral students) | **Edpsy 490, 538, 539, 575** or **576** *and potentially 588/595 or 596/597* |

*Note*. For doctoral students who have taken regression, we also recommend advanced quant courses through CSSS/STAT and PUBPOL, as appropriate.

## TIER 1: INTRODUCTORY COURSES

| Basic Educational Statistics - EDPSY 490 | Pre-Req | Course | CR | Offered | Taught By |
|---|---|---|---|---|---|
| • **Geared for** all levels, including undergraduates, graduates, and post-doctoral researchers *(Note: course meets QSR requirement for undergraduates)* <br>• **Prepares** students to critically evaluate statistics encountered in everyday life, and serves as a pre-requisite for more advanced courses *(Note: course can be waived as pre-req. to other courses if student passes online screener exam or has a degree in Statistics; for info email: lizz@uw.edu)* <br>• **Covers** language, logic, ethics, and computations associated with hypothesis testing, including measurement assumptions, sampling distributions, 1- and 2-goup $z$, $t$-, and $\chi^2$ tests, and simple regression; *SPSS* workshop offered at end of course | None (Basic Algebra Recommended) | **EDPSY** 490 | 3 | Fa: T <br> Wi: T/Th <br> Sp: T/Th <br> Su: T/Th | All M&S Faculty & M&S Doc Students |

| Applied Behavior Analysis (Single-Case Research) - EDSPE 511 | Pre-Req | Course | CR | Offered | Taught By |
|---|---|---|---|---|---|
| • **Geared for** graduates in special educ and school psych, but all graduates welcome <br>• **Prepares** students to design, implement, and evaluate the effects of interventions for individuals or small groups in home, school, and communities <br>• **Covers** single-case research design logic, appropriate research questions, critiquing research, and writing a research proposal | None (EDSPE 571 Recommended) | **EDSPE** 511 | 3 | Wi: Th | Spaulding |

| Policy Evaluation - EDLPS 568 | Pre-Req | Course | CR | Offered | Taught By |
|---|---|---|---|---|---|
| • **Geared for** graduates in educational policy, but all graduates welcome <br>• **Prepares** students to evaluate educational policies <br>• **Covers** basic understanding of common qualitative and quantitative research designs related to education and other social sciences | None | **EDLPS** 568 | 3 | Wi: W | Knight |

| Assessment & Evaluation in Higher Education - EDLPS 593 | Pre-Req | Course | CR | Offered | Taught By |
|---|---|---|---|---|---|
| • **Geared for** education policy graduates, but all graduates welcome <br>• **Prepares** students to design program evaluation plans in school contexts, including quantitative and qualitative aspects <br>• **Covers** basic program assessment and evaluation approaches; uses *Excel* | None (Edpsy 490 Recommended) | **EDLPS** 593 | 3 | Sp: Th | Fajardo |

| Secondary Data Analysis - EDLPS 596 | Pre-Req | Course | CR | Offered | Taught By |
|---|---|---|---|---|---|
| • **Geared for** education policy graduates, but all graduates welcome <br>• **Prepares** students to consume basic statistics, work with large-scale data, present statistical results, and utilize data to advance equitable educational practice <br>• **Covers** descriptive/inferential statistics, and data visualization; uses *Excel, SPSS* | None (Edpsy 490 Recommended) | **EDLPS** 596 | 4 | Wi: Th | Gehrke |

## TIER 2: INTERMEDIATE COURSES (PRE-REQ: EDPSY 490)

| Survey Instrument Design - EDPSY 513 | Pre-Req | Course | CR | Offered | Taught By |
|---|---|---|---|---|---|
| • **Geared for** graduates in education, but all graduates welcome<br>• **Prepares** students to plan, design, and implement an online survey<br>• **Covers** basic sampling plans, item writing best practices, and online questionnaire implementation using *Qualtrics* | Edpsy 490 | Edpsy 513<br>*(formerly 588)* | 3 | Wi: M | Wang (even yrs)<br>Olvera Astivia (odd yrs) |

| Applied Measurement in Ed Research - EDPSY 517 | Pre-Req | Course | CR | Offered | Taught By |
|---|---|---|---|---|---|
| • **Geared for** graduates in learning sci/school psychology, but all graduates welcome<br>• **Prepares** students to review literature and plan research for measuring latent variable constructs (e.g., *belongingness*, *resilience*, *self-efficacy*, etc.)<br>• **Covers** introductory measurement reliability and validity, critical quantitative perspectives, APA-style writing, and common quantitative research designs | Edpsy 490 | Edpsy 517<br>*(formerly 591)* | 3 | Sp: W | Sanders |

| Multiple Regression - EDPSY 538 | Pre-Req | Course | CR | Offered | Taught By |
|---|---|---|---|---|---|
| • **Geared for** graduates in education, but all graduates welcome<br>• **Prepares** students to understand and conduct multiple linear and logistic regression<br>• **Covers** introductory matrix/linear algebra, and applied multiple regression analysis; *SPSS* and *R* used | Edpsy 490 | Edpsy 538<br>*(formerly 594)* | 3 | Wi: Th | Olvera Astivia & Sanders<br>*(typically also offered Spring, but not 2022)* |

## TIER 3: ADVANCED COURSES (PRE-REQ: EDPSY 538)

| Classic Test Theory: Reliability & Validity - EDPSY 539 | Pre-Req | Course | CR | Offered | Taught By |
|---|---|---|---|---|---|
| • **Geared for** graduates in education, but all graduates welcome<br>• **Prepares** students to understand and conduct classic reliability and validity analyses for surveys and assessments measuring latent constructs<br>• **Covers** in-depth understanding of true score theory and psychometrics, including all classic forms of reliability and validity analyses; uses *Excel*, *SPSS* | Edpsy 538 | Edpsy 539<br>*(formerly 592)* | 3 | Sp: T | Li |

| Structural Equation Modeling (SEM) I - EDPSY 575 | Pre-Req | Course | CR | Offered | Taught By |
|---|---|---|---|---|---|
| • **Geared for** graduates in education, but all graduates welcome<br>• **Prepares** students to understand and conduct exploratory and confirmatory factor models, and latent structural regression models for metrical dependent variables<br>• **Covers** factor analysis and structural regression models; uses *R* | Edpsy 538 | Edpsy 575 | 3 | Sp: Th | Olvera Astivia |

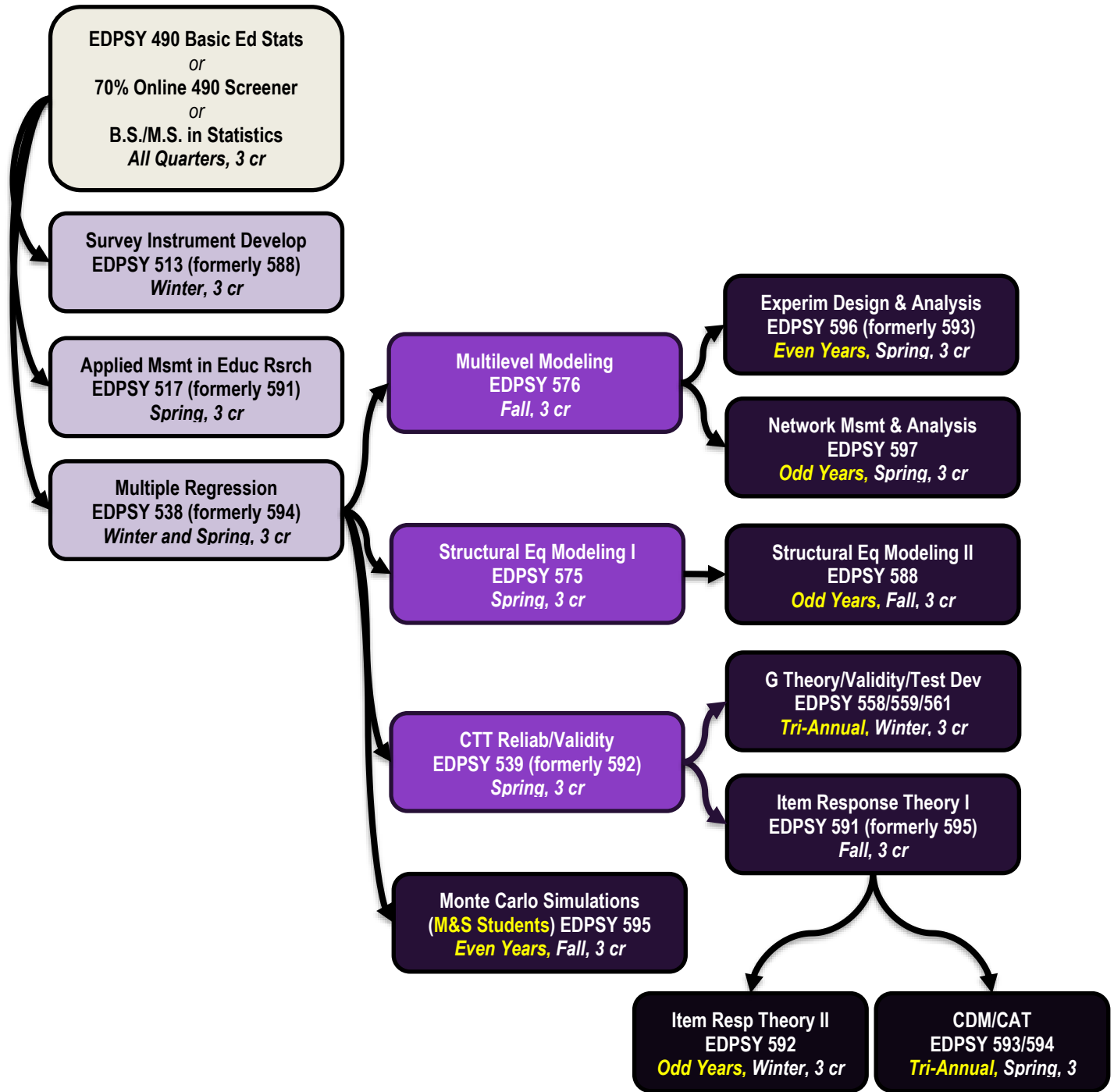| Multilevel Modeling (MLM) - EDPSY 576 | Pre-Req | Course | CR | Offered | Taught By |
|---|---|---|---|---|---|
| • **Geared for** graduates in education, but all graduates welcome<br>• **Prepares** students to understand and analyze nested data (e.g., students in schools and measurements in people) using multilevel linear and logistic models<br>• **Covers** 2- and 3L linear and logistic cross-sectional and longitudinal models; uses *R* | Edpsy 538 | Edpsy 576 | 3 | Fa: Th | Sanders |

## TIER 4: MORE ADVANCED COURSES (more specific PRE-REQs)

| Validity Theory - EDPSY 559 | Pre-Req | Course | CR | Offered | Taught By |
|---|---|---|---|---|---|
| • **Geared for** graduates in educational measurement, but all graduates welcome<br>• **Prepares** students to rigorously evaluate *validity claims* about instruments (assessments, checklists, surveys), including consequential validity/criticality<br>• **Covers** in-depth understanding of validity theory frameworks in evaluating validity claims about instruments | Edpsy 539 | Edpsy 559 | 3 | Wi: W 2022 | Li<br>(alternating years) |

| Item Response Theory Modeling (IRT) I - EDPSY 591 | Pre-Req | Course | CR | Offered | Taught By |
|---|---|---|---|---|---|
| • **Geared for** graduates in education, but all graduates welcome<br>• **Prepares** students to understand and analyze items from surveys and assessments to create modern measurement scales<br>• **Covers** concepts and applications of IRT models, including Rasch, 2-, and 3-PL models; uses *R*, *flexMIRT* | Edpsy 539 | Edpsy 591<br>*(formerly 595)* | 3 | Fa: W | Wang |

| Structural Equation Modeling (SEM) II - EDPSY 588 | Pre-Req | Course | CR | Offered | Taught By |
|---|---|---|---|---|---|
| • **Geared for** graduates in educational measurement, but all graduates welcome<br>• **Prepares** students to understand and conduct factor models for categorical data<br>• **Covers** higher-level SEM topics such as power analyses, factor models for binary outcomes, and latent class models; uses *R*, *Mplus* | Edpsy 575 | Edpsy 588 | 3 | Fa: W 2021 | Olvera Astivia<br>(alternating years) |

## TIER 4, Cont'd

| Generalizability Theory - EDPSY 558 (not offered 2021-22) | Pre-Req | Course | CR | Offered | Taught By |
|---|---|---|---|---|---|
| • **Geared for** graduates in educational measurement, but all graduates welcome<br>• **Prepares** students to evaluate *measurement errors* associated with instruments (assessments, checklists, surveys), and optimize instrument designs<br>• **Covers** in-depth understanding application of generalizability theory in G and D studies; uses *SPSS*, *Genova*, *urGenova* | Edpsy 539 | Edpsy 558 | 3 | Wi: W<br>**2023** | Li<br>(alternating years) |

| Test Instrument Develop - EDPSY 561 (not offered 2021-22) | Pre-Req | Course | CR | Offered | Taught By |
|---|---|---|---|---|---|
| • **Geared for** graduates in educational measurement, but all graduates welcome<br>• **Prepares** students to rigorously evaluate and design *cognitive/learning assessments*<br>• **Covers** measurement concepts, theoretical frameworks, and empirical findings for developing academic/cognitive assessment items individually and as a whole | Edpsy 539 | Edpsy 561<br>*(formerly 513)* | 3 | Wi: W<br>**2024** | Li<br>(alternating years) |

| Item Resp Theory (IRT) II - EDPSY 592 (not offered 2021-22) | Pre-Req | Course | CR | Offered | Taught By |
|---|---|---|---|---|---|
| • **Geared for** graduates in educational measurement, but all graduates welcome<br>• **Prepares** students to understand and conduct advanced IRT methods, including multidimensional, multi-level, and equipercentile IRT models<br>• **Covers** concepts and analysis models, as well as current issues, in advanced IRT IRT methods; uses *R*, *flexMIRT* | Edpsy 591 | Edpsy 592 | 3 | Wi: W<br>**2023, 25** | Wang<br>(alternating years) |

| Cognitive Diag Model (CDM) - EDPSY 593 (not offered 2021-22) | Pre-Req | Course | CR | Offered | Taught By |
|---|---|---|---|---|---|
| • **Geared for** graduates in educational measurement, but all graduates welcome<br>• **Prepares** students to carry out different cognitive diagnostic models (CDMs) for item-level data to create skill profiles for formative assessment<br>• **Covers** in-depth exploration of CDMs including DINA and GDINA models; uses *R* | Edpsy 591 | Edpsy 593 | 3 | Wi: W<br>**2024, 27** | Wang<br>(every 3 years) |

| Computer Adapt Tests (CAT) - EDPSY 594 (not offered 2021-22) | Pre-Req | Course | CR | Offered | Taught By |
|---|---|---|---|---|---|
| • **Geared for** graduates in educational measurement, but all graduates welcome<br>• **Prepares** students to design and evaluate adaptive testing for both latent measurement scales and classification<br>• **Covers** in-depth exploration of CAT algorithms for unidimensional, multidimensional, categorical latent traits/profiles; uses *R* | Edpsy 591 | Edpsy 594 | 3 | Wi: W<br>**2026, 29** | Wang<br>(every 3 years) |

| Monte Carlo Simulations - EDPSY 595 (not offered 2021-22) | Pre-Req | Course | CR | Offered | Taught By |
|---|---|---|---|---|---|
| • **Geared for** graduates in educational measurement, or with permission of instructor<br>• **Prepares** students to evaluate, design, and conduct a Monte Carlo simulation study<br>• **Covers** simulation of univariate and multivariate normal and non-normal data, applying models to simulated data, saving simulation results, and assessing properties of simulated results; uses *R* | Edpsy 575 | Edpsy 588 | 3 | Fa: W<br>**2022** | Olvera Astivia<br>(alternating years) |

| Experim Design & Analysis - EDPSY 596 (not offered 2021-22) | Pre-Req | Course | CR | Offered | Taught By |
|---|---|---|---|---|---|
| • **Geared for** graduates in educational measurement, but all graduates welcome<br>• **Prepares** students for design and analysis of experimental (randomized) research<br>• **Covers** individual-, cluster-, and stratified-randomized designs and analyses, with some coverage of SMART (adaptive) designs; uses *R* | Edpsy 576 | Edpsy 596 | 3 | Sp: M<br>**2024** | Sanders<br>(alternating years) |

| Network Measure & Analysis - EDPSY 597 (not offered 2021-22) | Pre-Req | Course | CR | Offered | Taught By |
|---|---|---|---|---|---|
| • **Geared for** graduates in educational measurement, but all graduates welcome<br>• **Prepares** students for measuring and analyzing network data (connections among individuals, rather than individuals)<br>• **Covers** descriptive and inferential statistical applications, with emphasis on exponential random graph models (ERGMs); *R* used | Edpsy 576 | Edpsy 597 | 3 | Sp: M<br>**2023** | Sanders<br>(alternating years) |

# M&S Course Sequencing: Broad Overview

**EDPSY 490 Basic Ed Stats**
*or*
**70% Online 490 Screener**
*or*
**B.S./M.S. in Statistics**
*All Quarters, 3 cr*

**Survey Instrument Develop**
**EDPSY 513 (formerly 588)**
*Winter, 3 cr*

**Applied Msmt in Educ Rsrch**
**EDPSY 517 (formerly 591)**
*Spring, 3 cr*

**Multiple Regression**
**EDPSY 538 (formerly 594)**
*Winter and Spring, 3 cr*

**Multilevel Modeling**
**EDPSY 576**
*Fall, 3 cr*

**Experim Design & Analysis**
**EDPSY 596 (formerly 593)**
*Even Years, Spring, 3 cr*

**Network Msmt & Analysis**
**EDPSY 597**
*Odd Years, Spring, 3 cr*

**Structural Eq Modeling I**
**EDPSY 575**
*Spring, 3 cr*

**Structural Eq Modeling II**
**EDPSY 588**
*Odd Years, Fall, 3 cr*

**CTT Reliab/Validity**
**EDPSY 539 (formerly 592)**
*Spring, 3 cr*

**G Theory/Validity/Test Dev**
**EDPSY 558/559/561**
*Tri-Annual, Winter, 3 cr*

**Item Response Theory I**
**EDPSY 591 (formerly 595)**
*Fall, 3 cr*

**Monte Carlo Simulations**
**(M&S Students) EDPSY 595**
*Even Years, Fall, 3 cr*

**Item Resp Theory II**
**EDPSY 592**
*Odd Years, Winter, 3 cr*

**CDM/CAT**
**EDPSY 593/594**
*Tri-Annual, Spring, 3*

**CTT = Classic Test Theory**
**CDM = Cognitive Diagnostic Modeling**
**CAT = Computerized Adaptive Testing**