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| **Event Title:** | **Structural Equation Modelling and Causal Inference** | **3 Day Event** |
| **Date(s):** | **8,9,10 November** | **40 Places** |
| **Event Format:** | Online | |

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| **If the course being delivered via the NCRM Moodle VLE, please check this box** |
| *This course requires delegates to be registered on the NCRM Moodle platform and this paragraph MUST be included in the course listing on the NCRM Training Directory:*  This course will be hosted in the NCRM Moodle Virtual Learning Environment. In order to participate, delegates will be issued with a personal Moodle user account linked to the name and email address provided when they register for the course. Accounts will remain live for one year from the start of the course to allow continued access to the course materials, after which they will be automatically deleted. Accounts can be deleted earlier by emailing [dataprotection@ncrm.ac.uk](mailto:dataprotection@ncrm.ac.uk) |

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| **Short Summary of Course / Event Description** |
| This is an intensive 3-day course on Structural Equation Modelling (SEM) with hands-on practical sessions. The first day introduces/refreshes the basics of SEM, focusing on the building blocks of structural and measurement models, and structural regression models which include both a structural and a measurement component. Some attention will be paid to multiple group analysis and measurement invariance. The second day treats SEM for longitudinal and missing data. Panel data models such as cross-lagged models and latent growth curve models will be studied and Full Information Maximum Likelihood method for handling missing data will be introduced. The third day discusses SEM for causal inference. Fixed-effects versus random effects, cross-legged panel models with individual fixed effects, and instrumental variable designs within the SEM framework will be discussed. An informal comparison of SEM with Directed Acyclic Graphs (DAGs) will feature in the course too. Each day includes a 3-hour online/live lecture and a 3-hour hands-on supervised computer practical. |
| **Course Contents** (Bullet points) |
| The course covers:   * Basics of Structural Equation Modelling (SEM) * Structural (regression type) models * Measurement models (Confirmatory Factor Analysis, Multi-trait multi-method models) * Multiple group analysis and measurement invariance * Full Information Maximum Likelihood Estimation * Longitudinal SEM (cross-lagged models, latent-curve models) * SEM for causal inference (fixed versus random effects models, cross-lagged panel models with fixed effects, instrumental variable models) |
| **Learning Outcomes** (Bullet points) |
| By the end of the course participants will:   * Be able to fit Structural Equation Models to real-world cross-sectional and longitudinal data. * Be able to understand and interpret the results of a wide range of SEMs. * Be able to critically evaluate the assumptions and requirements for causal inference with SEM. |
| **The Presenters/Speakers** (including a short biography) |
| Ozan Aksoy is Associate Professor of Social Science at the UCL Social Research Institute at University College London. He has been a member of the UCL Q-Step centre which provides social science students with state-of-the-art training in social data science, through courses in quantitative research methods, data analysis and visualization. He has more than 15 years of experience in teaching methods and statistics in the social sciences. His research interests include cooperation, trust, and religious behaviour. He uses game theory, statistical and computational methods, and laboratory and natural experiments as research tools. He is the recipient of the 2019 Raymond Boudon Award for Early Career Achievement and has been since 2022 an elected fellow of the European Academy of Sociology. His recent work has been published, among others, in American Sociological Review, American Journal of Sociology, Social Forces, Nature Human Behaviour, Sociological Science, and European Sociological Review. |
| **Computer Software and Computer workshops** (if the course features computer workshops and/or software please specify the necessary information that course participants need to know (i.e. which software will be used during the course, which version is required, etc.) |
| The primary working packages in the lab sessions will be R, RStudio and Lavaan.  Wherever possible, analogous code for Stata-SEM and MPlus will be provided. |
| **Pre-requisites** (for example please include information on how familiar participants need to be, if at all, with any computer software which will feature in the course) |
| Familiarity with R/Rstudio and a basic understanding of regression/ANOVA will be required. |
| **Target Audience** (Please comment for example on academic, government researchers; disciplines; level (junior; senior) |
| The main target are students and practitioners in sociology, social psychology, epidemiology, and cognate disciplines. Next to a theoretical understanding of SEM, the focus will also be on practical, hands-on applications of SEM. So, the module will be relevant for government researchers and non-academic practitioners too. |
| **Please indicate the level of the course** |
| Advanced (specialised prior knowledge)  Intermediate (some prior knowledge)  Entry (no or almost no prior knowledge) |
| **Research methods area classification** (the course is pre-dominantly in the area of …) |
| quantitative  qualitative  mixed  creative  visual  digital  other, Please specify: |
| **Keywords to help search on website (important) (minimum 5)** |
| (choose from the NCRM list of keywords at <http://www.ncrm.ac.uk/training/Typology.pdf> and add some of your own if possible too)   * Linear regression; Instrumental variables * Hierarchical models; Mixed models; Random effects; Fixed Effects * Cross-lagged panel models; Growth curve models * Confirmatory factor analysis; Structural equation models * R, Stata, Mplus |
| **Advertising (for internal use only – this will not be visible on the course listing in the Training Database)**  Please advise on where best to advertise this course. You may include email lists, websites, groups, and/or email addresses of relevant contacts you may have. This will not be shown on the website but will help us with targeting and recruitment. |
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| **Fee (for the Online Store – this will not be visible on the course listing in the Training Database)** |
| The fee per teaching day is:   * £30 per day for students registered at UK/EU University. * £60 per day for staff at UK/EU academic institutions, UK/EU Research Councils researchers, UK/EU public sector staff and staff at UK/EU registered charity organisations and recognised UK/EU research institutions. * £100 per day for all other participants   In the event of cancellation by the delegate a full refund of the course fee is available up to two weeks prior to the course. NO refunds are available after this date.  If it is no longer possible to run a course due to circumstances beyond its control, NCRM reserves the right to cancel the course at its sole discretion at any time prior to the event. In this event every effort will be made to reschedule the course. If this is not possible or the new date is inconvenient a full refund of the course fee will be given. NCRM shall not be liable for any costs, losses or expenses that may be incurred as a result of its cancellation of a course, including but not limited to any travel or accommodation costs.  The University of Southampton’s Online Store T&Cs also continue to apply. |
| **Duration** (please indicate start and finish dates (and dates of any non-consecutive days in between) and start and finish times for each day) |
| **8, 9, 10 November:**  Start/finish 10am/5pm; lunch break: 1-2pm  Lecture: 10am-1pm  Computer practical: 2pm-5pm |
| **Preparatory Reading including online resources** (please indicate what material you want course participants to look at, read or work through prior to the course and whether this is required or just desirable) |
| **Required reading:**  Rex Kline (2023) Principle and Practice of Structural Equation Modelling, 5th edition: Guilford  The lavaan tutorial (http://lavaan.ugent.be/tutorial/tutorial.pdf) |
| **Blended Learning** (please indicate if the course contains elements of blended learning, i.e. a mixture of face to face and online learning) **(for internal use only – this will not be visible on the course listing in the Training Database)** |
| no blended learning involved  yes course contains elements of blended learning  If yes, please provide further information: |
| **Can (part of) the material be used for a (brief) online (asynchronous) resource** |
| no the whole course is synchronous (live teaching)  yes, potentially  yes, definitely  If yes (potentially or definitely), please provide further information, where possible, on what could be made available as a stand-alone online resource: |
| **Format of course**  Please provide information on:   * timing, frequency, duration: e.g. one morning with a short practical in the afternoon; 6 mornings over 6 weeks etc. * type of sessions the course includes, e.g. lectures, (computer) workshops, practice sessions, question and answer sessions, group work, interactive sessions etc. * please indicate if synchronous (live online teaching) and/or asynchronous teaching (referring course participants to online material/video etc) is used (ideally indicate for which session) |
| * 3-hour lecture in the morning followed by a 3-hour computer practical in the afternoon * The lecture introduces the statistical concepts and tools. * The computer practical involves hands-on exercises and analyses of the material treated in the lecture. |
| **Event Outline (Programme)** (if available; at least approximately) (please indicate per session if synchronous or asynchronous, and if a group session, etc.) |
| **Day 1**  **Lecture and computer practical on**   * Basics of Structural Equation Modelling (SEM) * Structural (regression type) models * Measurement models (Confirmatory Factor Analysis, Multi-trait multi-method models) * Multiple group analysis and measurement invariance   **Day 2**  **Lecture and computer practical on**   * Longitudinal SEM (cross-lagged models, latent-curve models) * Full Information Maximum Likelihood Estimation * SEM versus DAGs   **Day 2**  **Lecture and computer practical on**   * Fixed versus random effects models * Cross-lagged panel models with fixed effects * Instrumental variable models |
| **Course Materials** (please also indicate anything that course participants need to bring, e.g. calculators, usb memory stick) |
| Participants will receive written course notes and material electronically (by email) |