جامعة الملك فهد للبترول والمعادن
King Fahd University of Petroleum & Minerals

College of Computing and Mathematics
Department of Mathematics

MATH 436 – Discrete Models
Syllabus (Term 242)

Instructor: Dr. Khairul Saleh

Course number & title:	MATH 436 Discrete Models
Course description:	Difference equations and discrete dynamical systems, linear and nonlinear models, linear and nonlinear systems, stability and well-posedness, models and numerical experiments from different fields of science and engineering.
Course Credit Hours:	3-0-3
Textbook:	Difference Equations: Theory, Applications & Adv Topics, Mickens, 3rd ed, 2015.
Prerequisites:	MATH 208
Course Objectives	The main objectives of the course are: 1) To introduce the fundamental knowledge and skills of difference equations and discrete dynamical systems. 2) To provide the students with physical, mathematical and computational aspects of discrete models in science and engineering. 3) To help students gain experience in using mathematical software to tackle problems that are not amenable to analytical treatment
Course Learning outcomes:	Upon completion of this course, students should be able to 1. Classify difference equations 2. Solve linear difference equations 3. Compute the solution of difference equations 4. Compute the solution of discrete dynamical systems 5. Analyze the stability of equilibria 6. Interpret the behavior of the solutions
Graduate Attributes	Check this link: **KFUPM List of Attributes and Associated Skills**

Coverage Plan

Week	Date (2025)	Section	Topic
1	12–16 Jan	1.1	Genesis of Difference Equations
		1.2	Definitions
		1.6	Elementary Difference Operators
2	19–23 Jan	2.2	General Linear Equation
		2.4	$y_{k+1} = R_k y_k$
3	26–30 Jan	2.5	Continued Fractions
		2.8	A General First-Order Equation: Expansion Techniques
4	2–6 Feb	3.1	Introduction to Linear Difference Equations
		3.2	Linearly Independent Functions
		3.4	Inhomogeneous Equations
5	9–13 Feb	3.5	Second-Order Equations
		3.6	Sturm–Liouville Difference Equations
6	16–20 Feb	4.2	Homogeneous Equations
		4.3	Construction of a Difference Equation Having Specified Solutions
Sunday February 23, 2025: Saudi Founding Day Holiday			
7	24–27 Feb	4.5	Inhomogeneous Equations: Method of Undetermined Coefficients
		4.6	Inhomogeneous Equations: Operator Methods
Midterm Exam: 1.1 – 4.5 Date: February 26, 2025			
8	2–6 Mar	4.8	Systems of Difference Equations
		6.2	Nonlinear Homogeneous Equations
9	9–13 Mar	6.3	Riccati Equations
		6.5	Nonlinear Transformations, Miscellaneous Forms
10	16–20 Mar	7.2	Applications in Mathematics
March 23 – April 3, 2025: Eid Al-Fitr Holidays			
11	6–10 Apr	7.4 7.5	Stability of Fixed Points The Logistic Equation
12	13–17 Apr		
13	20–24 Apr	7.5 7.6	The Logistic Equation Continued Numerical Integration of Differential Equations
14	27 Apr – 1 May		
15	4–8 May	7.6	Numerical Integration of Differential Equations Continued Review and Catch-up
	11 May		
Final Exam: Comprehensive. Date: TBD			

Grading Policy:

Midterm Exam:	30%
Homework Assignments:	15%
Classwork (Attendance, Quizzes, Class Participation):	20%
Final Exam:	35%

Attendance:

- Students must adhere to the attendance policy of KFUPM.
- A DN grade will be given to any student who accumulates 9 unexcused absences or 15 unexcused and excused absences.
- A DN grade will be given to the eligible student after being warned twice.

Academic Integrity:

All KFUPM ethics policies apply to this course. See the Undergraduate Bulletin on the Registrar's website.