**ECCB 613\* Dynamics of Populations | Fall 2022**

**\* This course was previously WFSC 624**

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| Instructor: | Masami Fujiwara | Email: | fujiwara(at)tamu.edu |
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| Office Hour: | TBA | Web: | <http://fujiwara.us> |
| Course: | WFSC 624-600, 699, 700 | Credit Hours: | 3 |
| Location: | Section 600: WFES 406Sections 699, 700: Online | Time: | Section 600: W, W, F, 12:40 PM – 1:30 PMSection 699, 700: Asynchronous\*  |

**\* Lectures will be broadcasted synchronously using Zoom and recorded. Students in sections 699 & 700 are encouraged to join the meeting synchronously, but not required.**

**Course Material:** [**https://canvas.tamu.edu**](https://canvas.tamu.edu)

## Course Description

Principles of population dynamics and their applications to assessment and management of animal and plant populations. Use of quantitative methods for understanding population dynamics.

## Prerequisite

None (Basic knowledge and skills necessary for graduate study are expected.)

## Learning Outcomes

By the end of this course, students will acquire the following skills:

1. understanding the basic processes affecting population dynamics.
2. building population models based on biological information,
3. analyzing the models using mathematical software R (via assignments),
4. interpreting results of population models,
5. making recommendations for management and conservation actions based on the results

**Schedule\***

**Week 1 <Total Expected Hours 9 HR>**

Lecture\*: Course introduction & What are population dynamics? (**1.5 HR**)

**DISCRETE TIME POPULATION MODEL**

Review of Lecture Material (**1.5 HR**)

Reading Assignment (**3 HR**)

**Week 2 <Total Expected Hours 12 HR>**

Lecture\*: Simple matrix algebra; Stage structure (Lefkovitch Matrix Model) (**1.5 HR**)

Lecture\*: Asymptotic growth rate, stable stage distribution, and reproductive values (**1.5 HR**)

 Review of Lecture Material (**3 HR**)

Reading Assignment (**3 HR**)

**Week 3 <Total Expected Hours 12 HR>**

Lecture\*: Eigenvalue, eigenvector, transient dynamics, sensitivity and elasticity (**1.5 HR**)

Lecture\*: Examples: Loggerhead Sea Turtles, Right Whale, and Killer Whale (**1.5 HR**)

Review of Lecture Material (**3 HR**)

Reading Assignment (**3 HR**)

**Week 4 <Total Expected Hours 12 HR>**

Lecture\*: Lifecycle classification, Life event calculations (**1.5 HR**)

Lecture\*: Density dependence I (**1.5 HR**)

Review of Lecture Material (**3 HR**)

Reading Assignment (**3 HR**)

**Week 5 <Total Expected Hours 12 HR>**

Lecture\*: Density dependence II (**1.5 HR**)

Lecture\*: Two sex, Supplementation, and Stochasticity (**1.5 HR**)

 Review of Lecture Material (**3 HR**)

Reading Assignment (**3 HR**)

**Week 6 <Total Expected Hours 12 HR>**

Lecture\*: Demographic Stochasticity (1.5 HR)

Lecture\*: Environmental Stochasticity (**1.5 HR**)

Review of Lecture Material (**3 HR**)

Reading Assignment (**3 HR**)

**Week 7 <Total Expected Hours 12 HR>**

Lecture\*: Review (**1.5 HR**)

Lecture\*: Life table analysis, Analysis of environmental fluctuation (Time-series analysis) (**1.5 HR**)

Review of Lecture Material (**3 HR**)

Reading Assignment (**3 HR**)

**Mid-Term Exam October 17-21 (Online): Proctored by Respondus Monitor**

**SOME STATISTICS**

**Week 8 <Total Expected Hours 12 HR>**

Lecture\*: Analysis of count data (state-space method, multivariate stat, regression) (**1.5 HR**)

Review of lecture material (**1.5 HR**)

Preparation for Exam (**7.5 HR**)

**CONTINUOUS-TIME MODEL**

**Week 9 <Total Expected Hours 12 HR>**

Lecture\*: Capture-recapture statistics (**1.5 HR**)

Lecture\*: Other miscellaneous statistics in population ecology (**1.5 HR**)

Review of Lecture Material (**3 HR**)

Reading Assignment (**3 HR**)

**Week 10 <Total Expected Hours 12 HR>**

Lecture\*: Continuous time model, Exponential growth (**1.5 HR**)

Lecture\*: Predator prey model (**1.5 HR**)

Review of Lecture Material (**3 HR**)

Reading Assignment (**3 HR**)

**Week 11 <Total Expected Hours 12 HR>**

Lecture\*: Competition, mutualism, and others (**1.5 HR**)

**Other Topics in Population Ecology**

Lecture\*: Discrete vs. continuous models, Infectious disease 1 (**1.5 HR**)

 Review of Lecture Material (**3 HR**)

Reading Assignment (**3 HR**)

**Week 12 <Total Expected Hours 12 HR>**

Lecture\*: Infectious disease 2 (**1.5 HR**)

Lecture\*: Biological invasion (**1.5 HR**)

Review of lecture material (**3 HR**)

Reading Assignment (**3 HR**)

**Week 13 <Total Expected Hours 12 HR>**

Lecture\*: Metapopulation dynamics (**1.5 HR**)

Review of lecture material (**1.5 HR**)

Preparation for Presentation **(7.5 HR)**

**Week 14 <Total Expected Hours 12 HR>**

Student Presentation **(1.5 H)**

Comments on other students’ presentations (**3.5 HR**)

Preparation for Final Exam (**10 HR**)

Reading Assignment (**3 HR**)

**Week 15 <Total Expected Hours 3 HR>**

Lecture\*: Review (**1.5 HR**)

Review of lecture material (**1.5 HR**)

**FINAL EXAM: December 8-December 12 (Online: Proctored by Respondus Monitoring)**

TAMU Academic Calendar: <http://registrar.tamu.edu/General/Calendar.aspx>

**Textbooks (recommended: not required)**

***Matrix Population Models*** 2nd Edition by Hal Caswell. Sinauer Associates, Inc. ISBN: 087893121X.

***Population Ecology: First Principles*** 2nd Edition by Vandermeer and Goldberg, Princeton University Press ISBN: 9781400848737

**Lectures**

Face-to-face lectures will be given and available remotely (real time) using Zoom. Lectures will also be recorded.

**Assignments**

Weekly quizzes will be assigned. Eight home work will be assigned throughout the course.

**Reports and Presentation**

Students will work on a matrix population model report (three drafts and final report). Students are also required to present the results from the matrix population model analyses. Each student will record a presentation and submit it. These videos will become available to other students. Rubrics for grading the reports and presentation will be provided separately (around mid-September).

**Exams**

One mid-term and the final exams are given. Both are “closed book exams”: i.e. no external material is allowed. The use of calculator is not permitted (nor needed). The exam will be administered using Respondus Lockdown (available on Canvas). **It will require a computer (Windows PC or MacOS) with Webcam.**). A make-up exam will be given for a student who misses an exam due to one of the reasons accepted by the university policy.

**Technology**

Students who take this class remotely are required to have “high speed” internet access (e.g. campus network, DSL, Cable) and have basic computer skills. These skills include the use of Zoom, Remote Desktop Access to campus computers (via [https://voal.tamu.edu](https://voal.tamu.edu/)), and watching streamed video files (mp4). To get help for Mac or Linux computers, please seek help from the campus IT staff ([http://its.tamu.edu). If](http://its.tamu.edu/) you plan to use a government owned computer for this class (discouraged), please coordinate with your IT staff. There may be some restrictions on the installation of software (e.g. for VOAL, R, and RStudio), use of software (e.g. Zoom), and internet access (firewall).

**Determination of Final Course Grade (FCG)**

1. Assignments (8 x 5% of FCG)
Report/Quiz: 3%

Online Discussion: 2%

1. Project: Stage structured population model (15% of FCG)
10% Report

5% Presentation/Comments

1. Weekly quizzes (15 %)
2. Exam 1 (15% of FCG)
3. Final Exam (15% of FCG)

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| Letter Grade | A | B | C | D | F |
| Percentage\* | [100%+, 90%] | (90%, 80%] | (80%, 70%] | (70%, 60%] | (60%, 0%] |

\* In case you do not remember math from high school, a square bracket means it includes the value (greater or equal to), and a round bracket means it does not include the value (less than).

**Department Policy**

**Non-Discrimination Policy**

A major goal of the Department of Ecology and Conservation Biology is to foster a learning environment that nurtures diversity and promotes inclusion. Texas A&M University and the Department of Ecology and Conservation Biology are committed to the fundamental principles of academic freedom, equality of opportunity, and human dignity. We expect a climate that values and nurtures collegiality, diversity, pluralism, and the uniqueness of the individual within our state, nation, and world. Texas A&M University, in accordance with applicable federal and state law, prohibits discrimination, including harassment, on the basis of race, color, national or ethnic origin, religion, gender identity, disability, age, sex, sexual orientation, marital or parental status, national or ethnic origin, or veteran status in employment, educational programs, and admissions.

Discrimination of a student in class, i.e., behavior directed against a particular student that harms, humiliates, or intimidates that student, will not be tolerated. The mere expression of one’s ideas is not discrimination and is fully protected by academic freedom; however, personal attacks of individual students are not permitted. We do not tolerate racial and ethnic harassment (defined in Student Rule 31;

<https://student-rules.tamu.edu/rule31>) or sexual harassment (defined in Student Rule 47; <https://student-rules.tamu.edu/rule47>) and we will report any incidents to the proper authorities, <https://stophate.tamu.edu/>, or <https://tellsomebody.tamu.edu>.

**University Policies**

**Attendance Policy**

The university views class attendance and participation as an individual student responsibility. Students are expected to attend class and to complete all assignments.

Please refer to [Student Rule 7](https://student-rules.tamu.edu/rule07/) in its entirety for information about excused absences, including definitions, and related documentation and timelines.

**Makeup Work Policy**

Students will be excused from attending class on the day of a graded activity or when attendance contributes to a student’s grade, for the reasons stated in Student Rule 7, or other reason deemed appropriate by the instructor.

Please refer to [Student Rule 7](https://student-rules.tamu.edu/rule07/) in its entirety for information about makeup work, including definitions, and related documentation and timelines.

Absences related to Title IX of the Education Amendments of 1972 may necessitate a period of more than 30 days for make-up work, and the timeframe for make-up work should be agreed upon by the student and instructor” ([Student Rule 7, Section 7.4.1](https://student-rules.tamu.edu/rule07)).

“The instructor is under no obligation to provide an opportunity for the student to make up work missed because of an unexcused absence” ([Student Rule 7, Section 7.4.2](https://student-rules.tamu.edu/rule07)).

Students who request an excused absence are expected to uphold the Aggie Honor Code and Student Conduct Code. (See [Student Rule 24](https://student-rules.tamu.edu/rule24/).)

**Academic Integrity Statement and Policy**

“An Aggie does not lie, cheat or steal, or tolerate those who do.”

“Texas A&M University students are responsible for authenticating all work submitted to an instructor. If asked, students must be able to produce proof that the item submitted is indeed the work of that student. Students must keep appropriate records at all times. The inability to authenticate one’s work, should the instructor request it, may be sufficient grounds to initiate an academic misconduct case” ([Section 20.1.2.3, Student Rule 20](https://aggiehonor.tamu.edu/Rules-and-Procedures/Rules/Honor-System-Rules)).

You can learn more about the Aggie Honor System Office Rules and Procedures, academic integrity, and your rights and responsibilities at [aggiehonor.tamu.edu](https://aggiehonor.tamu.edu/).

***NOTE****: Faculty associated with the main campus in College Station should use this Academic Integrity Statement and Policy. Faculty not on the main campus should use the appropriate language and location at their site.*

**Americans with Disabilities Act (ADA) Policy**

Texas A&M University is committed to providing equitable access to learning opportunities for all students. If you experience barriers to your education due to a disability or think you may have a disability, please contact Disability Resources in the Student Services Building or at (979) 845-1637 or visit [disability.tamu.edu](https://disability.tamu.edu/). Disabilities may include, but are not limited to attentional, learning, mental health, sensory, physical, or chronic health conditions. All students are encouraged to discuss their disability related needs with Disability Resources and their instructors as soon as possible.

***NOTE****: Faculty associated with the main campus in College Station should use this Americans with Disabilities Act Policy statement. Faculty not on the main campus should use the appropriate language and location at their site.*

**Title IX and Statement on Limits to Confidentiality**

Texas A&M University is committed to fostering a learning environment that is safe and productive for all. University policies and federal and state laws prohibit gender-based discrimination and sexual harassment, including sexual assault, sexual exploitation, domestic violence, dating violence, and stalking.

With the exception of some medical and mental health providers, all university employees (including full and part-time faculty, staff, paid graduate assistants, student workers, etc.) are Mandatory Reporters and must report to the Title IX Office if the employee experiences, observes, or becomes aware of an incident that meets the following conditions (see [University Rule 08.01.01.M1](https://rules-saps.tamu.edu/PDFs/08.01.01.M1.pdf)):

* The incident is reasonably believed to be discrimination or harassment.
* The incident is alleged to have been committed by or against a person who, at the time of the incident, was (1) a student enrolled at the University or (2) an employee of the University.

Mandatory Reporters must file a report regardless of how the information comes to their attention – including but not limited to face-to-face conversations, a written class assignment or paper, class discussion, email, text, or social media post. Although Mandatory Reporters must file a report, in most instances, you will be able to control how the report is handled, including whether or not to pursue a formal investigation. The University’s goal is to make sure you are aware of the range of options available to you and to ensure access to the resources you need.

Students wishing to discuss concerns in a confidential setting are encouraged to make an appointment with [Counseling and Psychological Services](https://caps.tamu.edu/) (CAPS).

Students can learn more about filing a report, accessing supportive resources, and navigating the Title IX investigation and resolution process on the University’s [Title IX webpage](https://titleix.tamu.edu/).

***NOTE****: Faculty associated with the main campus in College Station should use this Title IX and Statement on Limits of Liability. Faculty not on the main campus should use the appropriate language and location at their site.*

**Statement on Mental Health and Wellness**

Texas A&M University recognizes that mental health and wellness are critical factors that influence a student’s academic success and overall wellbeing. Students are encouraged to engage in proper self-care by utilizing the resources and services available from Counseling & Psychological Services (CAPS). Students who need someone to talk to can call the TAMU Helpline (979-845-2700) from 4:00 p.m. to 8:00 a.m. weekdays and 24 hours on weekends. 24-hour emergency help is also available through the National Suicide Prevention Hotline (800-273-8255) or at [suicidepreventionlifeline.org](https://suicidepreventionlifeline.org/).

**COVID-19 Temporary Amendment to Minimum Syllabus Requirements**

The Faculty Senate temporarily added the following statements to the minimum syllabus requirements in Fall 2020 as part of the university’s COVID-19 response.

*Campus Safety Measures*

To promote public safety and protect students, faculty, and staff during the coronavirus pandemic, Texas A&M University has adopted policies and practices for the Fall 2020 academic term to limit virus transmission. Students must observe the following practices while participating in face-to-face courses and course-related activities (office hours, help sessions, transitioning to and between classes, study spaces, academic services, etc.):

* Self-monitoring—Students should follow CDC recommendations for self-monitoring. **Students who have a fever or exhibit symptoms of COVID-19 should participate in class remotely and should not participate in face-to-face instruction.**
* Face Coverings—[Face coverings](https://rules-saps.tamu.edu/PDFs/34.99.99.M0.03.pdf) (cloth face covering, surgical mask, etc.) must be properly worn in all non-private spaces including classrooms, teaching laboratories, common spaces such as lobbies and hallways, public study spaces, libraries, academic resource and support offices, and outdoor spaces where 6 feet of physical distancing is difficult to reliably maintain. Description of face coverings and additional guidance are provided in the [Face Covering policy](https://rules-saps.tamu.edu/PDFs/34.99.99.M0.03.pdf) and [Frequently Asked Questions (FAQ)](https://provost.tamu.edu/Menu/News/TAMU-Face-Covering-FAQs) available on the [Provost website](https://provost.tamu.edu/Menu/News/TAMU-Face-Covering-FAQs).
* Physical Distancing—Physical distancing must be maintained between students, instructors, and others in course and course-related activities.
* Classroom Ingress/Egress—Students must follow marked pathways for entering and exiting classrooms and other teaching spaces. Leave classrooms promptly after course activities have concluded. Do not congregate in hallways and maintain 6-foot physical distancing when waiting to enter classrooms and other instructional spaces.
* To attend a face-to-face class, students must wear a face covering (or a face shield if they have an exemption letter). If a student refuses to wear a face covering, the instructor should ask the student to leave and join the class remotely. If the student does not leave the class, the faculty member should report that student to the [Student Conduct office](https://studentlife.tamu.edu/sco/face-covering-violations/) for sanctions. Additionally, the faculty member may choose to teach that day’s class remotely for all students.

*Personal Illness and Quarantine*

Students required to quarantine must participate in courses and course-related activities remotely and **must not attend face-to-face course activities**. Students should notify their instructors of the quarantine requirement. Students under quarantine are expected to participate in courses and complete graded work unless they have symptoms that are too severe to participate in course activities.

Students experiencing personal injury or Illness that is too severe for the student to attend class qualify for an excused absence (See [Student Rule 7, Section 7.2.2](https://student-rules.tamu.edu/rule07/).) To receive an excused absence, students must comply with the documentation and notification guidelines outlined in Student Rule 7. While Student Rule 7, Section 7.3.2.1, indicates a medical confirmation note from the student’s medical provider is preferred, **for Fall 2020 only, students may use the Explanatory Statement for Absence from Class form in lieu of a medical confirmation. Students must submit the Explanatory Statement for Absence from Class within two business days after the last date of absence.**

*Operational Details for Fall 2020 Courses*

For additional information, please review the [FAQ](https://provost.tamu.edu/Campus-Messages/Fall-2020-Courses-at-TAMU) on Fall 2020 courses at Texas A&M University.