Course Information

Course Title	Course Code Number	Credit Value
Climate Modelling and Forest Applications	FODE 010	3 credits
Prerequisites		
This course has no prerequisites, but a basic knowledge of ecology is needed to take full advantage of the material that is provided. Some basic knowledge of R programming will make the modeling part easier but not compulsory as we assume students with no experience in using R.		
Corequisites		
None.		

Contacts

Course Instructor(s)	Contact Details	Office Location	Office Hours
TBD	TBD	TBD	TBD
Other Instructional Staff			
TBD			

Course Description

Climate change is a major threat to the capacity of forest ecosystems to provide ecological, economic and social services. Climate modeling tools for forestry applications are becoming increasingly available for forest managers and local authorities to understand the potential effects of climate change and to develop regionally specific adaptation and mitigation strategies. It is crucial to nurture future professionals with the knowledge and skills to use new modelling tools and interpret model predictions in forest planning and management practices, and to develop forest resources management strategies to maintain and improve the resilience and productivity of forest ecosystems under a rapidly changing climate.

This online course will introduce the concepts and urgencies of climate change and its potential impacts on global forest systems. The course will also introduce various climatic and ecological modeling tools for forestry applications, including adaptive management strategies. Subsequent course modules will encompass introductions to climatic and ecological models, more specifically addressing applications to forestry to increase the resilience and viability of forest ecosystems. Students will master skills and techniques to: 1) use climatic models to generate spatial climate data; 2) build ecological models; and 3)

interpret and apply model output to forest management practice. Finally all concepts will be reviewed and synthesized through case studies and applied to a final group project.

Target Audience

The course is designed for undergraduate and graduate students who are interested in professional forestry and forest adaptation to climate change.

Delivery Format

This course is designed to be a fully online MOOC type course with an option to issue a graduate-level course completion certificate. Course content such as readings and fundamental concepts will be offered as open educational resources. The entire or 'parts of' the course are welcome to be repurposed in other current and future courses and programs to support flipped, blended, and online learning. It will follow a format similar to mainstream MOOCs on EdX or Coursera, which typically include presentations, mini videos, automatically graded tests, and moderated online discussions on weekly basis.

In the case of self-directed learning, students will learn through light moderated online discussions facilitated by student volunteers or TAs, and through self-review activities found at the end of each learning topic. In the case of certificate learning, students will learn through scheduled instructor-facilitated sessions and discussions and will actively engage with instructors, TAs, and theirs peers to complete all graded assignments to earn the certificate. Course completion certificates will be issued after students successfully pass the **course.** Students can access all course materials, presentations, videos, assignments, and tutorials online through UBC Canvas System.

Learning Outcomes

This course will introduce students with: 1) the basic concept of climate change and its impacts on forest ecosystems; 2) the principles of climatic and ecological models; 3) skills and techniques to use climatic models and to build ecological models; and 4) methods of incorporating model predictions in developing forest adaptive strategies to adapt to climate change.

By the end of this course students should be able to:

- Explain climate change and its impact on forest ecosystems at global and local scales;
- Use the scale-free climate model ClimateNA (for north America) and ClimateAP (for Asia Pacific) to generate climate data for specific locations and geographic areas (climate maps);
- Build ecological niche model and generate spatial model predictions;

- Interpret and incorporate models' output in developing strategies for conservation, adaptation and management under a changing climate.

Learning Materials

There is no required textbook to purchase for this course. During this course, we will mainly use online accessible free tools, data and other materials. We also expect that you will access a variety of additional materials. Associated with each module, you will find a variety of suggested sources of further information. Some of these will be references to textbooks and journal articles, some of which may require access to a library. Wherever possible, we will use freely available online materials. Students are expected to read materials to supplement the information provided in the presentations.

Please see topic readings for a complete list of required and optional readings for each learning topic.

Learning Approach & Activities

Each module of the online course will encourage active and experiential learning using images, animations or videos that present simulated events representing impacts of climate change on forest ecosystems and possible solutions through climate modelling. These will be followed by detailed explanations of the concepts and mechanisms of the events and rational of the possible solutions. Online discussions will facilitate students to present their questions and to exchange ideas. Hand on experiences will also be obtained by working with the climate models to obtain climate data and ecological projections for the location of their interest, including their hometowns. Guest lectures will be presented to demonstrate case studies in applications of climate modelling in local forest resource management to adapt to climate change in the region. The assignments and other activities are used not only to consolidate the knowledge and skills learned from the individual modules, but also to pave the way to prepare students to complete the final project. The final group project will provide an opportunity for students to apply and integrate the knowledge and skills learned from individual modules into an adaptive application practice.

Course Topics

The course is built around six major modules. Each module consists of 2-3 topics and each topic typically consists of Introduction, Readings, Fundamental Concepts, Self-check Quiz, Activities & Assignments, Summary, and Self-review Questions.

Introduction to the course (week 1)

Module I. Introduction to Climate Change and Its Impacts on Forest Ecosystems (week 2-3)
- Topic 1.1: Introduction to Global Climate Change
- Topic 1.2: Introduction to Impacts of Climate Change on Forest Ecosystems in Tropics/Subtropics

Module II. Climate Modelling in Forest Adaptation to Climate Change (week 4-5)
- Topic 2.1: Introduction to Climate Models
- Topic 2.2: Introduction to Ecological Models

Module III. Scale-free Climate Models and Their Applications (week 6-7)
- Topic 3.1: Introduction to ClimateNA and ClimateAP (or ClimateNA/AP)
- Topic 3.2: The Use of ClimateNA/AP to Generate Point and Spatial Climate Data

Module IV. Introduction to Ecological Models (week 8-10)
- Topic 4.1: Principles and Methods of Niche-based Models
- Topic 4.2: Introduction to FORECAST Climate
- Topic 4.3: Introduction to Climatic Response Functions

Module V. Building Ecological Models in R (week 11-12)
- Topic 5.1: Ecological and Climatic Data Processing
- Topic 5.2: Model Building and Model Predictions

Module VI. Model Applications (week 13-14)
- Topic 6.1: Model Interpretation and Applications
- Topic 6.2: Case Studies with Douglas-fir and Chinese fir

Review and Wrap-up (Week 15)

Course Schedule

For self-directed learning students, you can complete the topics and modules at your own pace. The speed at which you progress through the course will depend on a number of factors, including how well you can understand English, how much you already know about the topics.

For certificate learning students, you are expected to follow the schedule below to participate in all instructor-facilitated course activities and complete all course assignments by specified due dates

Note that all deadlines, dates and times are given in Pacific Standard Time (PST). Contact your instructors to discussion any adjustment needed to accommodate your time zone.

Start Week	Topic	Core Concepts	Learning Activities	Assignment Dues
Week 1: Day 1-7	**Course Orientation**	Course syllabus Course schedule Course requirements Assignment details	• Review course introduction and overview materials. • Familiarize yourself with course platform and tools. • Post self intro on class discussion board. • Obtain required textbooks. • Ask any questions of general requirements for the course on class discussion board.	Self Introduction due at 23:59pm on Day 3 of this week (PST). Pre-course survey due at 23:59pm on Day 7 of this week (PST).
Module 1: Introduction to Climate Change and its impacts on forest ecosystems				
Week 2: Day 1-7	**Topic 1.1:** Introduction to global climate change	Basic science and facts about climate change	• Read reading materials • Go through the presentations • Take self-check quiz • Participate in online class discussions	
Week 3: Day 1-7	**Topic 1.2:** Introduction to impacts of climate change on forest ecosystems	Local adaptation and impacts of climate change on forest ecosystems and forest tree species	• Read reading materials • Go through the presentations • Take self-check quiz • Participate in online class discussions • Complete Module 1 Test	Module 1 Test Due at 23:59pm on Day 7 of this week (PST).
Module 2: Climate Modelling in forest adaptation to climate change				
Week 4: Day 1-7	**Topic 2.1:** Introduction to climate models	Climate models and their roles in climate change related research and	• Read reading materials • Go through the presentations • Take self-check quiz	Teaching research survey due at 23:59pm on Day 7 of this

		applications	• Participate in online class discussions	week (PST).
Week 5: Day 1-7	**Topic 2.2:** Introduction to ecological models	An overview of ecological models	• Read reading materials • Go through the presentations • Take self-check quiz • Participate in online class discussions • Complete Module 2 Test	Module 2 Test Due at 23:59pm on Day 7 of this week (PST).
Module 3: Scale-free Climate Models and Their Applications				
Week 6: Day 1-7	**Topic 3.1:** Introduction to ClimateNA/AP	Major advantages of ClimateNA/AP over other climate models and the mechanisms of this model	• Read reading materials • Go through the presentations • Take self-check quiz • Participate in online class discussions	
Week 7: Day 1-7	**Topic 3.2:** The use of ClimateNA/AP to generate point and spatial climate data	How to use ClimateNA/AP	• Read reading materials • Go through the presentations • Take self-check quiz • Participate in online class discussions • Complete Assignment 1 • Start Assignment 2 this week	Module 3 Self-test Due at 23:59pm on Day 7 of this week (PST). Assignment 1, due at 23:59pm on Day 7 of this week
Module 4: Introduction to Ecological Models				
Week 8: Day 1-7	**Topic 4.1:** Principles and methods of niche-based models	Principles and methods of niche-based models	• Read reading materials • Go through the presentations • Take self-check quiz • Participate in online class discussions • Complete	Assignment 3, due at 23:59pm on Day 7 of this week

			Assignment 3 • Continue with Assignment 2	
Week 9: Day 1-7	**Topic 4.2:** Introduction to FORECAST Climate	An overview of the process-based model FORECAST Climate	• Read reading materials • Go through the presentations • Take self-check quiz • Participate in online class discussions • Complete Assignment 4 • Continue with Assignment 2	Assignment 4, due at 23:59pm on Day 7 of this week
Week 10: Day 1-7	**Topic 4.3:** Introduction to Climatic response functions	An overview of climatic response functions in addressing among-population variation to climate change	• Read reading materials • Go through the presentations • Take self-check quiz • Participate in online class discussions • Complete Module 4 Test • Continue with Assignment 2	Module 4 Test Due at 23:59pm on Day 7 of this week (PST).
Module 5: Building ecological models in R				
Week 11: Day 1-7	**Topic 5.1:** Ecological and climatic data processing	How to collect and process ecological and climatic data for building an ecological niche model	• Read reading materials • Go through the presentations • Take self-check quiz • Participate in online class discussions • Complete Assignment 2 • Form groups for final group project	Assignment 2, due at 23:59pm on Day 7 of this week
Week 12: Day 1-7	**Topic 5.2:** Model building and model predictions	Step-by-step instructions on how to build an ecological niche model and	• Read reading materials • Go through the presentations • Take self-check quiz	

		generate spatial model predictions in R	• Navigate the web-based ClimateAP to visualize and download model output • Start group project this week	
Module 6: Model applications				
Week 13: Day 1-7	**Topic 6.1:** Model interpretation and applications	How to interpret model predictions and to forest resource management planning	• Read reading materials • Go through the presentations • Take self-check quiz • Continue with group project	
Week 14: Day 1-7	**Topic 6.2:** Case Studies with Douglas-fir and Chinese fir	Case studies in application of model predictions in forest resource management using process-based ecological models	• Read reading materials • Go through the presentations • Take self-check quiz • Complete group project	Group project due at 23:59pm on the day 7 of this week.
Week 15: Day 1-7	**Course Wrap-up**		• Submit all assignments	Intra-group peer evaluation due at 23:59pm on the day 2 of this week. Post-course survey due at 23:59pm on Day 7 of this week (PST).

Course Certification

This is a course with an option to obtain certification for a 3-credit graduate-level course. Students would need to decide whether to pursue a certificate by end of Week 3 of the course. The number of certificate learning students for each offering of the course would be capped at 10. Assessments to student certification include the following components. Each component must be passed to successfully complete the course to get the course certificate. The passing grade is 60%.

Components	Points/Marks	Weight
Online Class Discussions (10)	15 each x 10 = 150	20%
Online Module Tests (3)	5 each x 3 = 15	15%
Assignment 1	5	5%
Assignment 2	20	20%
Assignment 3	10	10%
Assignment 4	5	5%
Final Group Project	25	25%
Extra Credit (e.g. Teaching Research Surveys, etc.)	5 each x 3 = 15	5%

Final letter grades will be given based on the following grading schema:

Letter Grade	Range
A+	90% - 100%
A	85% - 89%
A-	80% - 84%
B+	76% - 79%
B	72% - 75%
B-	68% - 71%
C+	64% - 67%
C	60% - 63%
F (Fail)	0% - 59%

Late Assignment Policy

In general, submitting assignments after the specified completion date is not considered acceptable for university students. However, in the event that a student cannot submit an assignment on the specified completion date, **late work will be accepted only if it has been date stamped by the Dean's office. Late work will NOT be accepted after five days past the due date and 10% will be deducted per day.** This means WEEKDAYS, NOT class meetings. In

extreme cases of personal misfortune this policy can be extended ONLY by special arrangement with the instructors.

Participation Expectations

You are expected to participate in all course activities and engage in peer-learning. You will be evaluated based on your progress in the course (e.g. whether you can complete the lectures, self-tests, discussions and other associated activities on time).

Netiquette Expectations

It is important to recognize that the online classroom is in fact a classroom, and certain behaviors are expected when you communicate with both your peers and your instructors. These guidelines for online behavior and interaction are known as netiquette.

Security

Remember that your password is the only thing protecting you from pranks or more serious harm. Thus,

- Don't share your password with anyone
- Change your password if you think someone else might know it
- Always logout when you are finished using the system

General Guidelines

When communicating online, you should always:

- Treat instructor, TAs and peers with respect
- Use clear and concise language
- Use standard fonts such as Times New Roman and use a size 12 or 14 pt. font
- Be careful with personal information (both yours and other's)

Email Netiquette

When you send an email to your instructor, TAs, or classmates, you should:

- Use a descriptive subject line
- Be brief
- Sign your message with your name and return e-mail address
- Be sure you REALLY want everyone to receive your response when you click, “reply all”

- Be sure that the message author intended for the information to be passed along before you click the "forward" button

Message Board Netiquette & Guidelines

When posting on the Discussion Board in your online class, you should:

- Make posts that are on topic and within the scope of the course material
- Take your posts seriously and review and edit your posts before sending
- Be as brief as possible while still making a thorough comment
- Be sure to read all messages in a thread before replying
- Don't repeat someone else's post without adding something of your own to it
- Avoid short, generic replies such as, "I agree." You should include why you agree or add to the previous point
- When you disagree with someone, you should express your differing opinion in a respectful, non-critical way
- Do not make personal or insulting remarks

(Adapted from https://go.osuit.edu/center/teaching_learning/content/netiquette-guidelines-online-courses)

Academic Integrity

UBC is an academic community in which commitment to the principles of truth and academic honesty is essential. The Code of Academic Integrity prohibits students from committing the following acts of academic dishonesty:

1. Cheating: intentionally using or attempting to use unauthorized materials, information, or study aids in any academic exercise.
2. Fabrication: intentional and unauthorized falsification or invention of any information or citation in any academic exercise.
3. Facilitating academic dishonesty: intentionally or knowingly helping or attempting to help another violate any provision of the Academic Code.
4. Plagiarism: intentionally or knowingly representing the words or ideas of another as one's own in any academic exercise.

ANY PLAGIARISM will result in a mark of zero for the assignment/exam. As a student, you are expected to submit original work and give credit to other people's ideas and writing. Plagiarism includes copying other people's ideas or writing without citing the source. If a quotation is used, it must be identified as a quotation and correctly cited. **Plagiarism is considered a very serious issue and can affect your career**.

Please make sure you know UBC's policies on plagiarism and read tips for avoiding it (see http://help.library.ubc.ca/planning-your-research/academic-integrity-plagiarism/).

For additional guidance on what plagiarism is and how to avoid it, please see:

UBC Calendar: http://www.calendar.ubc.ca/Vancouver/index.cfm?tree=3,54,111,959

UBC Learning Commons, Avoiding Plagiarism: http://learningcommons.ubc.ca/resource-guides/avoiding-plagiarism/

Other Course Policies

Learning Analytics

Learning analytics includes the collection and analysis of data about learners to improve teaching and learning. This course will be using the following learning technologies: Canvas, etc. Many of these tools capture data about your activity and provide information that can be used to improve the quality of teaching and learning. In this course, I plan to use analytics data to:

- View overall class progress
- Track your progress in order to provide you with personalized feedback
- Review statistics on course content being accessed to support improvements in the course
- Track participation in discussion forums
- Assess your participation in the course

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