## Acknowledgement

UBC’s Point Grey Campus is located on the traditional, ancestral, and unceded territory of the xwməθkwəy̓əm (Musqueam) people. The land it is situated on has always been a place of learning for the Musqueam people, who for millennia have passed on in their culture, history, and traditions from one generation to the next on this site.

## Course Information

|  |  |  |
| --- | --- | --- |
| **Course Title** | **Course Code Number** | **Credit Value** |
| Geospatial Data Analysis, UBC | GEM 530 Section 101 | 3 |

### Prerequisites

None

### Corequisites

None

## Contacts

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Instructor(s)** | **Contact Details** | **Office Location** | **Office Hours** |
| Dr. Suborna Ahmed | [suborna@mail.ubc.ca](mailto:suborna@mail.ubc.ca)  The typical response time is within 24-48 hours on weekdays.  Students can contact through discussion page on canvas. | Forest Science Centre (2424 Main Mall)  Room: 2214 | Wednesday 1:00 –2:00 pm  Also, the instructor is available after and before every lecture.  Students can make an appointment if the mentioned office hour doesn’t work. |

## Lecture TIme: Tuesday 1:00 – 4:00 pm; FSC 2435

## Course Instructor Biographical Statement

Dr. Suborna Ahmed is a lecturer in the Department of Forest Resources Management, UBC. She holds a PhD from the University of British Columbia in Forest Biometrics and a Statistician by training. Suborna’s research interests include quantitative analysis of complex forestry datasets at a large scale; methods for forecasting tree growth and yield; modelling and forecasting improved genetics; meta-analysis of tree mortality, damaging agents and tree fertilization; and application of machine learning approaches in various sectors in forestry. Suborna is teaching Statistics and programming languages in both Bachelor and Master programs in UBC.

## Other Instructional Staff

You can contact our course TA, but you have to keep the instructor in the loop in any conversation regarding any issue in the course. There are one Graduate Teaching Assistant in this course:

Teaching Assistant: Nicholas Leach (nleach@mail.ubc.ca); Office : FSC 2231

Office hours: 4-5 pm, Thursday

You can also contact Nick through canvas page.

## Course Overview, Content and Objectives

This course involves a combination of lectures, in-class exercises and discussions, labs and quizzes. This course will cover the fundamentals of Python programming and scripting as it relates to geospatial data analysis and manipulation. This course begins by reviewing what is Python, its syntax, and data structures as well as control structures and other language specific topics. The course then explores how to process, query, and analyze geospatial data to address topical environmental management issues. This is accomplished by initially familiarizing students with a graphical user interface and graphical programming, and then introducing the Python scripting language and its utility for geospatial analysis. All material presented is within the context of the big data era, and relatable to tangible environmental management themes (i.e., resilience; carbon and biomass; ecological goods and services; landscape pattern, heterogeneity and change; social-ecological perspectives for environmental management). Hands-on learning activities employing two reoccurring geospatial data-sets representing UBC’s Malcolm Knapp Research Forest and coastal NW Madagascar illuminate all material covered and help establish connections to environmental management themes. All course materials are available through UBC’s Canvas platform and/or the MGEM course drive. The primary units/themes include:

* Geospatial data: an overview
* Moving from GUI to models to scripts
* Learning how to modify and write Python scripts
* Extending Python with pertinent geo-focused modules

By the end of the course, you will be exposed to many useful tools to conduct the analysis, query, and manipulation of geospatial data in Python. Please note that no previous experience or familiarity with scripting is required. However, a familiarity with GIS and remote sensing would benefit the student greatly (based on the below-suggested prerequisite materials).

**Prerequisites**

1. You will need a laptop with a functioning copy of ArcGIS 10.X installed. Other software (e.g., PyCharm/Python v2.7) can be installed during the course as needed. You can install the [*community version of PyCharm*](https://www.jetbrains.com/pycharm/download/#section=windows). It is your responsibility to ensure that you have a laptop equipped with ArcGIS and capable of running ArcGIS and Python. For non-MGEM students, we can only provide limited support regarding getting any/all of these software to work on your laptop.
2. While not required, some familiarity with GIS, remote sensing and scripting is preferred
   1. If you have little to no familiarity with GIS, completing “[*Getting Started with GIS*](https://www.esri.com/training/catalog/57630434851d31e02a43ef28/getting-started-with-gis/)” and “[*Get Started with ArcMap*](https://www.esri.com/training/catalog/57660c89bb54adb30c94541c/get-started-with-arcmap/)*”* (or similar) is highly recommended.
   2. If you have little to no familiarity with remote sensing, working through the freely available online tutorial on the fundamentals of remote sensing from Natural Resources Canada is highly recommended.

## Evaluation Criteria and Grading

The course is graded on a numeric (percentage) basis:

|  |  |
| --- | --- |
| Course Component | Percent of Final Mark |
| 7 Labs | 50% |
| 7 Quizzes | 35% |
| Participation in Exercises | 15% |
| Total | **100%** |

* **Labs:** Lab assignments constitute **50%** of the grade for this course. Labs directly reinforce lectures, exercises and discussions and employ two reoccurring geospatial datasets, but also some one-time use datasets. Lab titles are listed in the schedule and generally make use of that week’s lecture topics.
* **Quizzes:** Out-of-class quizzes, each worth **3.18%,** constitute **35 %** of the grade for this course. Quizzes will only cover material presented in class and/or covered in *required* readings.
* **Participation Exercises:** In-class participation exercises worth **15%** of the grade for this course. The emphasis of these in-class exercises are more so on learning and effort than on correct answers!
* **There is neither a midterm nor final exam for this course.**

Letter grades are determined by the university are as follows:

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

## Late Submission Policy

All assignments, quizzes and in-class exercises are due at 6 pm on Saturdays. For late submission, two marks would be deducted up to 7 days. After seven days, the instructor won't accept it. After 3rd December no submission will be accepted.

## Required & Suggested Readings, and Optional Activities

There are no required textbooks. This course will require readings from peer-reviewed scientific journal articles, online help sections, and other freely accessible sources as outlined in the course schedule; these materials are available through links on the syllabus and the course Canvas site. The suggested readings help reinforce what you’ll learn through this course. Additional required and suggested readings may be assigned during the course with advance notice. While the topics covered by these suggestions are touched on in class, these materials simply provide an opportunity to delve deeper and more thoroughly into particular subjects based on interest and goals. Optional activities provide students opportunities to learn additional helpful material but are in no way required. Most often, optional activities extend that week’s materials to a related concept or Python module.

## Academic Integrity

The academic enterprise is founded on honesty, civility, and integrity. As members of this enterprise, all students are expected to know, understand, and follow the codes of conduct regarding academic integrity.  At the most basic level, this means submitting only original work done by you and acknowledging all sources of information or ideas and attributing them to others as required.  This also means you should not cheat, copy, or mislead others about what is your work.  Violations of academic integrity (i.e., misconduct) lead to the breakdown of the academic enterprise, and therefore serious consequences arise, and harsh sanctions are imposed.  For example, incidences of plagiarism or cheating may result in a mark of zero on the assignment or exam, and more serious consequences may apply if the matter is referred to the President’s Advisory Committee on Student Discipline.  Careful records are kept in order to monitor and prevent recurrences.

## Health and Wellness

*Don't want to walk alone at night?  Not too sure how to get somewhere on campus?  Call Safewalk:* <http://www.ams.ubc.ca/services/safewalk/> (604) 822-5355

## Schedule of Topics

This schedule is subject to minor changes/adjustments. You will be notified of any changes in class/through Canvas; you are responsible to be aware of any changes.

| **In-Class Activities** | **Required Readings/Videos** | **Suggested Readings/Videos** | **Labs and Quizzes** | **Due** | **Optional Extension Activities** |
| --- | --- | --- | --- | --- | --- |
| **Tue Sep 10** |  |  |  |  |  |
|  | [Transactions in GIS: FOSS4G: Big data & cons: deluge or drought?](https://vimeo.com/147605501) |  | Quiz 1: Python basics Part 1 | Sep 14 | [“The Python Tutorial”](https://docs.python.org/3/tutorial/) |
| Lecture 1: Course Overview & IDEs, & Python – overview, syntax, data structures | [Intro to Python](https://overiq.com/python/3.4/intro-to-python/), Intro, Numbers -> String methods, Loops. | *Python scripting for ArcGIS, Chp 3, 4.1-4.13* |  |  | [Intro to Python](https://overiq.com/python/3.4/data-types-and-variables-in-python/), [DataTypes](https://overiq.com/python/3.4/data-types-and-variables-in-python/) – [String Methods](https://overiq.com/python/3.4/strings-methods-in-python/), [Loops](https://overiq.com/python/3.4/loops-in-python/) -> [Lists](https://overiq.com/python/3.4/lists-in-python/) |
| *Exercise 1A: Access, syntax, structures, & operators* | [Beginners Guide to Python: Overview](https://wiki.python.org/moin/BeginnersGuide/Overview), [How to Edit](https://wiki.python.org/moin/HowToEditPythonCode) (all but Implementations). | [*Python for Data Science*](https://github.com/gumption/Python_for_Data_Science/blob/master/3_Python_Basic_Concepts.ipynb) | Lab 1: Finish the code 1 | Sep 14 |  |
| *Exercise 1B: Your first Pythonic statement* | [A Byte of Python](https://python.swaroopch.com/): About Python, First Steps -> Operators and Expressions, Data Structures (only List). | [*Learn Python the Hard Way*](https://learnpythonthehardway.org/book/) |  |  | The Zen of Python [P1](https://www.python.org/dev/peps/pep-0020/) (type “*import this*” into a python console, [P2](https://medium.com/@Pythonidaer/a-brief-analysis-of-the-zen-of-python-2bfd3b76edbf) |
| **Tue Sep 17** |  |  |  |  |  |
| Review: Quiz 1 | [A Byte of Python](https://python.swaroopch.com/): Control Flow -> Data Structures | *Python scripting for ArcGIS->Chps 4.14-4.21*  [*Learn Python the Hard Way*](https://learnpythonthehardway.org/book/) | Quiz 2: Python basics Part 2 | Sep 21 | [Functions practice](https://www.learnpython.org/en/Functions) |
| Lecture 2: Python –loops, conditional statements, modules, functions, comments, style | (only Quick Introduction to Objects & Classes), Input and Output (from Files to the end). | [*Python for Data Science*](https://github.com/gumption/Python_for_Data_Science/blob/master/3_Python_Basic_Concepts.ipynb) |  |  | [Suggestions on Comments](https://www.digitalocean.com/community/tutorials/how-to-write-comments-in-python-3) |
| *Exercise 2A: Asking Questions?!?!* | Intro to Python, [if-else statements](https://overiq.com/python/3.4/if-else-statements-in-python/), [functions](https://overiq.com/python/3.4/functions-in-python/) -> [Inheritance](https://overiq.com/python/3.4/inheritance-and-polymorphism-in-python/) (not Polymorphism section). | [*Python Cheat Sheet*](https://blog.finxter.com/wp-content/uploads/2018/06/CheatSheet-Python-1-Keywords-1.pdf) | Lab 2: Finish the code 2 | Sep 21 | [Code Style from GVR](http://docs.python-guide.org/en/latest/writing/style/) |
| *Exercise 2B:Loop de Loop & #GoodComments* | [File Handling in Python](https://overiq.com/python/3.4/file-handling-in-python/) |  |  |  |  |
| **Tue Sep 24** |  |  |  |  |  |
| Review: Quiz 2 | [A Byte of Python](https://python.swaroopch.com/): Exceptions -> [Standard Library](https://python.swaroopch.com/stdlib.html) | [*Learn Python the Hard Way*](https://learnpythonthehardway.org/book/) | Quiz 3: Solve that error | Oct 5 | Jupyter Notebooks,  [P1](https://jupyter.org/), [P2](http://jupyter-notebook.readthedocs.io/en/stable/), [P3](https://www.dataquest.io/blog/jupyter-notebook-tutorial/), & [P4](https://medium.com/codingthesmartway-com-blog/getting-started-with-jupyter-notebook-for-python-4e7082bd5d46) |
| Lecture 3: Errors, Scripting & First steps into Graphical Programming | Intro to Python, Exception Handling -> Dictionary | *Python scripting for ArcGIS -> Chp 5.12, 5.1-5.11, 6.1-6.4* |  |  | [Iterators](http://pro.arcgis.com/en/pro-app/tool-reference/modelbuilder-toolbox/examples-of-using-iterators-in-modelbuilder.htm) and [loops](http://desktop.arcgis.com/en/arcmap/10.3/analyze/modelbuilder/a-quick-tour-of-using-iterators-for-iteration-looping-.htm) in Modelbuilder |
| *Exercise 3A: Fix that Error* | [ArcMap: What is ModelBuilder?](http://desktop.arcgis.com/en/arcmap/10.3/analyze/modelbuilder/what-is-modelbuilder.htm) | *Model Builder Primer* [*P1*](http://pro.arcgis.com/en/pro-app/help/analysis/geoprocessing/modelbuilder/modelbuilder-tutorial.htm)*,* [*P2*](http://desktop.arcgis.com/en/arcmap/10.3/analyze/executing-tools/executing-tools-in-modelbuilder-tutorial.htm) |  |  | UBC based GIS data sources, [P1](http://gis.ubc.ca/data-sources-2/canada/), [P2](http://guides.library.ubc.ca/gis/datasources) |
| *Exercise 3B: Intersecting Datasets* | Intro. to Madagascar's mangroves [P1](http://dx.doi.org/10.4314/mcd.v8i1.1), and [P2](http://voices.nationalgeographic.com/2014/12/16/mangrove-deforestation-in-madagascar-what-are-the-options/) | *Intro. to MKRF* | Lab 3: Intro MKRF, AAB, MUFL dataset | Oct 5 | [MIT – GIS Data explainer](https://ocw.mit.edu/resources/res-str-001-geographic-information-system-gis-tutorial-january-iap-2016/spatial-data/MITRES_STR_001IAP16_Intro.pdf) |
| **Tue Oct 1** |  |  |  |  |  |
|  |  | [*Spatial Analysis and GIS: A Primer*](https://www.researchgate.net/publication/2934461_Spatial_Analysis_and_GIS_A_Primer) | Quiz 4: ArcMap, Models, Script | Oct 19 |  |
| Lecture 4: Using ArcGIS in Python | [What is ArcPy](http://pro.arcgis.com/en/pro-app/arcpy/get-started/what-is-arcpy-.htm), Essential Vocabulary -> Importing | [*Tutorial; ArcPy Basics*](https://pythongisandstuff.wordpress.com/2011/07/12/tutorial-arcpy-basics/) |  |  |  |
| *Exercise 4A: Setting up your first ArcPy Script* | [A Beginners Guide to Arcy](http://geoawesomeness.com/programming-arcgis-python-beginners-guide/) | *[Esri Canaddelaya: Python Basics](https://hed.esri.ca/resourcefinder/data/files/PythonBasics.pdf)* | Lab 4: ArcPy Geoprocessing | Oct 19 |  |
| *Exercise 4B: Intersect Script Comparison* |  |  |  |  |  |
| **Tue Oct 8** |  |  |  |  |  |
| Review: Quiz 3 |  |  | Quiz 5: Finish the ArcPy code! | Nov 2 |  |
| Lecture 5: Geoprocessing with ArcPy | [Overview of ArcGis API](https://developers.arcgis.com/python/guide/overview-of-the-arcgis-api-for-python/), And Raster Analysis [P1](https://developers.arcgis.com/python/guide/using-imagery-layers/), [P2](https://developers.arcgis.com/python/guide/using-raster-analysis/), and [P3](https://developers.arcgis.com/python/guide/raster-analysis-advanced-concepts/) | [*GeoProcessing in Python*](http://pro.arcgis.com/en/pro-app/arcpy/geoprocessing_and_python/using-tools-in-python.htm) |  |  | [Advanced Cursors](https://community.esri.com/blogs/richard_fairhurst/2014/11/08/turbo-charging-data-manipulation-with-python-cursors-and-dictionaries) |
| *Exercise 5A: SVIs w/ ArcPy* |  |  | Lab 5: ArcPy Geoprocessing continued | Nov 2 |  |
| *Exercise 5B: Editing in ArcPy* | [ArcPy Cursors](http://pro.arcgis.com/en/pro-app/arcpy/get-started/data-access-using-cursors.htm) |  |  |  |  |
| **Tue Oct 15** |  |  |  |  |  |
| Review: Quiz 4 |  |  | Quiz 6: WWAPPD? (What Would A Pythonista Do) | Nov 16 |  |
| Lecture 6: Further Steps in ArcPy | [ArcPy Mapping](http://desktop.arcgis.com/en/arcmap/10.3/analyze/arcpy-mapping/introduction-to-arcpy-mapping.htm) [P1](http://pro.arcgis.com/en/pro-app/arcpy/mapping/tutorial-getting-started-with-arcpy-mp.htm), [P2](http://desktop.arcgis.com/en/arcmap/10.3/analyze/arcpy-mapping/getting-started-with-arcpy-mapping-tutorial.htm) | *[ArcPy Cursors and Geometry](https://boxshapedworld.wordpress.com/tutorials/arcpy-cursors-and-geometry/)* |  |  | Advance Mapping Tricks [P1](http://proceedings.esri.com/library/userconf/proc17/tech-workshops/tw_2411-183.pdf) |
| *Exercise 6A: mapping in ArcPy* | Script to Tool , [P1](http://desktop.arcgis.com/en/arcmap/10.3/analyze/creating-tools/a-quick-tour-of-creating-script-tools.htm), [P2](http://desktop.arcgis.com/en/arcmap/10.3/analyze/creating-tools/a-quick-tour-of-creating-tools-in-python.htm) |  | Lab 6: Madagascar's mangroves | Nov 16 |  |
| *Exercise 6B: script to tool* |  |  |  |  |  |
| **Tue Oct 22** |  |  |  |  |  |
|  | [MatPlotLib History](https://matplotlib.org/users/history.html) | [*MatPlotLib Intro Video*](https://youtu.be/CuuvojEKHWo) | Quiz 7: Can you plot it? | Nov 30 | [Seaborn for easy pretty plots](https://seaborn.pydata.org/index.html) |
| Lecture 7: Plotting = Matplotlib |  |  |  |  | [P1](https://jakevdp.github.io/PythonDataScienceHandbook/04.14-visualization-with-seaborn.html), [P2](https://seaborn.pydata.org/tutorial.html), & [CheatSheet](https://s3.amazonaws.com/assets.datacamp.com/blog_assets/Python_Seaborn_Cheat_Sheet.pdf) |
| *Exercise 7A: Scattered Plots!* | [PyPlot Tutorial](https://matplotlib.org/tutorials/introductory/pyplot.html) |  | Lab 7: Plotting to Learn | Nov 30 | [Basemap for mapping](https://matplotlib.org/basemap/) [P1](http://basemaptutorial.readthedocs.io/en/latest/), & [P2](https://gist.github.com/dannguyen/eb1c4e70565d8cb82d63) |
| *Exercise 7B: Plotting Details* |  | [*Matplotlib Cheatsheet*](https://github.com/juliangaal/python-cheat-sheet/blob/master/Matplotlib/Matplotlib.md)*,* [*V2*](https://s3.amazonaws.com/assets.datacamp.com/blog_assets/Python_Matplotlib_Cheat_Sheet.pdf) |  |  |  |
| **Tue Oct 29** |  |  |  |  |  |
| Review: Quiz 5 | [A Quick Intro to Pandas](https://towardsdatascience.com/a-quick-introduction-to-the-pandas-python-library-f1b678f34673) | [*Pandas cheat sheet*](https://s3.amazonaws.com/assets.datacamp.com/blog_assets/PandasPythonForDataScience.pdf) |  |  | [12 Pandas Tricks](https://www.analyticsvidhya.com/blog/2016/01/12-pandas-techniques-python-data-manipulation/) |
| Lecture 8: Pandas are the sheets |  |  |  |  | [GeoPandas](http://geopandas.org/) [P1](https://geohackweek.github.io/vector/04-geopandas-intro/), [P2](https://www.hatarilabs.com/ih-en/introduction-to-spatial-analysis-in-python-with-geopandas-tutorial), & [P3](https://www.youtube.com/watch?v=O1dNEt3P7Sw) |
| *Exercise 8A: Your first pd.Dataframe* | [10 Mins to Pandas](https://pandas.pydata.org/pandas-docs/stable/10min.html) | [*Pandas Tutorial*](https://www.tutorialspoint.com/python_pandas/index.htm) |  |  |  |
| *Exercise 8B: A troubling selection* |  |  |  |  |  |
| **Tue Nov 5** |  |  |  |  |  |
|  | [A quickstart to Numpy](https://docs.scipy.org/doc/numpy/user/quickstart.html) | [*Introduction to Arrays*](https://www.machinelearningplus.com/python/numpy-tutorial-part1-array-python-examples/) |  |  | Learning [GDAL](http://www.gdal.org/) |
| Lecture 9: Data in/out; Numpy + Rasterio | [Look ma, no for loops!](https://realpython.com/numpy-array-programming/) |  |  |  | command line |
| *Exercise 9A: An array of methods* |  |  |  |  | capabilities [P0](http://www.gdal.org/gdal_utilities.html), [P0.5](http://www.gdal.org/ogr_utilities.html), |
| *Exercise 9B: Data in, manipulate, & out* | [Rasterio](https://github.com/sgillies/rasterio), [P1](https://rasterio.readthedocs.io/en/latest/intro.html) & [P2](https://rasterio.readthedocs.io/en/latest/quickstart.html) |  |  |  | [P1](https://github.com/dwtkns/gdal-cheat-sheet), [P2](https://github.com/glw/gdalcheatsheet), [P3](https://medium.com/planet-stories/a-gentle-introduction-to-gdal-part-1-a3253eb96082), & [P4](https://medium.com/planet-stories/a-gentle-introduction-to-gdal-part-2-map-projections-gdalwarp-e05173bd710a)  & [P5](http://www.gdal.org/gdal_tutorial.html) |
| **Tue Nov 12** |  |  |  |  |  |
|  |  |  |  |  | [Shapely](http://shapely.readthedocs.io/en/stable/manual.html) functionality, [P1](https://macwright.org/2012/10/31/gis-with-python-shapely-fiona.html) |
| Lecture 11: Vector Manipulation w/Fiona! | [Fiona Docs](http://toblerity.org/fiona/) | [*Shapely Video*](https://www.youtube.com/watch?v=9u1gk4fnJM4) |  |  | [PySAL](http://pysal.readthedocs.io/en/latest/) functionality, [P1](http://pysal.readthedocs.io/en/latest/users/tutorials/), & [P2](https://www.earthdatascience.org/tutorials/intro-to-spatial-regression/) |
| *Exercise 10A: Overlays* |  | [*Shapely + Fiona*](https://macwright.org/2012/10/31/gis-with-python-shapely-fiona.html) |  |  |  |
| *Exercise 10B:Complexity* |  |  |  |  |  |
| **Tue Nov 19** |  |  |  |  |  |
|  | [SciKit Docs](http://scikit-learn.org/stable/index.html), and [Explainer](https://machinelearningmastery.com/a-gentle-introduction-to-scikit-learn-a-python-machine-learning-library/) | [*Building a ML example*](https://www.digitalocean.com/community/tutorials/how-to-build-a-machine-learning-classifier-in-python-with-scikit-learn) |  |  | Suggested Sci Kits to try: [image](http://scikit-image.org/) |
| Lecture 12: Machine Learning in Python |  |  |  |  |  |
| *Exercise 11A: Using your first MLA* |  | [*ML w/ Landsat*](http://ceholden.github.io/open-geo-tutorial/python/chapter_5_classification.html) |  |  | [Interactive Plots!](http://blog.yhat.com/posts/interactive-geospatial-analysis.html) |
| *Exercise 11B: Validating your model* |  |  |  |  | [Rasterio + Learn = Pyimpute](https://github.com/perrygeo/pyimpute) |
| **Tue Nov 26** |  |  |  |  |  |
|  |  | [*Multiprocessing*](https://docs.python.org/3/library/multiprocessing.html)*,* [*P1*](http://chriskiehl.com/article/parallelism-in-one-line/)*,* [*P2*](http://cslocumwx.github.io/blog/2015/02/23/python-multiprocessing/) |  |  |  |
| Lecture 12: Review/big picture & forward |  | [*Subprocessing*](https://docs.python.org/3/library/subprocess.html)[*P1*](http://www.pythonforbeginners.com/os/subprocess-for-system-administrators)*,* [*P2*](http://chris35wills.github.io/subprocess_gdal/) |  |  | [Seven Part Series on Pythonic mapmaking!](http://michelleful.github.io/code-blog/2015/04/24/sgmap/) |
| *Exercise 12A: Groupthink! LAB w/ ENV THEME* |  |  |  |  |  |
| *Exercise 12B: Course review/final discussion/feedback* |  |  |  |  | [Leaflet + Python](https://programminghistorian.org/en/lessons/mapping-with-python-leaflet)  [Folium (leaflet in disguise)](http://folium.readthedocs.io/en/latest/quickstart.html#vincent-vega-markers) |

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## University Policies

UBC provides resources to support student learning and to maintain healthy lifestyles but recognizes that sometimes crises arise and so there are additional resources to access including those for survivors of sexual violence. UBC values respect for the person and ideas of all members of the academic community. Harassment and discrimination are not tolerated nor is suppression of academic freedom. UBC provides appropriate accommodation for students with disabilities and for religious observances. UBC values academic honesty and students are expected to acknowledge the ideas generated by others and to uphold the highest academic standards in all of their actions.

Details of the policies and how to access support are available on[**the UBC Senate website**](https://senate.ubc.ca/policies-resources-support-student-success)**.**

### 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. This tool captures 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 (example data use )

* 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

### Copyright

All materials of this course (course handouts, lecture slides, assessments, assignments, quizzes, exercises, etc.) are the intellectual property of the Course Instructor or licensed to be used in this course by the copyright owner. Redistribution of these materials by any means without permission of the copyright holder(s) constitutes a breach of copyright and may lead to academic discipline.

I do not permit to record my lecture classes and lab sessions.

*Version: August 2019*