University of North Texas at Dallas
Fall 2016
SYLLABUS

MATH 4900.001	Topics in Knot Theory and its applications	3 hours
Department of	Mathematics and Information Sciences	
Division of	Liberal Arts & Life Sciences	
Instructor Name:	*Dr. Noureen Khan*	
Office Location:	*Founders Hall - 223*	
Office Phone:	*972 338 1567*	
Email Address:	*noureen.khan@unt.edu*	
Office Hours:	*Monday & Wednesday: 11:30A – 2:30P*	
Lab Hours:	*Monday & Wednesday: 8:30A – 9:30A*	
Classroom Location:	Founders Hall – TBA	
Class Meeting Days & Times:	Monday and Wednesday 2:30P - 3:50P	
Course Catalog Description:	Special topics in Knot Theory and its Application	
Prerequisites:	Math 2700 or by consent of instructor	
Useful Books:	Class notes and articles will be provided in class. The following books and articles are useful as reference text: • *Knots knots*, Justin Roberts, • The Knot Book, Colin C. Adams • Knot Theory and Its Applications, Kunio Murasugi, • History and Science of Knots, J C Turner & P van de Griend • The Ashley Book of Knots, Clifford W. Ashley	

Access to Learning Resources:	UNT Dallas Library: 　　　phone: (972) 780-3625; 　　　web: http://www.unt.edu/unt-dallas/library.htm UNT Dallas Bookstore: 　　　phone: (972) 780-3652; 　　　e-mail: 1012mgr@fheg.follett.com

Course Goals: The goals of this course are to

1.	Learn basic and simple notion in knot theory and Combinatorics.
2.	Define and compute simple invariants of knots and links.
3.	Learn technology and mathematical software including 3D printing.
4.	Study about applications of Knot Theory, explore basic unsolved problems.
5.	Conduct original research, and present it at state conferences.

Course Objectives:

1. Study current accessible research in knot theory and attempt to come up with new results and/or generate and examine examples that support the current literature.
2. Use 3D printers to produce actual physical models of the knots and related objects that are in the papers you are reading. You may have to learn Mathematica, Maple, MATLAB, or other programs to help you create the models.
3. Learn how communicate mathematics through written papers, and presentations using LaTeX, Beamer, WordPress, Blogger, and other typesetting and presentation software.
4. Present your work as a talk and as a poster at the MAA Texas Section meeting that will be held in Tylor, TX in October -2016.
5. Create and print a final project that will be housed in the front foyer display case in the Department of Mathematics.

Course Outline:

Knot theory is a branch of topology that studies how one may embed a circle within three-dimensional space. Since knots may become quite complicated, much of modern knot theory involves the development of invariants that can distinguish between different equivalence classes of knots. In this course we will survey some basic topics, including Knots, Links, Invariants, Reidemeister moves, knot polynomials, knot groups, etc.

We will learn how to formalize knots and learn techniques to distinguish them from one another. We will also discuss open problems in knot theory. The course will be mostly self-contained and will have an emphasis on careful proof writing.

Class Project:

Throughout the semester, students will work on 3D projects, which involved studying a class related topic, writing a term paper on a selected topic, and making its 3D model.

The students will read original scientific papers as well as review papers and books, and discuss the material with the instructor during class and lab hours. By the end of this class student will write a term paper and make an in-class final presentation of their paper and 3D model. The titles and abstracts of the presentations, as well as the complete texts of the projects will be presented in class and at a State conference.

Course Evaluation Methods:

This course will utilize the following instruments to determine student grades and proficiency of the learning outcomes for the course.

Individual Project – Project will be assigned in the beginning of semester.

Presentation – In class presentations of individual projects.

Grading Matrix:

Instrument	Percentage %	Points
Attendance	10	10
Project Report	30	30
Project model	30	30
Presentation	30	30
Total:	100	100

Web Resources:

The following websites provide the most comprehensive database of knots, links and their invariants:

- Knot Atlas by Dror Bar Natan
  http://katlas.org/wiki/Main_Page

- Knot Info by C. Livingston and J.C. Cha
  http://www.indiana.edu/~knotinfo/

- KnotPlot by Rob Scharein was part of his thesis work in the Imager Computer Graphics Laboratory and it is the best visualization software for knot theory. Its add-on TopoICE can be used to model the shape of DNA bound by proteins (such as recombinases) which bind 2 segments of DNA and can knot or link circular DNA molecules
  http://www.knotplot.com/

This schedule is subject to change by the instructor. Any changes made will be communicated by emails and/or blackboard announcements.

Monday	TOPICS		Wednesday	TOPICS
8/22/16	Introduction and syllabus		8/24/16	Chapter 1 *What is Knot Theory*
8/29/16	Chapter 1 *What is Knot Theory*		8/31/16	Reading Assignment **Article # 1**
9/05/16	Labor Day NO CLASS		9/07/16	Introduction to *3D Printing*
9/12/16	Chapter 2 *Classical Invariants*		9/14/16	Chapter 2 *Classical Invariants*
9/19/16	*Writing Assignment #1*		9/21/16	*Presentations*
9/26/16	Chapter 3 *Basic Operations*		9/28/16	Chapter 3 *Basic Operations*
10/03/16	Chapter 3 *Basic Operations*		10/05/16	Chapter 3 *Basic Operations*
10/10/16	*Reading Assignment Article #2*		10/12/16	*Reading Assignment Article #2*
10/17/16	*Writing Assignment #2*		10/19/16	**Presentations**
10/24/16	Chapter 4 *Coloring of Knots*		10/26/16	Chapter 4 *Coloring of Knots*
10/31/16	Chapter 4 *Coloring of Knots*		11/02/16	Chapter 4 *Coloring of Knots*
11/07/16	Chapter 5 *Rational Tangles*		11/09/16	Chapter 5 *Rational Tangles*
11/14/16	Chapter 5 *Rational Tangles*		11/16/16	Chapter 5 *Rational Tangles*
11/21/16	*Reading Assignment Article #3*		11/23/16	*Reading Assignment Article #3*
11/28/16	*Writing Assignment #3*		11/30/16	**Presentations**
12/05/16	*Review & Discussions*		12/07/16	**Final Report & 3D Presentations**

University Policies and Procedures:

Students with Disabilities (ADA Compliance):

The University of North Texas Dallas faculty is committed to complying with the Americans with Disabilities Act (ADA). Students' with documented disabilities are responsible for informing faculty of their needs for reasonable accommodations and providing written authorized documentation. For more information, you may visit the Office of Disability Accommodation/Student Development Office, Suite 115 or call at 972-780-3632.

Student Evaluation of Teaching Effectiveness Policy:

The Student Evaluation of Teaching Effectiveness (SETE) is a requirement for all organized classes at UNT. This short survey will be made available to you at the end of the semester, providing you a chance to comment on how this class is taught. I am very interested in the feedback I get from students, as I work to continually improve my teaching. I consider the SETE to be an important part of your participation in this class.

Exam Policy:

Exams should be taken as scheduled. No makeup examinations will be allowed except for documented emergencies (See Student Handbook). In the case of injury or illness, you need to provide a note from a health care professional affirming date and time of a medical office visit regarding the injury or illness and stating that you should not be in class that day. You must notify me no later than the end of the second working day after the missed exam.

Academic Integrity:

Academic integrity is a hallmark of higher education. You are expected to abide by the University's code of conduct and Academic Dishonesty policy. Any person suspected of academic dishonesty (i.e., cheating or plagiarism) will be handled in accordance with the University's policies and procedures. Refer to the Student Code of Conduct at http://www.unt.edu/csrr/student_conduct/index.html *for complete provisions of this code.*

Attendance and Participation Policy:

*The University attendance policy is in effect for this course. Class attendance and participation is expected because the class is designed as a shared learning experience and because essential information not in the textbook will be discussed in class. The dynamic and intensive nature of this course makes it impossible for students to make-up or to receive credit for missed classes. Attendance and participation in all class meetings is essential to the integration of course material and your ability to demonstrate proficiency. Students are responsible to notify the instructor if they are missing class and for what reason. Students are also responsible to make up any work covered in class. It is recommended that each student coordinate with a student colleague to obtain a copy of the class notes, if they are absent. **Excessive absences (more than 3 classes) may result in being dropped from the class or receiving an F for the course.***

Diversity/Tolerance Policy: Students are encouraged to contribute their perspectives and insights to class discussions. However, offensive & inappropriate language (swearing) and remarks offensive to others of particular nationalities, ethnic groups, sexual preferences, religious groups, genders, or other ascribed statuses will not be tolerated. Disruptions which violate the Code of Student Conduct will be referred to the Center for Student Rights and Responsibilities as the instructor deems appropriate.

Copyright Policy: The handouts used in this course are copyrighted. By "handouts," I mean all materials generated for this course, which include but are not limited to syllabi, lecture notes, quizzes, exams, in-class materials, review sheets, projects, and problems sets. Because these materials are copyrighted, you do not have the right to copy and distribute the handouts, unless I expressly grant permission.