Course Title: Social Network Analysis
Course Code: SOC617
Recommended Study Year: Taught Master Year 1
No. of Credits/Term: 3
Term: 1
Mode of Tuition: Lecture and Laboratory
Class Contact Hours: 3 hours per week
Category in Major Prog.: Required (Master of Social Sciences in Sociology and Data Analytics)
Discipline: Sociology and Social Policy
Medium of Instruction: English
Prerequisite(s): N/A
Co-requisite(s): N/A
Exclusion(s): N/A
Exemption Requirement(s): N/A

Brief Course Description

This course provides an intensive, hands-on introduction to the analysis and visualization of social networks using computational and statistical methods. It focuses on how network structures shape social outcomes, emphasizing practical analysis over theoretical exposition. Students will learn to acquire, manage, and model relational data, and to interpret patterns such as centrality, clustering, diffusion, and community structure. Through applications to real-world data—from organizations and online communities to global collaboration networks—students will develop the technical competence and analytical reasoning necessary to evaluate and communicate network-based evidence in social research.

Aims

The course aims to equip students with the ability to design and conduct social network analyses using contemporary computational tools. It emphasizes practical fluency in transforming relational data into meaningful sociological insights, integrating visualization, modelling, and interpretation. Students will also learn to critically assess methodological choices, data quality, and ethical implications in network research and practice.

Learning Outcomes

Upon successful completion of this course, students will be able to:

1. Acquire, structure, and manage relational data for analysis in R (LO1).
2. Compute and interpret core and advanced structural measures of networks, including centrality, density, clustering, and modularity (LO2).
3. Estimate and diagnose statistical network models (ERGMs and temporal extensions) and interpret parameters in sociological terms (LO3).
4. Visualize and communicate complex network structures using publication-quality outputs (LO4).
5. Evaluate the methodological soundness and empirical validity of network-based research (LO5).
6. Design and execute an independent, reproducible social network analysis addressing a substantive research question (LO6).

Indicative Content

1. **Introduction to Network Analysis**
   Overview of network thinking, key concepts, and environment setup. Translating social questions into relational data structures.
2. **Network Data Preparation**
   Importing, cleaning, and transforming edge lists, node attributes, and multiplex data.
3. **Descriptive and Structural Analysis**
   Network measures: centrality, paths, density, clustering, and assortativity. Comparative diagnostics and summary statistics.
4. **Network Visualization**
   Building effective visual representations using igraph, tidygraph, and ggraph. Design principles for interpretability.
5. **Community Detection and Structural Patterns**
   Identifying cohesive subgroups and latent structures: modularity, equivalence, and block modelling.
6. **Statistical Network Modelling**
   Introduction to random graph models, ERGMs, and goodness-of-fit evaluation. Parameter interpretation and simulation.
7. **Dynamic and Temporal Network Analysis**
   Analysing evolving networks using temporal data. Introduction to longitudinal models and network change mechanisms.
8. **Diffusion and Influence in Networks**
   Simulating contagion and information spread using empirical network data.

Assessing network resilience and intervention effects.

9. **Applied Project Development and Reproducibility**
   Designing a complete analysis workflow: data, methods, code, reporting, and visualization using Quarto or R Markdown.

Teaching Method

The course integrates lectures and laboratory sessions to promote applied learning and independent analytical reasoning. Lectures introduce methodological concepts and analytical frameworks, while laboratories focus on implementing them in R through guided coding exercises and real-world datasets. Students progressively build their analytical portfolio, receiving feedback on code design, interpretation, and reproducibility. By the end of the course, students will have completed an end-to-end network analysis project demonstrating methodological sophistication and empirical insight.

Measurement of Learning Outcomes

Three assessment components measure the learning outcomes (LOs) listed above:

Participation (LO1-5):	10%
Laboratory Assignments (LOs 1-5):	40%
Final Exam (LOs 1-6):	50%
Total	100%

Participation

Active participation in lectures, laboratory sessions, and applied exercises assesses students' engagement with analytical methods and their ability to connect conceptual reasoning with empirical network analysis. Students are expected to demonstrate consistent preparation, critical reflection on readings, and sustained contribution to coding and discussion activities. Participation reflects the professional standards expected of postgraduate study—independent learning, analytical curiosity, and the capacity to articulate methodological reasoning and collaborate effectively in solving complex analytical problems.

Laboratory Assignments

Students complete a series of R-based analytical assignments designed to develop technical fluency and methodological rigor in social network analysis. Each assignment focuses on a specific stage of the analytical workflow—data preparation, computation of structural metrics, visualization, and modelling (e.g., ERGMs, temporal networks). Students submit reproducible code and concise analytical summaries that interpret results within sociological frameworks. The assignments assess the student's ability to apply appropriate methods, evaluate model assumptions, and communicate findings clearly through well-documented scripts and visual outputs.

Final Take-Home Exam

The final take-home examination assesses students' capacity to integrate and apply advanced approaches in social network analysis independently. Students are provided with a relational dataset and guiding research questions that require them to design a complete analytical strategy, justify methodological choices, implement and evaluate network models, and interpret outcomes in light of sociological theory. The exam emphasises analytical precision, conceptual integration, and methodological transparency. Students are expected to demonstrate sound judgement, originality, and autonomy in carrying out and presenting a comprehensive network analysis from data management through model interpretation.

Basic Readings

Barabási, A. (2016). *Network Science*. New York: Cambridge University Press.

Borgatti, S., Everett, M., Johson, J., and Agneessens, F. (2022). Analyzing Social Networks Using R. SAGE.

Easley, D., & Kleinberg, J. (2010). *Networks, crowds, and markets: Reasoning about a highly connected world*. Cambridge University Press.

Hunter DR, Handcock MS, Butts CT, Goodreau SM, Morris M. (2018). ergm: A Package to Fit, Simulate and Diagnose Exponential-Family Models for Networks. *Journal of Statistical Software*, 24(3), 1-29.

McLevey, J., Scott, J. & Carrington, P. (2023). The SAGE Handbook of Social Network Analysis. 2nd Edition. SAGE Publications.

Robins, G. (2015). Doing Social Network Research: Network-based Research Design for Social Scientists. Sage.

Watts, D. J. (2003). Six Degrees: The Science of a Connected Age. W.W. Norton.

Recommended Materials

Burt, R. S. (2004). Structural holes and good ideas. *American Journal of Sociology*, 110(2):349-399

Klovdahl, A. S. (1985). Social networks and the spread of infectious diseases: The AIDS example. *Social Science and Medicine*, 21(11):1203-1216

Lusher D, Koskinen J, Robins G. Exponential Random Graph Models for Social Networks. New York, NY: Cambridge University Press. Chapters 2-4.

Marsden, P. V. (1990). Network data and measurement. *Annual Review of Sociology*, 16:435-463.

Snijders, T. A. (2011). Statistical models for social networks. *Annual review of sociology*, *37*(1), 131-153.

Watts, D. J. (1999). Networks, dynamics, and the small world phenomenon. *American Journal of Sociology*, 105(2):493-527.

IMPORTANT NOTES

1) Students are expected to spend a total of 9 hours per week to achieve the course learning outcomes.

2) Students shall be aware of the University regulations about dishonest practice in course work, tests and examinations, and the possible consequences as stipulated in the Regulations Governing University Examinations.

In particular, plagiarism, being a kind of dishonest practice, is “the presentation of another person’s work without proper acknowledgement of the source, including exact phrases, or summarized ideas, or even footnotes/citations, whether protected by copyright or not, as the student’s own work”.

Students are required to strictly follow university regulations governing academic integrity and honesty.

3) If you need accommodation due to a disability please contact me as soon as possible to make arrangements.

4) Students are required to submit writing assignment(s) using Turnitin.

5) To enhance students' understanding of plagiarism, a mini-course "Online Tutorial on Plagiarism Awareness" is available on https://pla.ln.edu.hk/.

6) Students are encouraged to utilize AI tools introduced in the course in a responsible and ethical manner, fully recognizing both their potential and limitations. Students can also integrate generative AI tools in their assignments strictly for brainstorming/ideation, grammar checks and enhancements but not on writing your assignments and other course deliverables. The instructor will be responsible for informing students about the university's policy on academic integrity as well as course assessment requirements at the beginning of the course, including which assignment can and cannot make use of Generative AI tools.

7) Students must adhere to the University's guidelines and practices when using Generative Artificial Intelligence (AI) tools. The official documents "Guidelines for Using GAI Tools at Lingnan University" and "Best Practices for Ethical and Responsible Use of GAI Tools in Course Assessments" can be found here: https://www.ln.edu.hk/tlc/generative-artificial-intelligence/gai-guidelines-best-practices.

Good Practice

6) The instructor and tutors will be regularly available to communicate with students in person, by email, and by phone if necessary. Emails will be replied within 2 working days. Students are advised to send emails during office hours (9:00 to 18:00).

7) The instructor and tutors will mark, give comments, and return students' writing assignments within two weeks of submission.

8) Students will attend on time and in full the classes of this course and participate actively in both lectures and tutorials. If the students are late, they must not interrupt ongoing presentations of their classmates during the tutorials. Late students will enter the room only once the presentation has finished.

9) Students will make efforts to produce and submit works as required in this course. In case of any inconvenience, the students must communicate with the instructor and the tutor in advance.

10) Students, the instructor and tutors will create a respectful learning atmosphere in which plural and contrasting views can be fully expressed and appreciated.

Participation

Criteria	Excellent (9–10%)	Good (7–8%)	Pass (4–6%)	Fail (Below 4%)
Engagement with data acquisition, structuring, and management (LO1)	Fully prepared for all sessions; demonstrates mastery of relational data handling through insightful contributions during in-class exercises.	Regularly prepared and engaged; demonstrates solid understanding of data preparation tasks though contributions may lack depth.	Participates inconsistently; shows basic understanding of data preparation but limited initiative or accuracy.	Shows no preparation or contribution; absent or disengaged during applied sessions.
Application and interpretation of network metrics (LO2)	Engages actively in interpreting centrality, clustering, and density measures; articulates clear sociological implications of metrics.	Interprets metrics correctly and participates actively, though occasionally misses nuanced implications.	Engages occasionally in discussions; identifies some metrics correctly but fails to interpret sociologically.	Misinterprets metrics or provides incorrect explanations; fails to engage with network analysis concepts.
Participation in modelling discussions and critical interpretation (LO3)	Offers critical insights into network models (e.g., ERGM or diffusion); identifies strengths, assumptions, and potential limitations with precision.	Provides competent input during modelling discussions; identifies model purposes but with limited critical detail.	Limited contributions to modelling; may misunderstand core assumptions or lack interpretive clarity.	Provides no input in model-related discussions or demonstrates fundamental misunderstandings.
Contribution to visualization and communication exercises (LO4)	Contributes creative ideas to visualization tasks; suggests improvements for clarity and interpretability in R visual outputs.	Participates constructively in visualization work; offers suggestions with minor inconsistencies in clarity.	Minimal involvement in visualization tasks; basic outputs without interpretive insight.	No participation in visualization exercises; fails to engage with coding or analysis tasks.
Critical evaluation and reflection on methodological choices (LO5)	Shows consistent methodological reflection; raises critical questions linking analytical choices to sociological reasoning and ethics.	Reflects meaningfully on methodology; demonstrates understanding though connections to theory could be stronger.	Provides superficial reflections; minimal engagement with methodological critique or ethical reasoning.	No reflection or awareness of methodological or ethical implications; disengaged from analytical reasoning.

Laboratory Assignments

Criteria	Excellent (33–40%)	Good (25–32%)	Pass (16–24%)	Fail (Below 16%)
Data acquisition, preparation, and management in R (LO1)	Produces fully reproducible, well-documented code; handles relational data efficiently using appropriate packages and structures.	Code is functional and mostly reproducible; minor inefficiencies or documentation issues.	Produces working code with errors or incomplete documentation; partial reproducibility.	Fails to produce functional or relevant code; no reproducibility or understanding of data structures.
Computation and interpretation of structural measures (LO2)	Computes and interprets network measures accurately; demonstrates nuanced understanding of network structure and sociological implications.	Computes key measures accurately; interpretation is correct though may lack depth or sociological linkage.	Computes basic metrics but misinterprets or omits analytical details; interpretation lacks sociological grounding.	Miscomputes or misunderstands all key metrics; shows no analytical or theoretical comprehension.
Model estimation, evaluation, and interpretation (LO3)	Implements ERGMs or temporal models effectively; provides precise parameter interpretation with sound diagnostics.	Implements models with reasonable accuracy; parameter interpretation is adequate but not comprehensive.	Attempts model estimation with technical or interpretive inaccuracies; limited use of diagnostics.	Fails to estimate models correctly or interpret results; lacks basic methodological competence.
Documentation, visualization, and clarity of analytical reasoning (LO4, LO5)	Communicates analytical reasoning clearly with professional-quality visuals and structured reports; excellent documentation and interpretation.	Uses visualization effectively though with minor flaws; explanations are clear but could be more polished.	Visualizations lack clarity or depth; explanations are brief and unstructured.	Visualizations are absent, irrelevant, or unintelligible; interpretation missing entirely.

Final Exam

Criteria	Excellent (41–50%)	Good (31–40%)	Pass (20–30%)	Fail (Below 20%)
Data management and analytical design (LO1, LO2)	Designs a robust analytical strategy using R; data workflow and network metrics are precise, logical, and transparent.	Shows solid analytical strategy; data workflow is clear but may include small errors or limited interpretive detail.	Implements partial analytical workflow; some steps missing or incorrectly applied.	No coherent analytical design or data workflow; fails to use R or network packages appropriately.
Interpretation of complex structural measures (LO2)	Explains structural properties comprehensively, linking metrics to sociological mechanisms with strong theoretical grounding.	Interprets metrics correctly but links to theory or context are brief or underdeveloped.	Interprets network metrics at a surface level; lacks theoretical discussion or context.	Unable to explain structural metrics; interpretations are incorrect or absent.
Model estimation and diagnostic evaluation (LO3)	Implements and diagnoses models accurately, interpreting coefficients meaningfully; applies appropriate validation techniques.	Implements models correctly with partial diagnostic checks; some parameters insufficiently interpreted.	Model outputs are incomplete or insufficiently justified; missing evaluation of fit or parameters.	Fails to estimate models or misinterprets all parameters; lacks diagnostic reasoning.
Visualization and communication of results (LO4)	Visualizes networks using clear, publication-quality figures; integrates visual and analytical results effectively.	Visualizations are informative but limited in clarity or annotation; explanation is concise but lacks integration.	Visualizations exist but poorly executed or disconnected from analysis.	Visualizations missing or meaningless; fails to connect results to analysis.
Critical evaluation of methodological soundness (LO5)	Critically evaluates methodological strengths and limitations with insight; provides theoretically grounded justification of choices.	Evaluates methods with reasonable understanding; critique is somewhat generic.	Provides minimal methodological evaluation; lacks critical depth.	No methodological critique or understanding; fails to meet academic expectations.
Integration and reproducibility of complete workflow (LO6)	Delivers a complete, transparent workflow from data to interpretation; demonstrates full reproducibility and independent reasoning.	Workflow is coherent but partially reproducible; small inconsistencies in code or reporting.	Workflow is incomplete or non-reproducible; limited coherence or structure.	No complete workflow submitted; code and analysis are incoherent or non-functional.