WINONA STATE UNIVERSITY

COLLEGE OF SCIENCE AND ENGINEERING

DEPARTMENT OF MATHEMATICS AND STATISTICS

**Course Outline-MATH 462**

**Course Title:** Introduction to Topology

**Number of Credits**: 3

**Catalog Description:** A study of indexed families of sets, mappings, diagrams, continuity, neighborhoods, limit points, open and closed sets. Prerequisites: MATH 213 - Calculus II and MATH 327 - Foundations of Mathematics. Grade or P/NC. Offered periodically fall semester every third year.

**(Proposed) Catalog Description:** A study of geometric properties and spatial relations unaffected by the continuous change of the shape or size of the objects. Topics may include Point-Set Topology, Knot Theory, Classification of Surface, and/or Applications of Topology. Prerequisites: MATH 213 - Calculus II and MATH 327 - Foundations of Mathematics. Grade or P/NC. Offered periodically fall semester every third year.

**Possible Text(s):** “Topology Now” by Messer and Straffin  
“Introduction to Topology: Pure and Applied” by Adams and Franzosa

**Topics Covered:**

1. Topological Spaces
   1. Open Sets, Topology
   2. Basis
   3. Closed Sets
   4. Interior and Closure
   5. Limit Points and Boundary Points
2. Creating New Topological Spaces
   1. Subspace Topology
   2. Product Topology
   3. Quotient Topology
3. Continuity and Homeomorphisms
   1. Continuous Functions
   2. Homeomorphisms
   3. Topological equivalence
   4. Topological invariants
   5. Isotopy
4. Metric Spaces
   1. Metric Spaces
   2. Properties of Metric Spaces
   3. Motivation for general topological definitions
5. Topological Properties
   1. Connectedness
   2. Path Connectedness
   3. Compactness
   4. Compactification
6. Knots (optional)
   1. Knot Diagrams
   2. Reidemeister Moves
   3. Knot Colorings and other invariants
   4. Polynomial Invariants
7. Manifolds (optional)
   1. Manifolds
   2. Cut-and-paste methods
   3. Euler Characteristic and Orientability
   4. Classification of surfaces
   5. Three-Manifolds
8. Applications of Topology (optional)

**Remarks:**

* The level of rigor will depend on the instructor. One is recommended to balance the pros and cons of a strictly proof-based class and those of an intuitive/motivational approach

**Method of Instruction:** Lecture-presentation, discussion, question-answer sessions, use of calculators/computers, group work.

**Evaluation Procedure:** Homework, quizzes, projects, midterm exams, and a final exam.

**Last Revised:** Spring 2016 by Eric Errthum (unofficial, not department approved)