Psychological and Quantitative Foundations (PSQF) 7375 Section 0006: Advanced Longitudinal Models Spring 2025

Instructor and Home Department Information:	**Professor Lesa Hoffman (she/her—you can call me Lesa)** Educational Measurement and Statistics (EMS) Program *PSQF Dept Office: South 361 Lindquist Center; DEO: Professor Martin Kivlighan*
Instructor Contact Information:	Email: Lesa-Hoffman@UIowa.edu *(preferred mode of contact)* Office: 356 South Lindquist Center *(mostly unattended)* Phone: 319-384-0522 *(mostly unattended)*
Zoom Link for Class and Office Hours:	https://uiowa.zoom.us/my/lesahoffmaniowa Meeting ID: 5044356512; Mobile Access: +13126266799
Course Location and Time:	166 North Lindquist Center or via zoom Tuesdays and Thursdays 12:30–1:45 PM
Instructor Zoom-Only Office Hours:	Mondays and Wednesdays 3:00–4:30 PM in a group format (first-come, first-serve) or individually by appointment

Schedule of Topics and Events:

This course will meet synchronously in person and on zoom. The planned schedule of topics and events given here may need to be adjusted throughout the course. The **course website** will always have the **most current schedule of events and due dates**: http://lesahoffman.com/PSQF7375_AdvLong/index.html

Course Objectives, Prerequisites, and Materials:

This course will focus on the uses of multilevel and structural equation models for analyzing longitudinal data. **The course objective is for participants to be able to complete all the necessary steps in a longitudinal analysis involving time-varying predictors**: deciding which type of model is appropriate, configuring the dataset accordingly, building models to evaluate unique effects of predictors and multivariate association, and interpreting and presenting empirical findings. Prior to enrolling, participants should be comfortable with unconditional models of within-person change (i.e., fixed and random time slopes) and modeling time-invariant predictors, as covered in chapters 1, 3, 5, 6, and 7 of the course textbook (Hoffman, 2015).

Class time will be devoted primarily to lectures, examples, and review, the materials for which will be available for download at the course website. Readings and other resources have been suggested for each topic and may be updated later. **Synchronous attendance (in person or via zoom) is strongly encouraged** but is not required, and you do not need to notify the instructor of sporadic class absence. Video recordings of each class in which the instructor is the presenter will be available on YouTube so that closed captioning will be provided, and supplemental videos may be added as well. Recordings of classes with student presenters will be shared within ICON only. Auditors and visitors are always welcome to attend class. No required class sessions will be held outside the regular class time given above (i.e., no additional midterm or final exam sessions). However, because the course will have an applied focus requiring statistical software, participants are encouraged to attend group-based zoom office hours (first-come, first-served), in which multiple participants can receive immediate assistance near-simultaneously.

Course Requirements:

Participants will have the opportunity to earn **up to 100 total points** by completing work outside of class. Up to **51 points** can be earned from **homework assignments** (HW; 3 planned initially) through a custom online system or ICON as noted—these will be graded for accuracy. **Written assignments must be at least ¾ complete to be accepted**. Up to **34 points** can be earned by conducting a **project** (either individually or in pairs), which will involve planning and conducting data analyses to be shared in a conference-style presentation to the class along with a peer review process. Presentations can be **revised once** to earn the

maximum total points. More details about the project structure, allowable content, and presentation day assignments will be given later. Up to **15 points** may be earned from **formative assessments** (FA; 5 planned initially) through ICON; for each you will receive 3 points for effort only—incorrect answers will not be penalized. There may be other opportunities to earn extra credit at the instructor's discretion. Finally, revisions to the planned schedule and/or content may result in fewer activities (and thus fewer total points) at the instructor's discretion. If that happens, this syllabus will be updated to reflect the new point totals.

Policy on Accepting Late Work and Grades of Incomplete:

Participants may submit work at any point during the semester to be counted towards their course grade. However, in order to encourage participants to keep up with the class**, late homework assignments will incur a 2-point penalty; late outlines, revisions, or formative assessments will incur a 1-point penalty.** Extensions will be granted as needed for extenuating circumstances (e.g., conferences, comprehensive exams, family obligations) if requested at least **two weeks in advance** of the due date. A final grade of "incomplete" will only be given in dire circumstances and entirely at the instructor's discretion. **All work must be submitted by Thursday, May 15, 2025, at 11:59 PM to be included in the course grade.**

Final grades will be determined by the *percentage* earned out of the total possible points:

>96% = A+, 93–96% = A, 90–92% = A−, 87–89% = B+, 83–86% = B, 80–82% = B−, 77–79% = C+, 73–76% = C, 70–72% = C− **(PASS)**, 67–69% = D+, 63–66% = D, 60–62% = D−, <60% = F

Course Software:

Participants will need to have access to statistical software—**SAS, STATA, or R+RStudio; M*plus***—that can estimate the models presented. Each of these programs is freely available to participants in multiple ways:

- You can connect to the U Iowa Virtual Desktop (connect to the U Iowa VPN first) for free
- You can connect to the U Iowa Research Remote Desktop (connect to the U Iowa VPN first) for free
- You can install R software for free on your local machine, along with the free graphical RStudio interface that makes R easier to use (install second after R software)
- You could also pay $48 to install a 6-month student copy of STATA on your local machine

Course Textbook:

Hoffman, L. (2015). *Longitudinal analysis: Modeling within-person fluctuation and change*. Routledge/Taylor & Francis. Available for free at the University of Iowa library in electronic form.

Academic Misconduct:

As a reminder, the University of Iowa College of Education has a formal policy on academic misconduct, which all students in this course are expected to follow. While students can work with each other to understand the course content, all homework assignments must ultimately be completed individually (or in pairs for the project). Please consult the instructor if you have questions.

The use of ChatGPT or any other Artificial Intelligence (AI) should not be needed (or helpful), as the course materials will provide examples of all software code needed to complete homework assignments. Similarly, the use of AI in completing formative assessments (FAs) will defeat their purpose, as these structured reviews are designed to help participants recognize remaining sources of confusion or inexperience (and FA points will be given regardless, so long as there is some effort made in trying to answer each question). **In the project or any written homework, the uncredited use of AI will be treated as academic misconduct. Acceptable uses of AI are limited to grammatical and proof-reading advice (and should be credited).**

Respect for Each Other:

The instructor wants ALL participants to feel welcome and encouraged to actively participate in this course. **There is no such thing as a "stupid" question (or answer).** All course participants—enrolled students and auditing visitors—should always feel welcome to ask whatever questions will be helpful in helping them understand the course content. **Questions or comments are welcome at any point** during class (aloud or using the zoom chat window), in office hours, over email, or in individual appointments with the instructor (available by request). Students with disabilities or who have any special circumstances are encouraged to contact the instructor for a confidential discussion of their individual needs for academic accommodation.

All participants are welcome to attend class via zoom instead of in person for any reason at any time. If it is possible that you have been exposed to COVID-19 or any other illness, please DO NOT attend class in person! Similarly, if the instructor has been exposed to illness or the weather prohibits safe travel to class, the course will move to a temporary zoom-only format to protect all course participants.

When using zoom, please provide the name you wish for us to call you inside your zoom account (i.e., so that it appears on your window while in use). Student use of cameras and microphones while on zoom is also encouraged but not required (out of respect for your privacy and/or limited internet). Please note that class video recordings posted on YouTube will NOT include any video from course participants—only the class audio and screen share from the instructor will be captured. Participants who do not wish for their audio to be captured can use the zoom chat window (which also allows for private direct messages to the instructor), even while attending in person.

The University of Iowa is committed to **making the class environment (in person or online) a respectful and inclusive space** for people of all gender, sexual, racial, religious, and other identities. Toward this goal, students are invited to optionally share the names and pronouns they would like their instructors to use to address them. The University of Iowa prohibits discrimination and harassment against individuals on the basis of race, class, gender, sexual orientation, national origin, and other identity categories. For more information, contact the Office of Civil Rights Compliance. Additional university guidelines about classroom behavior and other student resources are provided here, student complaint procedures are provided here, and the university acknowledgement of land and sovereignty is provided here.

Respect for The Rest of Your World:

The instructor realizes that this course is not your only obligation in your work or your life. While class attendance in real time is not mandatory, it is strongly encouraged because frequent review of the material will be your best strategy for success in this course. However, if work or life events may compromise your ability to succeed, please contact the instructor for a confidential discussion so that we can work together to make a plan for your success. **Please do not wait until you are too far behind to try to catch up!**

Other Course Readings (all available in ICON under "Files"):

> **Note—This is a reduced number of readings, and they are ordered by priority by topic on the course website. They are included to give you more explanation and exposure to current research. I encourage you to read as many of these sources as possible, but your priority should be to participate in class and complete course work first!**

Asparouhov, T., & Muthén, B. (2023). Residual structural equation models. *Structural Equation Modeling, 30*(1), 1–31. https://doi.org/10.1080/10705511.2022.2074422

Berry, D., & Willoughby, M. (2017). On the practical interpretability of cross-lagged panel models: Rethinking a developmental workhorse. *Child Development, 88*(4), 1186–1206. https://doi.org/10.1111/cdev.12660

Grimm, K J., Ram, N., & Estabrook, R. (2016). *Growth modeling: Structural equation and multilevel modeling approaches*. Guilford. Full text also available at the University of Iowa library in electronic form.

Hamaker, E. L. (2023). The within-between dispute in cross-lagged panel research and how to move forward. *Psychological Methods*. Advance online publication. https://dx.doi.org/10.1037/met0000600

Hoffman, L. (2019). On the interpretation of parameters in multivariate multilevel models across different combinations of model specification and estimation. *Advances in Methods and Practices in Psychological Science, 2*(3), 288–311. https://doi.org/10.1177%2F2515245919842770

Hoffman, L. (in press). *A Rosetta Stone for modeling change: Connections among multilevel models, structural equation models, and multilevel structural equation models*. Forthcoming as chapter 21 of the *Handbook of Research Methods in Developmental Science (*2nd ed.).

Hoffman, L. (under review). *Disaggregating associations of between-person differences in change over time from within-person associations in longitudinal data*.

Hoffman, L., & Hall, G. J. (2024). Considering between- and within-person relations in autoregressive cross-lagged panel models for developmental data. *Journal of School Psychology, 102*, 101258. https://doi.org/10.1016/j.jsp.2023.101258

Hoffman, L., & Walters, R. W. (2022). Catching up on multilevel modeling. *Annual Review of Psychology, 73*, 629-658. https://doi.org/10.1146/annurev-psych-020821-103525

Isiordia, M., Conger, R., Robins, R. W., & Ferrer, E. (2017). Using the factor of curves model to evaluate associations among multiple family constructs over time. *Journal of Family Psychology, 31*(8), 1017–1028. https://doi.org/10.1037/fam0000379

Lüdtke, O., Marsh, H. W., Robitzsch, A., Trautwein, U., Asparouhov, T., & Muthén, B. (2008). The multilevel latent covariate model: A new, more reliable approach to group-level effects in contextual studies. *Psychological Methods, 13*(3), 203–229. https://doi.org/10.1037/a0012869

McCormick, E. M., Curran, P. J., & Hancock, G. R. (2024). Latent growth factors as predictors of distal outcomes. *Psychological Methods*. Advance online publication. https://doi.org/10.1037/met0000642

McNeish. D. (2017). Multilevel mediation with small samples: A cautionary note on the Multilevel Structural Equation Modeling framework. *Structural Equation Modeling, 24*(4), 609–625. https://doi.org/10.1080/10705511.2017.1280797

McNeish, D., & Hamaker, E. L. (2020). A primer on two-level dynamic structural equation models for intensive longitudinal data in Mplus. *Psychological Methods, 25*(5), 610–635. https://doi.org/10.1037/met0000250

McNeish, D., & Matta, T. (2018). Differentiating between mixed-effects and latent-curve approaches to growth modeling. *Behavior Research Methods, 50*, 1398–1414. https://doi.org/10.3758/s13428-017-0976-5

McNeish, D., & Matta, T. H. (2020). Flexible treatment of time-varying covariates with time unstructured data. *Structural Equation Modeling, 27*(2), 298–317. https://doi.org/10.1080/10705511.2019.1627213

O'Keefe, P., & Rodgers, J. L. (2017). Double decomposition of level-1 variables in multilevel models: An analysis of the Flynn Effect in the NSLY data. *Multivariate Behavioral Research, 52*(5), 630–647. https://doi.org/10.1080/00273171.2017.1354758

Preacher, K. J., Zhang, Z., & Zyphur, M. J. (2011). Alternative methods for assessing mediation in multilevel data: The advantages of multilevel SEM. *Structural Equation Modeling, 18*(2), 161–182. https://psycnet.apa.org/doi/10.1080/10705511.2011.557329

Preacher, K. J., Zhang, Z., & Zyphur, M. J. (2016). Multilevel structural equation models for assessing moderation within and across levels of analysis. *Psychological Methods, 21*(2), 189–205. https://doi.org/10.1037/met0000052

Rights, J, D., & Sterba, S. K. (2023). On the common but problematic specification of conflated random slopes in multilevel models. *Multivariate Behavioral Research, 58*(6), 1106–1133. https://doi.org/10.1080/00273171.2023.2174490

Usami, S., Murayama, K., & Hamaker, E. L. (2019). A unified framework of longitudinal models to examine reciprocal relations. *Psychological Methods, 24*(5), 637–657. http://dx.doi.org/10.1037/met0000210

Yaremych, H. E., Preacher, K. J., & Hedeker, D. (2023). Centering categorical predictors in multilevel models: Best practices and interpretation. *Psychological Methods, 28*(3) 613–630. http://dx.doi.org/10.1037/met0000434

Planned Schedule of Events for Weeks 1–9:

Week Number	Weekday and Date		Topics	Readings for Each Topic (ordered by priority)
1	M	1/20	**NOTHING DUE TODAY; NO OFFICE HOURS TODAY**	
	T	1/21	Lecture 0: Course Introduction Lecture 1: Review of Longitudinal Multilevel Models	Hoffman (2015) ch. 1, 3, 5, 6, and 7
	R	1/23	Lecture 1, continued	
2	M	1/27	**NOTHING DUE TODAY**	
	T	1/28	Lecture 2 and Example 2: Time-Varying Predictors of Within-Person Fluctuation in Univariate MLM	Hoffman (2015) ch. 8 Yaremych et al. (2023) Rights & Sterba (2023)
	R	1/30	Lecture 2 and Example 2, continued	
3	M	2/3	**HW1 (in ICON) EFFORT DRAFT DUE BY 11:59 PM**	
	T	2/4	Lecture 2 and Example 2, continued	
	R	2/6	**MEET ON ZOOM ONLY** Discussion of HW1	
4	M	2/10	**FA1 (in ICON) DUE BY 11:59 PM**	
	T	2/11	Discussion of FA1 Lecture 2 and Example 2, continued	
	R	2/13	Lecture 2 and Example 2, continued	
5	M	2/17	**HW1 (in ICON) ACCURACY DRAFT DUE BY 11:59 PM**	
	T	2/18	Lecture 3: Alternative Metrics of Time in Accelerated Longitudinal Designs	Hoffman (2015) ch. 10 O'Keefe & Rodgers (2017)
	R	2/20	Lecture 3, continued Example 3: Alternative Metrics of Time in Univariate MLM	
6	M	2/24	**FA2 (in ICON) DUE BY 11:59 PM**	
	T	2/25	Discussion of FA2 Lecture 3 and Example 3, continued	
	R	2/27	Lecture 3 and Example 3, continued	
7	M	3/3	**HW2 (online, based on Example 2) DUE BY 11:59 PM**	
	T	3/4	Lecture 4: Longitudinal Analysis via SEM and M-SEM Example 4a: Alternative Metrics of Time in SEM and M-SEM	Hoffman (in press) Hoffman (2019) McNeish & Matta (2018) McCormick et al. (2024)
	R	3/6	Lecture 4 and Example 4a, continued	
8	M	3/10	**PROJECT OUTLINE (in ICON) DUE BY 11:59 PM**	
	T	3/11	Lecture 4 and Example 4a, continued Example 4b: Change in Latent Factors in SEM	Grimm et al. (2016) ch. 14–15
	R	3/13	Example 4b, continued	
9	M	3/17	**NOTHING DUE TODAY**	
	T	3/18	**NO CLASS OR OFFICE HOURS THIS WEEK**	
	R	3/20	**NO CLASS OR OFFICE HOURS THIS WEEK**	

Planned Schedule of Events for Weeks 10–17:

Week Number	Weekday and Date		Topics	Readings for Each Topic (ordered by priority)
10	M	3/24	**FA3 (in ICON) DUE BY 11:59 PM**	
	T	3/25	Discussion of FA3 Example 4b, continued Lecture 5: Time-Varying Predictors in SEM and M-SEM	Hoffman (2015) ch. 9 Hoffman (under review)
	R	3/27	**MEET ON ZOOM ONLY** Lecture 5, continued Example 5a: Time-Varying Predictors of Within-Person Fluctuation in M-SEM and SEM	Lüdtke et al. (2008) Preacher et al. (2011, 2016) McNeish (2017) McNeish & Matta (2020)
11	M	3/31	**HW3 (online, based on Example 3) DUE BY 11:59 PM**	
	T	4/1	Lecture 5 and Example 5a, continued	
	R	4/3	Lecture 5, continued Example 5b: Multivariate Change in SEM and M-SEM	Hoffman & Hall (2024) Berry & Willoughby (2017) Usami et al. (2019) Asparouhov & Muthén (2022) Isiordia et al. (2017)
12	M	4/7	**PROJECT OUTLINE REVISIONS IF NEEDED (in ICON) DUE BY 11:59 PM**	
	T	4/8	Lecture 5 and Example 5b, continued	
	R	4/10	Lecture 5 and Example 5b, continued	
13	M	4/14	**FA4 (in ICON) DUE BY 11:59 PM**	
	T	4/15	Discussion of FA4 Lecture 5 and Example 5b, continued Other Resources	Hoffman & Walters (2022)
	R	4/17	Group 1 Student Presentations	
14	M	4/21	**NOTHING DUE TODAY**	
	T	4/22	Group 2 Student Presentations	
	R	4/24	**GROUP 1 PEER REVIEW (by email) DUE BY 11:59 PM** Group 3 Student Presentations	
15	M	4/28	**NOTHING DUE TODAY**	
	T	4/29	**GROUP 2 PEER REVIEW (by email) DUE BY 11:59 PM** Group 4 Student Presentations	
	R	5/1	**GROUP 3 PEER REVIEW (by email) DUE BY 11:59 PM** TBD	
16	M	5/5	**FA5 (in ICON) DUE BY 11:59 PM**	
	T	5/6	**GROUP 4 PEER REVIEW (by email) DUE BY 11:59 PM** Discussion of FA5 TBD	
	R	5/8	TBD	
17	M	5/12	**NOTHING DUE TODAY**	
	T	5/13	**NO CLASS, BUT OFFICE HOURS 12:30–3:30**	
	R	5/15	**NO CLASS, BUT OFFICE HOURS 12:30–3:30** **OPTIONAL REVISIONS TO PRESENTATIONS AND ALL OUTSTANDING WORK DUE BY 11:59 PM**	