II. COURSE DESCRIPTION

This course is designed to expose doctoral students to the analysis and solutions of real problems that are arisen in our real world including such systems as marine, environment, and ecology. Students will learn how to create solvable models of the real world situations and how to find answers on the posted questions by using tools of mathematics and computing. There will be topics on modeling and simulations of tides in the Gulf of Mexico, multi-species models of the food chains, population models, harvesting and hunting models, circulation of carbon, water, and oxygen, and few others. Students will learn ways to use some new tools such as some differential and/or difference equations for dynamical systems, useful numerical algorithms, Monte-Carlo methods, Markov processes, evaluation of stability, methods of extrapolation (predictions) and interpolations (filling gaps). Some statistical tools of multi-variate analysis will be presented. MatLab, SPSS, and other software will be employed.

III. PREREQUISITES FOR THE COURSE
Mathematical statistics and calculus II, or their equivalent, or permission of the instructor, or CMSS 6401

IV. COURSE OBJECTIVES
The core objectives for this course are:
- To understand philosophy of mathematical modeling
- To learn an art of modeling
- To learn environmental and ecological dynamical systems
- To understand stochastic systems of the natural world and their modeling
To apply mathematical modeling to real world problems

V. PURPOSE, INSTRUCTIONAL METHODS AND ACTIVITIES

Methods and activities for instruction include the following:

- Students will learn to perform statistical analysis of data provided by the texts and also by the instructor.
- Students will be given a start to use mathematical packages such as MatLab and SPSS.
- Students will analyze and learn interpretation of mathematical modeling and statistical theory by stressing the concepts that are fundamental for a total understanding.
- In the final project students will analyze and learn how to apply the theory to real life problems.
- Meetings will be held in the forms of lecture and discussion seminars and online. Teams of students will be assigned some projects. Midterm evaluation and final exam will be in the form of an assignment-test and/or project with the open-end real life situation.

VI. EVALUATION AND GRADE ASSIGNMENT

Grade policy:
Mid-term evaluation (open end questions in the form take home test) 15%
Projects (3 real world situations, team work) 65%
Final evaluation (takes place in the form of open end questions during final week of classes) 20%

Grade scale: A: 85-100, B: 70-84, C: 55-69, D: 40-54, F less than 40.

VII. TENTATIVE COURSE SCHEDULE

Project topics and dates (both are tentative):

| Weeks 3-6: Project on population dynamics | Due end of February |
| Weeks 7-9 Epidemic models project | Due mid April |
| Midterm evaluation on the second half of the 8th week through after spring break | Due March after spring break |
| Week 10-14: topics and project on stochastic systems | Due end of April-first week of May |
Final Evaluation will take place between May 1 and May 12 in the form of take home assignment with the open end questions.

VIII. TEXTBOOKS AND SUPPLIES

Murray text book on Mathematical Biology as well as some research papers and presentations will be provided as files over Blackboard. University Library has sufficient pool of textbooks on Mathematical Modeling and access to journal papers needed for this course. Computing Laboratories have all necessary software and computing power: MATLAB, SPSS, Excel, etc.

IX. CLASS POLICIES

I. Official Part

1. Attendance required, exceptions are sickness, job and family emergencies, but I will not use class roll at any time, because it is your responsibility to be in class and attend to the process of learning (see also II.2).
2. Please, print your name on all assignments and tests: your professor is not a decoding device.
3. If you have questions you MUST ask, you have the right to interrupt lecture or discussion at any time (see also II.1).
4. No checking regular homework. Each class we begin with a discussion of home problems and home reading (here you may have a chance to get some extra credit!), especially, if some of you have any questions. (see also I.1.2)
5. I am always open for all questions and discussions during the class and office hours. You can always arrange meeting with me at any other time suitable for both sides.
6. No multiple choice tests, all tests will consist of problems you have to solve from the beginning to the end. Partial credit will be given for any parts of problems solved. The policy is open books and notes, no talking, no cheating.

II. Unofficial part.

II.1. There are no "stupid" questions, there are only bad teachers.
II.2. All you do, you do it for yourself, not for the professor.
II.3. Do not be concerned about grades, be concerned of knowledge, because grades are the steepest increasing function of knowledge (here is an example of math language).
II.4. Do not be afraid of problems, let them be afraid of you.
II.5. Only doing nothing may be without mistakes. If you don’t make errors, you don’t learn anything.
II.6. Do not be nervous - it may be only worse.
II.7. Common sense is the base of all decisions, together with knowledge they can do almost everything (even pass this course!).
II.8. Keep your particles together.
II.9. The only valid excuse for not knowing the subject is a sudden death.

Classroom/professional behavior

Texas A&M University-Corpus Christi, as an academic community, requires that each individual respect the needs of others to study and learn in a peaceful atmosphere. Under Article III of the Student Code of Conduct, classroom behavior that interferes
with either (a) the instructor’s ability to conduct the class or (b) the ability of other students to profit from the instructional program may be considered a breach of the peace and is subject to disciplinary sanction outlined in article VII of the Student Code of Conduct. Students engaging in unacceptable behavior may be instructed to leave the classroom. This prohibition applies to all instructional forums, including classrooms, electronic classrooms, labs, discussion groups, field trips, etc.

**Grade Appeals***

A student who believes that he or she has not been held to appropriate academic standards as outlined in the class syllabus, equitable evaluation procedures, or appropriate grading, may appeal the final grade given in the course. The burden of proof is on the student to demonstrate the appropriateness of the appeal. A student with a complaint about a grade is encouraged to first discuss the matter with the instructor. For complete details on the process, including the responsibilities of the parties involved in the process and the number of days allowed for completing the steps in the process, consult Texas A&M University-Corpus Christi University Procedure 13.02.99.C2.01 *Student Grade Appeal Procedures* (http://www.tamucc.edu/provost/university_rules/index.html), and the College of Science and Engineering Grade Appeals webpage (http://sci.tamucc.edu/students/GradeAppeal.html). For assistance and/or guidance in the grade appeal process, students may contact the chair or director of the appropriate department or school or the College of Science and Engineering Dean’s Office.

**Disabilities Accommodations***

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please call or visit Disability Services at (361) 825-5816 in Driftwood 101.

If you are a returning veteran and are experiencing cognitive and/or physical access issues in the classroom or on campus, please contact the Disability Services office for assistance at (361) 825-5816.