

COURSE SYLLABUS

# Course Prefix, Number, and Title:

Math 418: Mathematical Modeling

# Credits:

3 credits

# University Name:

Dakota State University

# Academic Term/Year:

Spring 2024

## Last date to Drop and receive 100% refund:

Wednesday, 17 January 2024

## Last date to Withdraw and earn a grade of 'W':

Tuesday, 02 April 2024

# Course Meeting Time and Location:

MWF 01:00-01:50 am, DSC 121

# Instructor Information:

## Name:

Dr. Jeffrey S. Palmer

## Office:

DSC 146I

## Phone Number(s):

605-679-7668

## Email Address:

jeff.palmer@dsu.edu

## Office Hours:

T 09:00-09:50 am, MTWF 11:00-11:50 am, WF 08:30-08:50 am, or by appointment

# Approved Course Description:

## Catalog Description:

Creating and using mathematical models for solving real world problems. (2023-2024 DSU Undergraduate Catalog).

## Additional Course Information:

None

# Prerequisites:

## Course Prerequisite(s):

Completion of Math 125 - Calculus II or Math 315 - Linear Algebra

## Technology Skills:

This course will make use of Excel, Mathematica, Stella Architect and other appropriate tools.

# Student Learning Outcomes:

As you explore the concepts, ideas and applications encountered in this course do not be content to simply get an answer. Rather, you should constantly be asking yourself questions. What am I doing? Why am I doing this? What does this mean? I hope you will develop knowledge of, skill in, and understanding of those fundamental calculations that are needed in your mathematical toolbox. Mathematics is not moving symbols around on a piece of paper and obtaining the correct answer. You should always be asking yourself what you are doing and why you are doing it. We will use our mathematical toolbox to examine applied problems from a variety of disciplines. Applications from biology, chemistry, physics, business, economics, and other disciplines form an integral part of the course. Mathematics is not a cookbook discipline; the ultimate validation of your skills and understanding is reflected in your ability to develop solutions to problems that are new and unfamiliar to you. You will encounter, in course assignments and evaluations, activities that require problem solving and critical thinking. Finally, I hope that you will come to understand and appreciate both the power and the shortcomings of technology, particularly the computer, as a tool for understanding mathematical concepts and for solving applied problems. In conclusion, as a student in this course you are expected to:

* learn, practice, and master basic skills,
* understand important concepts,
* apply your knowledge to other disciplines,
* engage in problem solving and critical thinking,
* use technology as an appropriate tool.

# Course Materials:

## Required Textbook(s):

None

## Required Supplementary Materials:

None, however, students may use a scientific calculator.

## Optional Materials:

None.

# Course Delivery and Instructional Methods:

This course is an introduction to the formulation, analysis, and interpretation of mathematical models. In this context, you will have the opportunity to review and use various mathematical skills you have learned in previous courses. We will examine the theory and application of discrete time (difference equations) models as applied to a variety of problems, principally problems in biology (and particularly population dynamics). Excel, Mathematica, and Stella Architect will be used to help us with the analysis and simulation of our models.

# Communication and Feedback:

## Preferred Email Contact Method:

Please send all e-mail communications to Dr. Palmer or Professor Palmer at my [jeff.palmer@dsu.edu](mailto:jeff.palmer@dsu.edu) account.

## Email Response Time:

Typically, I access and read email once per day Monday through Friday when classes are in session. I generally respond to email messages within 48 hours, excluding weekends and holidays.

## Feedback on Assignments:

With extremely limited exceptions, I typically return work to students within 1 week, often earlier, of the due date, excluding holidays.

# Evaluation Procedures:

## Assessments:

There are four examinations (240 total points) scheduled for this course – see the Tentative Course Outline and Schedule below. Each exam will be cumulative, covering material from the beginning of the course through the preceding Friday. Exams may consist of both an in-class and/or a take-home component at the discretion of the instructor. If you miss an exam for a valid reason, you may be allowed to make up that exam or replace it with your score on the Final Exam (Exam 4) at the discretion of the instructor.

## Final Examination:

Monday, 29 April 2024, 01:00 – 03:00 pm

## Performance Standards and Grading Policy:

Your grade will be calculated using your accumulated point total (240 possible). The grading scale is:

>85% 204 – 240 points A

>70% 168 – 203 points B

>60% 144 – 167 points C

>50% 120 – 143 points D

<50% 000 – 119 points F

Students near a cutoff may receive a higher grade at the discretion of the instructor.

# Tentative Course Outline and Schedule:

| Date | Day | Topic |  |
| --- | --- | --- | --- |
| 08-Jan-24 | M | Introduction and Objectives |  |
| 09-Jan-24 | T |  |  |
| 10-Jan-24 | W | Lesson 01 – Theory and Application of 1st-Order Linear Difference Equations |  |
| 11-Jan-24 | R |  |  |
| 12-Jan-24 | F | Lesson 01 |  |
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|  |  |  |  |
| 15-Jan-24 | M | NO CLASS - MARTIN LUTHER KING JR. DAY |  |
| 16-Jan-24 | T |  |  |
| 17-Jan-24 | W | Lesson 01 LAST DAY TO ADD/DROP A FULL SEMESTER CLASS |  |
| 18-Jan-24 | R |  |  |
| 19-Jan-24 | F | Lesson 01 |  |
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| 22-Jan-24 | M | Lesson 02 – Theory and Application of 1st-Order Affine Difference Equations |  |
| 23-Jan-24 | T |  |  |
| 24-Jan-24 | W | Lesson 02 |  |
| 25-Jan-24 | R |  |  |
| 26-Jan-24 | F | Lesson 02 |  |
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|  |  |  |  |
| 29-Jan-24 | M | Lesson 02 |  |
| 30-Jan-24 | T |  |  |
| 31-Jan-24 | W | Lesson 03 – Theory and Application of 2nd-Order Linear Difference Equations |  |
| 01-Feb-24 | R |  |  |
| 02-Feb-24 | F | Lesson 03 |  |
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|  |  |  |  |
| 05-Feb-24 | M | Lesson 03 |  |
| 06-Feb-24 | T |  |  |
| 07-Feb-24 | W | Lesson 03 |  |
| 08-Feb-24 | R |  |  |
| 09-Feb-24 | F | EXAM 01 |  |
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| 12-Feb-24 | M | Lesson 04 – Theory and Application of Higher-Order Linear Difference Equations |  |
| 13-Feb-24 | T |  |  |
| 14-Feb-24 | W | Lesson 04 |  |
| 15-Feb-24 | R |  |  |
| 16-Feb-24 | F | Lesson 04 |  |
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| 19-Feb-24 | M | NO CLASS - PRESIDENT'S DAY |  |
| 20-Feb-24 | T |  |  |
| 21-Feb-24 | W | Lesson 04 |  |
| 22-Feb-24 | R |  |  |
| 23-Feb-24 | F | Lesson 04 |  |
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| 26-Feb-24 | M | Lesson 05 – Theory and Application of Discrete Time Linear Systems |  |
| 27-Feb-24 | T |  |  |
| 28-Feb-24 | W | Lesson 05 |  |
| 29-Feb-24 | R |  |  |
| 01-Mar-24 | F | Lesson 05 |  |
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| 04-Mar-24 | M | Lesson 05 |  |
| 05-Mar-24 | T |  |  |
| 06-Mar-24 | W | Lesson 05 |  |
| 07-Mar-24 | R |  |  |
| 08-Mar-24 | F | EXAM 02 |  |
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| 11-Mar-24 | M | NO CLASS - SPRING BREAK |  |
| 12-Mar-24 | T | NO CLASS - SPRING BREAK |  |
| 13-Mar-24 | W | NO CLASS - SPRING BREAK |  |
| 14-Mar-24 | R | NO CLASS - SPRING BREAK |  |
| 15-Mar-24 | F | NO CLASS - SPRING BREAK |  |
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| 18-Mar-24 | M | Lesson 06 – Theory and Application of Nonlinear Difference Equations |  |
| 19-Mar-24 | T |  |  |
| 20-Mar-24 | W | Lesson 06 |  |
| 21-Mar-24 | R |  |  |
| 22-Mar-24 | F | Lesson 06 |  |
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| 25-Mar-24 | M | Lesson 06 |  |
| 26-Mar-24 | T |  |  |
| 27-Mar-24 | W | Lesson 06 |  |
| 28-Mar-24 | R |  |  |
| 29-Mar-24 | F | NO CLASS - EASTER HOLIDAY |  |
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|  |  |  |  |
| 01-Apr-24 | M | Lesson 07 – Theory and Application of Discrete Time Nonlinear Systems |  |
| 02-Apr-24 | T | LAST DAY TO WITHDRAW |  |
| 03-Apr-24 | W | Lesson 07 |  |
| 04-Apr-24 | R |  |  |
| 05-Apr-24 | F | Lesson 07 |  |
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| 08-Apr-24 | M | LESSON 07 |  |
| 09-Apr-24 | T |  |  |
| 10-Apr-24 | W | Lesson 07 |  |
| 11-Apr-24 | R |  |  |
| 12-Apr-24 | F | EXAM 03 |  |
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| 15-Apr-24 | M | Lesson 08 – Theory and Application of Discrete Time Delay Equations |  |
| 16-Apr-24 | T |  |  |
| 17-Apr-24 | W | Lesson 08 |  |
| 18-Apr-24 | R |  |  |
| 19-Apr-24 | F | Lesson 08 |  |
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| 22-Apr-24 | M | Lesson 08 |  |
| 23-Apr-24 | T |  |  |
| 24-Apr-24 | W | Lesson 08 |  |
| 25-Apr-24 | R |  |  |
| 26-Apr-24 | F | Wrap Up and Conclusions |  |
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|  |  |  |  |
| 29-Apr-24 | M | FINAL EXAM 01:00 – 03:00 pm |  |
| 30-Apr-24 | T |  |  |
| 01-May-24 | W |  |  |
| 02-May-24 | R |  |  |
| 03-May-24 | F |  |  |

# Student Success Services and Supports:

## ADA Accommodations:

Dakota State University strives to ensure that physical resources, as well as information and communication technologies, are reasonably accessible to users to provide equal access to all. If you encounter any accessibility issues, you are encouraged to immediately contact the instructor of the course and Dakota State University's Office of Disability Services, which will work to resolve the issue as quickly as possible.

DSU's Office of Disability Services is located in the Learning Engagement Center and can be contacted by calling 605-256-5121 or emailing [dsu-ada@dsu.edu](mailto:dsu-ada@dsu.edu). Students seeking ADA accommodations (such as non-standard note taking or extended time and/or a quiet space taking exams and quizzes) can access the DSU website <https://dsu.edu/student-life/disability-services/index.html> for additional information and the link to the Disability Services Request Form. You will need to provide documentation of your disability and the ADA Coordinator must confirm the need before officially authorizing accommodations.

## DSU Knowledge Base:

The DSU Knowledge Base contains links and resources to help students by providing information about the following topics: User Accounts & Passwords, Academic Tools & Resources, Software & Apps Support, WiFi & Network Access, Campus Emergency Alert System, Campus Printing, IT Security & Safe Computing, and the Support Desk (which is there to help both on and off-campus students). The Knowledge Base can be accessed through the link below:

* [DSU Knowledge Base](https://support.dsu.edu/TDClient/KB/)

## D2L Support for Students:

The D2L Support for Students site is designed to provide DSU students a D2L support resource center that contains user guides, tutorials, and tips for using the D2L learning environment. The D2L Support for Students site can be accessed through the link below:

* [DSU D2L Support Resources for Students](https://d2l.sdbor.edu/d2l/home/606414)

# Classroom Policies:

## Attendance and Make-up Policy:

While there is no policy of required attendance of lectures in this course, it is unlikely that you will be able to earn a good grade without regularly attending the lectures. When you miss class, whatever the reason, you really miss important material from three lectures not one. Obviously, the lesson covered that day is missed but you also miss out on important connections of that day’s material with the previous day’s lesson and the following day’s lesson. Also, if you are on academic probation or are an at-risk student, you are required to attend every class meeting. You are expected to arrive at lecture on time and to remain for the entire class period. If for some reason you must arrive late or leave early, please do so quietly. Talking or other behavior that disrupts lecture will not be tolerated. If for any reason I am late for the start of class and you have not received official notification that the class has been canceled, you are expected to remain for 15 minutes before “assuming" that the lecture has been canceled for the day. Above all else, show respect for your classmates. Your attendance, behavior, and participation in the class have effects on others beside yourself.

# DSU Policies:

## Complaint Procedure

Dakota State University seeks to resolve student concerns and complaints in a fair and prompt manner. Students may file a complaint using the [DSU Concerns and Feedback form](https://dsu.wufoo.com/forms/dsu-concerns-and-feedback/). SARA complaints from out-of-state students may be filed using the procedures noted [here](https://catalog.dsu.edu/content.php?catoid=35&navoid=1632&hl=complaint&returnto=search#student-complaints).

## Grade Appeal Policy

If a student believes the final grade assigned in a course was inappropriate, he/she may appeal that grade by filing a formal grade appeal within 15 days of the start of the next academic session. Please see the [Undergraduate Catalog](https://catalog.dsu.edu/content.php?catoid=35&navoid=1614&hl=grade+appeal&returnto=search#Grade_Appeal_Process) or [Graduate Catalog](https://catalog.dsu.edu/content.php?catoid=36&navoid=1666#grade-appeal-process) for the required process to appeal a final grade.

# South Dakota Board of Regents Policy Statements

## Freedom in Learning Statement:

Under Board of Regents and Regental Institutions policy, student academic performance may be evaluated solely on an academic basis, not on opinions or conduct in matters unrelated to academic standards. Discussion and debate are critical to education and professional development. Students should be free to take reasoned exception to the data or views offered in any course of study and to reserve judgment about matters of opinion, but they are responsible for learning the content of any course of study for which they are enrolled. While the exploration of controversial topics may be an important component of meeting the student learning outcomes in a course, no student will be compelled or directed to personally affirm, adopt, or adhere to any divisive concepts (as defined in SDCL 13-1-67). Students who believe that an academic evaluation reflects prejudiced or capricious consideration of student opinions or conduct unrelated to academic standards should contact their home institution to initiate a review of the evaluation.

## ADA Statement:

The Regental Institutions strive to ensure that physical resources, as well as information and communication technologies, are reasonably accessible to users to provide equal access to all. If you encounter any accessibility issues, you are encouraged to immediately contact the instructor of the course and the Office of Disability Services, which will work to resolve the issue as quickly as possible. Please note: if your home institution is not the institution you are enrolled at for a course (host institution), then you should contact your home institution’s Office of Disability services. The disability services at the home and host institution will work together to ensure your request is evaluated and responded to in a timely manner.

## Academic Dishonesty and Misconduct:

Cheating and other forms of academic dishonesty and misconduct run contrary to the purposes of higher education and will not be tolerated. Academic dishonesty includes, but is not limited to, AAC Guideline 5.3.A – Syllabi BOR Required Policy Statements (Last Revised 01/2023) Page 2 of 2 plagiarism, copying answers or work done by another student (either on an exam or an assignment), allowing another student to copy from you, and using unauthorized materials during an exam. The Regental Institution’s policy and procedures on cheating and academic dishonesty can be found in your home institution’s Student Handbook and the governing Board of Regents policies can be found in BOR Policy 2:33 and BOR Policy 3:4. The consequences for cheating and academic dishonesty are outlined in policy.

All forms of academic dishonesty will result in a grade of 0 for the assignment, project, quiz, or exam in question. In addition, I may forward evidence of cheating to the Academic Integrity Board on campus for their consideration. Students found guilty of a second offense of academic dishonesty in this class will also receive a course grade of F.

## Acceptable Use of Technology:

Acceptable Use of Information Technology Resources: While Regental Institutions strive to provide access to computer labs and other technology, it is the student’s responsibility to ensure adequate access to the technology required for a course. This may include access to a computer (not Chromebooks, iPads, etc.), webcam, internet, adequate bandwidth, etc. While utilizing any of the information technology systems students, faculty and staff should observe all relevant laws, regulations, BOR Policy 7.1, and any institutional procedural requirements.

## Emergency Alert Communication:

In the event of an emergency arising on campus under BOR Policy 7:3, your Regental Home Institution will notify the campus community via the emergency alert system. It is the responsibility of the student to ensure that their information is updated in the emergency alert system. The student’s cell phone will be automatically inserted if available and if not, their email address is loaded. Students can at any time update their information in the student alert system.

# The instructor reserves the right to amend this syllabus.