Syllabus for Math 8850: Topics in Algebraic Topology

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Description
In this course we will focus on the role that categorical techniques play in homotopy theory.

Tentative list of topics

- **Limits and colimits**: Kan extensions, ends and coends.
- **Model categories**: the homotopy category; derived functors as Kan extensions; cofibrantly generated model categories and the small object argument.
- **Enriched categories**: weighted limits and colimits; enriched completeness and cocompleteness; the enriched small object argument.
- **Model structures of diagram categories**: injective and projective model structures; Reedy model structures.
- **Homotopy limits and colimits**: homotopy finality and cofinality; Quillen's Theorem A.
- **Equivariant homotopy limits and colimits**: model structures on categories of equivariant diagrams; equivariant homotopy finality and cofinality; equivariant excision; Tom Dieck splitting and the Wirthmüller isomorphism.

References
Our main reference will be

- *Categorical Homotopy Theory*, by Emily Riehl.

Additional references of interest include:

- *Model Categories*, by Mark Hovey.
- *Theory and Practice of Reedy Categories*, by Dominic Verity and Emily Riehl.
- *Homotopy theory of G-diagrams and equivariant excision*, by Emanuelle Dotto and Kristian Moi.
- *Higher Equivariant Excision*, by Emanuelle Dotto.

For a concise accessible introduction to model categories, try:

- *Homotopy theories and model categories*, by W. G. Dwyer and J. Spalinski, available at http://hopf.math.purdue.edu/Dwyer-Spalinski/theories.pdf