



湖北工业大学
HUBEI UNIVERSITY OF TECHNOLOGY

Course Title	Advanced Python for Marketing Analytics
Course Code	CMPT 5024
Semester	Winter 2027
Course Length	8 Weeks, 60 Contact Hours
Credits	4
Instructor	TBA
Office	TBA
Email	TBA
Prerequisite(s)	Prior Python programming experience, including functions, data structures, modules, and file operations. Basic object-oriented programming and elementary statistics are recommended.
Antirequisite	CMPT 5022 Advanced Python for Marketing Analytics (4 Weeks)

Course Description:

Advanced Python for Marketing Analytics develops students' ability to design, implement, test, and maintain Python solutions for marketing and business analytics. The course is intended for students who already understand Python fundamentals and wish to apply more advanced programming techniques to analytical workflows.

Topics include advanced functions, iterators and generators, decorators, context managers, object-oriented design, type hints, testing, debugging, logging, data engineering, numerical computing, visualization, and selected machine-learning methods.

Students will build reliable, modular, readable, maintainable, and reproducible code. Practical work uses Python and common analytics libraries, including NumPy, pandas, Matplotlib, Seaborn, and scikit-learn.

Applications may include customer segmentation, customer retention, campaign evaluation, customer feedback analysis, and predictive marketing. Emphasis is placed on analytical validity, data quality, responsible data use, and communicating results in business terms.

Course Goals:

Students who successfully complete this course will demonstrate competency in the following general education core goals:

- **Critical Thinking Skills** – Students will engage in analytical thinking, demonstrating the ability to critically evaluate, synthesize, and apply knowledge to complex problems, and construct well-reasoned solutions and arguments.
- **Independent Research and Inquiry** – Students will conduct independent research, utilizing academic resources to explore relevant topics, formulating research questions, analyzing data, and presenting findings in a coherent, scholarly manner.
- **Problem-Solving and Application** – Students will apply theoretical concepts and methodologies learned in the course to real-world problems, demonstrating the ability to develop practical solutions informed by academic inquiry.
- **Global and Cultural Awareness** – Students will gain awareness of the global and cultural contexts relevant to the course, appreciating diverse perspectives and considering the implications of their studies in a broader, international context.

Student Learning Outcomes:

Upon completion of this course, students will be able to:

- Use iterators, generators, decorators, context managers, exception handling, and type annotations appropriately;
- Design modular Python programs using functions, classes, and suitable programming abstractions;
- Apply testing, debugging, logging, and documentation practices to improve code reliability;
- Import, clean, validate, transform, join, and aggregate structured datasets using Python tools;
- Use NumPy and pandas effectively and explain key choices affecting computational efficiency;
- Create informative visualizations and interpret analytical outputs in a marketing or business context;
- Develop and evaluate selected segmentation or predictive-modeling workflows using appropriate metrics;
- Recognize data leakage, bias, privacy risks, and limitations that affect analytical conclusions;
- Produce a documented and reproducible analytical project with clear instructions for execution;
- Communicate technical methods, results, limitations, and recommendations to technical and nontechnical audiences;
- Collaborate professionally through code review, feedback, and project planning where team work is approved.

Textbooks/Supplies/Materials/Equipment/ Technology or Technical Requirements:

Reference Books:

McKinney, W. *Python for Data Analysis: Data Wrangling with pandas, NumPy, and Jupyter*. 3rd ed. O'Reilly Media, 2022.

Ramalho, L. *Fluent Python: Clear, Concise, and Effective Programming*. 2nd ed. O'Reilly Media, 2022.

VanderPlas, J. *Python Data Science Handbook: Essential Tools for Working with Data*. 2nd ed. O'Reilly Media, 2022.

Tools and Technical References:

Python Software Foundation. Python 3 Documentation. <https://docs.python.org/3/>

NumPy Developers. NumPy User Guide. <https://numpy.org/doc/stable/user/>

pandas Development Team. pandas User Guide.

https://pandas.pydata.org/docs/user_guide/

Matplotlib Development Team. Matplotlib Documentation.

<https://matplotlib.org/stable/>

Seaborn Development Team. Seaborn Documentation. <https://seaborn.pydata.org/>

scikit-learn Developers. scikit-learn User Guide. https://scikit-learn.org/stable/user_guide.html

Course Requirements:

Advanced Python Programming Assignments (20%)

Students complete programming exercises focused on advanced language features, modular design, readability, and correct behavior. Submissions should include executable code and concise explanations of key design choices.

Data Engineering and Data Quality Pipeline (15%)

Students build a workflow to ingest, clean, validate, transform, and combine a dataset. Assessment considers data-quality checks, appropriate handling of missing or invalid values, traceability, and reproducibility.

Testing, Debugging, and Performance Task (15%)

Students develop tests, diagnose documented errors, use logging or debugging tools, and assess a performance bottleneck. Grading emphasizes evidence-based debugging and justified improvements.

Applied Analytics Notebook (15%)

Students submit a reproducible notebook applying appropriate data manipulation, visualization, and/or an analytical method to a marketing or business question.

Conclusions must be supported by outputs and acknowledge limitations.

Capstone Project and Technical Report (25%)

Students complete an individual or approved team project addressing a problem such as customer retention, customer lifetime value, segmentation, campaign evaluation, forecasting, or customer feedback analysis. Deliverables include a clear problem definition, documented workflow, data-quality checks, evaluation, limitations, and practical recommendations.

Code Review and Seminar Participation (10%)

Students complete assigned readings, participate in technical discussions, review code constructively, and explain programming or analytical decisions. External code, datasets, and research sources must be acknowledged.

Assessments: Activity	Percent Contribution
Advanced Python Programming Assignments	20%
Data Engineering and Data Quality Pipeline	15%
Testing, Debugging, and Performance Task	15%
Applied Analytics Notebook	15%
Capstone Project and Technical Report	25%
Code Review and Seminar Participation	10%

Grading:

Final grades will be based on the sum of all possible course points as noted above.

Grade	Percentage of available points
A	94-100
A-	90-93
B+	87-89
B	84-86
B-	80-83
C+	77-79
C	74-76
C-	70-73
D	64-69
D-	60-63
F	0-59

Course Schedule:

The schedule of activities is subject to change at the reasonable discretion of the instructor. Minor changes will be announced in class, major ones provided in writing.

CMPT 5024 Schedule		
Lecture	Topic	Readings
L1	Course Orientation and Python Workflow	McKinney, <i>Python for Data Analysis</i> , data workflow and data structures; Python Tutorial, https://docs.python.org/3/tutorial/
L2	Advanced Functions and API Design	Ramalho, <i>Fluent Python</i> , functions; Python documentation, Function Definitions
L3	Iterators and Generators	Ramalho, <i>Fluent Python</i> , iterators and generators; Python documentation, Iterator Types
L4	Decorators, Context Managers, and Exceptions	Ramalho, <i>Fluent Python</i> , decorators and context managers; Python documentation, Errors and Exceptions
L5	Object-Oriented Design and Python Data Model	Ramalho, <i>Fluent Python</i> , classes and data model; Python documentation, Classes
L6	Type Hints, Modules, and Packaging	Python documentation, typing and modules;

		Ramalho, <i>Fluent Python</i> , interfaces and protocols
L7	Testing, Debugging, and Logging	Python documentation, unittest and logging; instructor-provided testing exercises
L8	Reproducible Projects and Version Control	McKinney, <i>Python for Data Analysis</i> , reproducible analytical workflows; instructor-provided version-control materials
L9	NumPy and Vectorized Computing	McKinney, <i>Python for Data Analysis</i> , NumPy; VanderPlas, <i>Python Data Science Handbook</i> , NumPy; NumPy User Guide
L10	Advanced pandas: Indexing, Reshaping, and Time Series	McKinney, <i>Python for Data Analysis</i> , indexing, reshaping, and time series; pandas User Guide
L11	Data Cleaning, Missing Values, and Validation	McKinney, <i>Python for Data Analysis</i> , data cleaning; pandas User Guide, missing data and text data
L12	Joins, Aggregation, and Feature Engineering	McKinney, <i>Python for Data Analysis</i> , data combination and grouping; VanderPlas, <i>Python Data Science Handbook</i> , data manipulation
L13	SQL and Python Data Pipelines	Python documentation, sqlite3; McKinney, <i>Python for Data Analysis</i> , data loading and storage
L14	APIs, JSON, and Data Acquisition	Python documentation, json and urllib; McKinney, <i>Python for Data Analysis</i> , data acquisition
L15	Visualization and Analytical Communication	VanderPlas, <i>Python Data Science Handbook</i> , visualization; Matplotlib and Seaborn official documentation; instructor-assigned marketing analytics reading
L16	Profiling and Performance Optimization	Python documentation, profilers; NumPy User Guide, broadcasting and vectorization; Ramalho, <i>Fluent Python</i> , relevant language features
L17	Machine-Learning Pipelines and Evaluation	VanderPlas, <i>Python Data Science Handbook</i> , machine learning; scikit-learn User Guide, model selection and evaluation
L18	Customer Segmentation	scikit-learn User Guide, clustering; instructor-assigned customer segmentation case or article with full citation
L19	Predictive Marketing Analytics	scikit-learn User Guide, supervised learning and metrics;

L20	Text Analytics for Customer Feedback	instructor-assigned predictive marketing analytics case or article scikit-learn User Guide, text feature extraction; instructor-assigned customer feedback analytics case or article
L21	Time-Series and Campaign Analysis	McKinney, <i>Python for Data Analysis</i> , time-series functionality; instructor-assigned campaign analytics reading
L22	Experiment Analysis and Decision Support	Instructor-provided experiment analysis materials; relevant scikit-learn documentation where applicable
L23	Capstone Engineering Workshop	Review relevant Python, NumPy, pandas, testing, and scikit-learn documentation according to project needs
L24	Capstone Demonstrations and Technical Review	Project-specific official documentation and assigned research or case readings
L25	Final Presentations and Course Synthesis	Review relevant textbook chapters, official documentation, and project-specific readings

Accommodation Statement:

Academic accommodations may be made for any student who notifies the instructor of the need for an accommodation. It is imperative that you take the initiative to bring such needs to the instructor's attention, as he/she is not legally permitted to inquire. Students who may require assistance in emergency evacuations should contact the instructor as to the most appropriate procedures to follow.

Academic Integrity Statement

Each student is expected to maintain the highest standards of honesty and integrity in academic and professional matters. The University reserves the right to take disciplinary action, up to and including dismissal, against any student who is found guilty of academic dishonesty or otherwise fails to meet the standards. Any student judged to have engaged in academic dishonesty in coursework may receive a reduced or failing grade for the work in question and/or for the course.

Academic dishonesty includes, but is not limited to, dishonesty in quizzes, tests, or assignments; claiming credit for work not done or done by others; hindering the academic work of other students; misrepresenting academic or professional qualifications within or without the University; and nondisclosure or misrepresentation in filling out applications or other University records.

Other Items:

Attendance and Expectations

All students are required to attend every class, except in cases of illness, serious family concerns, or other major problems. We expect that students will arrive on time, be prepared to listen and participate as appropriate, and stay for the duration of a meeting rather than drift in or out casually. In short, we anticipate that students will show professors and fellow students maximum consideration by minimizing the disturbances that cause interruptions in the learning process. This means that punctuality is a must, that cellular phones be turned off, and that courtesy is the guiding principle in all exchanges among students and faculty. You will be responsible for the materials and ideas presented in the lecture.

Assignment Due Dates

All written assignments must be turned in at the time specified. Late assignments will not be accepted unless prior information has been obtained from the instructor. If you believe you have extenuating circumstances, please contact the instructor as soon as possible.

Make-Up Work

The instructor will not provide students with class information or make-up assignments/quizzes/exams missed due to an unexcused absence. Absences will be excused and assignments/quizzes/exams may be made up only with written documentation of an authorized absence. Every effort should be made to avoid scheduling appointments during class. An excused student is responsible for requesting any missed information from the instructor and setting up any necessary appointments outside of class.

Access, Special Needs, and Disabilities

Please notify the instructor at the start of the semester if you have any documented disabilities, a medical issue, or any special circumstances that require attention, and the school will be happy to assist.