Package ‘CurricularComplexityData’

April 29, 2026

Title Data for Exploring Curricular Complexity

Version 0.2.0

Description Provides 'igraph' objects representing engineering plans of study across multiple disciplines and institutions. The data are intended for use with the 'CurricularComplexity' package (Reeping, 2026) <doi:10.32614/CRAN.package.CurricularComplexity> to support analyses of curricular structure.

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Encoding UTF-8

RoxygenNote 7.3.3

Depends R (>= 3.5)

Suggests CurricularComplexity

LazyData true

NeedsCompilation no

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Repository CRAN

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Contents

NSF_SUCCESS *NSF SUCCESS Engineering Curricula Networks*

Description

A collection of curricular networks for five engineering disciplines across multiple MIDFIELD institutions in the United States. Each network is an 'igraph' object representing courses as nodes and prerequisite/corequisite relationships as directed edges.

Usage

```
NSF_SUCCESS
```

Format

A list of 494 'igraph' objects.

Details

#' @section Authors: David Reeping (University of Cincinnati) Nahal Rashedi Elliot Setser Sushant Padhye Autri Banerjee Emily Hodge Levi Smith

Context: These curricula are from institutions in the Multiple-Institution Database for Engineering Longitudinal Development (MIDFIELD), which contains nearly two million undergraduate student records from 21 U.S. universities spanning 1987-2024. This dataset complements MIDFIELD by capturing curricular structure and complexity as part of the project "Studying Undergraduate Curricular Complexity for Engineering Student Success (SUCCESS)."

Sampling: Curricular plans were collected from 13 MIDFIELD institutions over 10 years for Mechanical, Electrical, Chemical, Civil, and Industrial Engineering programs using institutional websites and the Internet Archive Wayback Machine.

Data structure: The dataset is a list of 494 'igraph' objects. Each object corresponds to a plan of study for a specific discipline, institution, and year. Vertices represent courses with attributes course_name, "course_code", "term", and "credits". Edges represent prerequisite and corequisite relationships with an attribute "type" of "prereq" or "coreq"

Limitations: The dataset focuses on large, research-intensive institutions and five engineering disciplines. Users should exercise caution when extrapolating beyond this scope. Minor data entry errors may exist for older plans of study, but overall trends are robust.

Source

Collected from institutional websites and the Internet Archive Wayback Machine, Fall 2022.

References

Reeping, D., Padhye, S. M., & Rashedi, N. (2023). A process for systematically collecting plan of study data for curricular analytics. In *Proceedings of the 2023 ASEE Annual Conference & Exposition*.

Padhye, S., Reeping, D., & Rashedi, N. (2024). Analyzing trends in curricular complexity and extracting common curricular design patterns. In *Proceedings of the 2024 ASEE Annual Conference & Exposition* (Paper 46580).

Reeping, D., Ebrahiminejad, H., Ohland, M., Reid, K., & Rashedi, N. (2026). Analyzing the curricular complexity of engineering programs across disciplines and time. *IEEE Transactions on Education*.

#' Rashedi, N., Reeping, D., Wei, S. (2026). A scoping review of methods used to analyze engineering curricula quantitatively using curricular analytics *Engineering Education Review*.

`ThreeEngineeringDisciplines_Ryan`
Mechanical, Civil, and Electrical Engineering Curricula Networks

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Description

A collection of curricular networks for three engineering disciplines across multiple institutions in the United States. Each network is an 'igraph' object representing courses as nodes and prerequisite/corequisite relationships as directed edges.

Usage

```
ThreeEngineeringDisciplines_Ryan
```

Format

A list of 155 'igraph' objects.

Details

#' @section Author: Olivia Ryan (Virginia Tech)

Context: These curricula are from 48 of the 50 institutions that awarded the most engineering bachelor's degrees in 2023, based on ASEE By the Numbers, plus five additional smaller institutions used as counter cases. This data was collected as part of Olivia Ryan's dissertation.

Sampling: Curricular plans were collected from 53 total institutions for Civil, Electrical, and Mechanical engineering programs (n = 155). The curriculum plans in the dataset include information from the 2023, 2024, or 2025 catalog year, depending on which plan was most recently available. Many curriculum plans included upper-level electives or choices throughout the curriculum, which needed to be accounted for to represent an accurate plan of study. A set of rules was applied to determine which electives to include. First, curriculum plan requirements were used to determine whether electives needed to be distributed across specialty areas, and courses were selected to meet those requirements. Next, electives were chosen to align with common job sectors in the field. Within these specialties, electives with the fewest or most common prerequisites were selected to approximate a typical student pathway. To maintain flexibility, two to three electives were left without prerequisites, reflecting options that allow students to take courses in other disciplines.

Data structure: The dataset is a list of 155 'igraph' objects. Each object corresponds to a plan of study for a specific discipline, institution, and year. Vertices represent courses with attributes course_name, "course_code", "term", and "credits". Edges represent prerequisite and corequisite relationships with an attribute "type" of "prereq" or "coreq"

Limitations: The dataset focuses primarily on large, research-intensive institutions across three engineering disciplines. Users should exercise caution when extrapolating beyond this scope. Although a systematic process was used to determine upper-level electives, selections may not be perfectly consistent across programs and institutions.

Source

Collected from institutional websites, Summer 2025.

Index