ÇANKAYA UNIVERSITY
Faculty of Arts and Sciences
Course Definition Form

This form should be used for either an elective or a compulsory course being proposed and for a curriculum development process for an undergraduate curriculum at Çankaya University, Faculty of Arts and Sciences. Please fill in the form completely and submit the print-out carrying the approval of the Department Chair to the Dean's Office and mail its electronic copy to serpilkilic@cankaya.edu.tr. Upon receipt of *both copies*, the print-out will be forwarded to the Faculty Academic Board for approval. Incomplete forms will be returned to the Department. The approved form is finally sent to the President's office for approval by the Senate.

Part I. Basic Course Information

Department Name	MATHEMATICS					**Dept. Numeric Code**	27
Course Code	MATH422	**Number of Weekly Lecture Hours**	3	**Number of Weekly Lab/Tutorial Hours**	0	**Number of Credit Hours**	3
Course Web Site	http:// math.cankaya.edu.tr					**ECTS Credit**	05

Course Name *This information will appear in the printed catalogs and on the web online catalog.*	
English Name	Mathematical Biology
Turkish Name	Matematiksel Biyoloji

Course Description
Provide a brief overview of what is covered during the semester. This information will appear in the printed catalogs and on the web online catalog. Maximum 60 words.

Linear difference equations. Nonlinear difference equations. Steady-state solution. Periodic solution. M-cycles. Local stability. Cobwebbing method. Bifurcation theory. Saddle-node bifurcation. Pitchfork bifurcation. Transcritical bifurcation. Period doubling (flip) bifurcation. The approximate logistic equation. Delay difference equations. Biological applications of difference equations such as population models, Nicholson-Bailey model, host-parasite models and predator-prey models.

Prerequisites (if any) *Give course codes and check all that are applicable.*	1st	2nd	3rd	4th
	☐ Consent of the Instructor	☐ Senior Standing	☐ Give others, if any.	
Co-requisites (if any)	1st	2nd	3rd	4th
Course Type *Check all that are applicable*	☐ Must course for dept.	☐ Must course for other dept.(s)	☒ Elective course for dept.	☒ Elective course for other dept.(s)

Course Classification
Give the appropriate percentage for each category.

Category	Mathematics & Natural Sciences	Engineering & Architectural Sciences			
Percentage	100				

Part II. Detailed Course Information

Course Objectives
Maximum 100 words.

To learn a qualitative way of looking at complex systems and their evolution.

Learning Outcomes
Explain the learning outcomes of the course. Maximum 10 items.

1) The students will learn the definitions of the steady-state solution, periodic solution and m-cycles of difference equations.
2) The students will learn local stability analysis of a steady-state solution, periodic solution and m-cycles of difference equations and the Cobwebbing method.
3) The students will learn bifurcation theory, some types of bifurcation and delay difference equations.
4) The students will apply the theory they learn to the approximate logistic equation.
5) The student will learn some biological applications of difference equations such as population models, Nicholson-Bailey model, host-parasite models and predator-prey models.

Textbook(s)
List the textbook(s), if any, and other related main course material.

Author(s)	Title	Publisher	Publication Year	ISBN
Linda J.S. Allen	An Introduction to Mathematical Biology	Pearson / Prentice Hall	2007	978-0130352163

Reference Books
List, if any, other reference books to be used as supplementary material.

Author(s)	Title	Publisher	Publication Year	ISBN
R.W. Shonkwiler, J. Herod	Matematical Biyology	Springer	2009	978-0-387-70983-3
J. Murray	Matematical Biyology	Springer	2002	0-387-95223-3

Teaching Policy
Explain how you will organize the course (lectures, laboratories, tutorials, studio work, seminars, etc.)

3 hours of lecturing per week. Attendance is compulsory.

Laboratory/Studio Work
Give the number of laboratory/studio hours required per week, if any, to do supervised laboratory/studio work and list the names of the laboratories/studios in which these sessions will be conducted.

Computer Usage
Briefly describe the computer usage and the hardware/software requirements for the course.

Course Outline
List the weekly topics to be covered.

Week	Topic(s)
1	Linear Difference Equations: Basic Definitions and Notations
2	Linear Difference Equations: First Order Equations
3	Linear Difference Equations: Second Order and Higher Order Equations
4	Linear Difference Equations: First Order Linear Systems
5	Nonlinear Difference Equations: Basic Definitions and Notations
6	Nonlinear Difference Equations: Local Stability in First Order Equations and Cobwebbing Method
7	Nonlinear Difference Equations: Bifurcation Theory
8	Nonlinear Difference Equations: Bifurcation Theory and the Approximate Logistic Equation
9	Nonlinear Difference Equations: Local Stability in the First Order Systems
10	Nonlinear Difference Equations: An Epidemic Model and Delay Difference Equations
11	Biological Applications of Difference Equations
12	Biological Applications of Difference Equations
13	Biological Applications of Difference Equations
14	Biological Applications of Difference Equations

Grading Policy
List the assessment tools and their percentages that may give an idea about their relative importance to the end-of-semester grade.

Assessment Tool	Quantity	Percentage	Assessment Tool	Quantity	Percentage	Assessment Tool	Quantity	Percentage
Homework			Case Study			Attendance		
Quiz(es)			Lab Work			Field Study		
Midterm Exam	2	60	Classroom Participation			Project		
Term Paper			Oral Presentation			Final Exam	1	40

ECTS Workload
List all the activities considered under the ECTS.

Activity	Quantity	Duration (hours)	Total Workload (hours)
Attending Lectures (*weekly basis*)	14	3	42
Attending Labs/Recitations (*weekly basis*)			
Compilation and finalization of course/lecture notes (*weekly basis*)	14	1	14
Collection and selection of relevant material (*once*)	1	5	5
Self study of relevant material (*weekly basis*)	14	1	14
Take-home assignments			
Preparation for quizzes			
Preparation for mid-term exams (*including the duration of the exams*)	2	15	30
Preparation of term paper/case-study report (*including oral presentation*)			
Preparation of term project/field study report (*including oral presentation*)			
Preparation for final exam (*including the duration of the exam*)	1	20	20

TOTAL WORKLOAD / 25	125/25
ECTS Credit	**5**

Total Workloads are calculated automatically by formulas. To update all the formulas in the document first press CTRL+A and then press F9.

Program Qualifications vs. Learning Outcomes *Consider the program qualifications given below as determined in terms of learning outcomes and acquisition of capabilities for all the courses in the curriculum. Look at the learning outcomes of this course given above. Relate these two using the Likert Scale by marking with X in one of the five choices at the right.*

No	Program Qualifications	Contribution				
		0	1	2	3	4
1	Adequate knowledge in mathematics; ability to use applied and theoretical information in these areas to solve pure and applied mathematical problems.				X	
2	Ability to use modern computational tools to analyze an abstract or real life problem				X	
3	Adequate knowledge in theoretical and historical background in mathematics				X	
4	Ability to work individually and in teams efficiently, ability to collaborate effectively in teams to analyze complex systems from intra-disciplinary and multi-disciplinary areas				X	
5	Ability to communicate effectively in English about technical subjects, both orally and in writing				X	
6	Ability to use, develop and implement new experiments and algorithms to solve scientific, engineering and financial problems				X	
7	Ability to analyze a mathematical problem using both analytical and numerical methods; use and compare theoretical and simulational methods to gain deeper insight				X	
8	Ability to report the findings, conclusions and interpretations related to a project in the area of pure and applied mathematics, ability to write technical reports, to prepare and conduct effective presentations				X	
9	Recognition of the need for lifelong learning; ability to access information, to follow developments in science and technology, and to keep continuous self improvement				X	
10	Awareness of professional and ethical responsibility issues and their legal consequences					X

Scale for contribution to a qualification: **0**-none, **1**-little, **2**-moderate, **3**-considerable, **4**-highest