COLUMBUS STATE
COMMUNITY COLLEGE

Curriculum for Data Analytics Program

NSF ATE Data Analytics Technician Advancement (DATA) Principal

Investigators: Gloria Rogiers and Britney Williams-Ward

Program Outlines

Data Analytics and Visualization Associate of Applied Science

Data Analytics Certificate

New Courses – Syllabus and Units

Analytical and Computations Foundations of Data Analytics I & II

Data Analysis I & II

Data Visualization I & II

DATA ANALYTICS - ANALYSIS AND VISUALIZATION AAS

MAJOR

Description

In today's world, data and our ability to store and process it has revolutionized our daily lives and decision-making. The Data Analytics – Analysis and Visualization program provides students with a working knowledge of data management and data analytics tools and techniques so that they are able to communicate their insights and support data-driven processes. Course topics provide exposure to the various types and sources of data, the design and use of databases, an overview of how data are stored, mined and analyzed for descriptive, predictive and prescriptive purposes, and how data are organized to make compelling and actionable recommendations, reports and visualizations. Students will learn how to source and process data, how to use current tools and techniques to derive insights from data, how to use data to communicate meaningful stories, and how to think critically about data including topics such as bias, data privacy, and ethical use. Related statistics and mathematics classes provide students with the analytical context and knowledge that, when used with information systems, make the vast amounts of data available in today's data-driven world a source of incredible value.

Software/Hardware Requirements:
Students taking courses in this curriculum may need to own or have access to hardware/software to pursue this degree. This is particularly important for students who are enrolled in online/distance learning (DL) sections of a particular course. Check with the program adviser to discuss specific course needs and options.

Career Opportunities

A number of traditional and emerging roles exist in the market today across industries including banking, retail, insurance, consulting, life sciences, marketing and public service. Data analytics skills are foundations for roles such as Data Analyst, Operations Analyst, Marketing Analyst and Data Scientist (https://www.dataquest.io/blog/10-data-analytics-jobs/).

Salaries of positions related to the plan on study:

Junior Data Analyst: $52,000
Data Analyst: $35,000
ETL Developer: $60,000
Database Administrator: $47,000
Business Analyst: $50,000
Sources: Forbes, Glassdoor, IBM, Bureau of Labor Statistics

Program Learning Outcomes

Upon successful completion of this program, students will be able to:

1. Participate in collaborative projects utilizing the Systems Development Life Cycle (SDLC) and other methodologies as appropriate.

2. Determine and document project requirements.

3. Demonstrate team project skills using effective technical communication.

4. Clean, transform and analyze data in diverse formats and structures using programming languages used in data analytics.

5. Produce and interpret numerical summaries and data visualizations to describe, explore and communicate insights from data.

6. Identify and apply programming logic concepts.

7. Manage data (extract, merge, transform, check for quality, etc.) using a relational database language and other programming languages as appropriate.

8. Identify and communicate the impacts of ethical and privacy related concerns that arise when sourcing, processing and analyzing data.

Degree Requirements:

First Semester		**Units:** 15
CSCI 1103	Intro to Programming Logic	3
COLS 1100	First Year Experience Seminar	1
MATH 1146	College Algebra Plus	5
CSCI 1320	Database Fundamentals	3
ECON 2200	Principles of Microeconomics	3

Second Semester		**Units:** 13
STAT 1400	Statistical Concepts for Business	3
CSCI 1420	Analytical and Computational Foundations for Data Analytics I	2
CSCI 1421	Analytical and Computational Foundations for Data Analytics II	2
ITST 1130	Cloud Foundations for AWS Cloud Practitioner	3
CSCI 1511	Python Programming	3

Summer Semester		**Units:** 6
CSCI 1145	HTML	3
ENGL 1100	Composition I	3

Third Semester		**Units:** 13
CSCI 2420	Data Analysis I	2
CSCI 2421	Data Analysis II	2
NAT XXXX (select from approved GE-NAT list)		3
PHIL 1130	Ethics	3
Basic Related Elective (select 3 credits from approved basic related list)		3

Fourth Semester		**Units:** 13-15
CSCI 2422	Data Visualization I	2

CSCI 2423	Data Visualization II		2
Technical Elective - select 3-4 hours from the approved list			3-4
Second Writing Course - select 3 credits from the approved electives			3
Seminar and Practicum OR Capstone			3-4

NAT GE-Natural Science Requirement - 3 credit hours minimum   **Units:** 0

ASTR 1141	Life in the Universe	3
ASTR 1161	The Solar System	3
ASTR 1162	Stars and Galaxies	3
ASTR 1400	Astronomy Laboratory	1
BIO 1107	Human Biology	4
BIO 1111	Intro to Biology	4
BIO 1113	Biological Sciences I	4
BIO 1114	Biological Sciences II	4
BIO 1127	Introduction to Environmental Science	4
BIO 2215	Introduction to Microbiology	4
CHEM 1100	Chemistry and Society	5
CHEM 1111	Elementary Chemistry I	4
CHEM 1112	Elementary Chemistry II	4
CHEM 1171	General Chemistry I	5
CHEM 1172	General Chemistry II	5
GEOL 1101	Introduction to Earth Science	4
GEOL 1105	Geology and the National Parks	3
GEOL 1121	Physical Geology	4
GEOL 1122	Historical Geology	4
GEOL 1151	Natural Disasters	3
PHYS 1103	World of Energy	3
PHYS 1200	Introductory Algebra-Based Physics I	5
PHYS 1201	Algebra-Based Physics II	5
PHYS 1250	Calculus-Based Physics I	5
PHYS 1251	Calculus-Based Phys II	5

Approved Basic Related Electives List - 3 credit hours minimum   **Units:** 0

ACCT 1211	Financial Accounting	3
BMGT 1102	Interpersonal Skills	2
BMGT 2216	Business Ethics	3
BMGT 2250	Project Management Principles	3
BMGT 2258	Operations Management	3
COLS 1101	College Success Skills	1
GIS 1100	Introduction to GIS	3
GIS 1200	GIS Software I	2
IMM 1120	Fundamentals of Interactive Media	4
ITST 1101	Industrial Applications and Software	2
ITST 2252	Scripting Fundamentals	2
SCM 1100	Supply Chain Mgmt Principles	3

Approved Technical Electives - select a minimum of 3-4 credit hours   **Units:** 0

CSCI 1101	Computer Concepts & Apps	3
CSCI 1275	Business Analysis with Agile Development Frameworks	3
CSCI 1152	Networking Concepts (Network+)	3
CSCI 1630	C# Programming I	3
CSCI 2370	Database Systems Programming	3
CSCI 2371	Database Adminstration & Data Mining	4
CSCI 2447	JavaScript Fundamentals	3
CSCI 2467	Java Programming I	3
CSCI 2521	C++ Programming	3

Second Writing Course - select 3 credit hours   **Units:** 0

ENGL 2767	Comp II Writing About Science/Technology	3
COMM 2204	Technical Writing	3

Seminar and Practicum OR Capstone   **Units:** 0

CSCI 2802	CSCI Seminar	1
AND		
CSCI 2902	CSCI Practicum	3
AND		
CSCI 2999	CSCI Capstone	3
OR		

Total: 60-62

DATA ANALYTICS

Description

In today's world, data and our ability to store and process it has revolutionized our daily lives and decision-making. The Data Analytics Certificate program provides students with a working knowledge of data management and data analytics tools and techniques so that they are able to communicate their insights and support data-driven processes. Course topics provide exposure to the various types and sources of data, an overview of how data are stored, mined and analyzed for descriptive, predictive and prescriptive purposes, and how data are organized to make compelling and actionable recommendations, reports and visualizations. Students will learn how to source and process data, how to use current tools and techniques to derive insights from data, how to use data to communicate meaningful stories, and how to think critically about data including topics such as bias, data privacy, and ethical use.

Software/Hardware Requirements:
Students taking courses in this curriculum may need to own or have access to hardware/software to pursue this degree. This is particularly important for students who are enrolled in online/distance learning (DL) sections of a particular course. Check with the program adviser to discuss specific course needs and options.

Career Opportunities

Analytics-focused career options include work with data analysis/business intelligence teams within an organization in roles such as Data Analyst, Business Analyst, or ETL Developer. Students completing this plan of study will also have the skills and knowledge for positions in the broader IT field including Database developer and Database Administrator.

Based on labor market data from EMSI, Data Practitioner related occupations such as Computer Analysts, Social Science Research Assistants, and Statistical Assistants are projected to grow upwards of 20% by the year 2024.

Also per EMSI, by 2024, central Ohio employers in retail, healthcare, logistics, banking, government, and other fields, will need 1,794 additional technicians earning wages averaging $38.10/hour.

Program Learning Outcomes

Upon successful completion of this program, students will be able to:

1. Clean, transform and analyze data in diverse formats and structures using programming languages used in data analytics.

2. Produce and interpret numerical summaries and data visualizations to describe, explore and communicate insights from data.

3. Manage data (extract, merge, transform, check for quality, etc.) using a relational database language and other programming languages as appropriate.

4. Identify and communicate the impacts of ethical and privacy related concerns that arise when sourcing, processing and analyzing data.

5. Determine and document project requirements.

Degree Requirements:

Prerequisites		Units: 11
CSCI 1103	Intro to Programming Logic	3
MATH 1146	College Algebra Plus	5
CSCI 1320	Database Fundamentals	3

First Semester		Units: 7
CSCI 1420	Analytical and Computational Foundations for Data Analytics I	2
CSCI 1421	Analytical and Computational Foundations for Data Analytics II	2
STAT 1400	Statistical Concepts for Business	3

Second Semester		Units: 8
CSCI 2420	Data Analysis I	2
CSCI 2421	Data Analysis II	2
CSCI 2422	Data Visualization I	2
CSCI 2423	Data Visualization II	2

Total: 26

Columbus State Community College
Computer Science Department

COURSE NUMBER: CSCI 1420
COURSE TITLE: Analytical and Computational Foundations of Data Analytics I
INSTRUCTOR: Britney Williams-Ward   **CONTACT:** bwilliams32@cscc.edu
Credits / Class Hours per Week: 2/4   **PREREQUISITES:** none

DESCRIPTION OF COURSE: Analytical and Computational Foundations for Data Analytics I begins a course sequence that provides the analytical and computational foundation for the study of more advanced topics in analytics, visualization and data mining. This sequence will discuss what data are, how they are sourced, and how they are managed. Additionally, the mathematical, statistical and programming foundations of data analytics and visualization will be introduced.

COURSE STUDENT LEARNING OUTCOMES:
- Define and identify characteristics of data, data literacy, analytics, critical thinking, and related concepts that are foundational to the study of data analytics.
- Identify both popular and emerging tools, techniques, and frameworks that are found in a data worker's toolbox.
- Select and apply appropriate techniques for describing and analyzing data.
- Use spreadsheets to organize, clean, and manipulate data for analysis.
- Discuss examples, case studies, and current events that illustrate how data and analytics are used to make decisions.
- Apply critical thinking to data use.
- Identify and describe ethical practices around data use.

PROGRAM OUTCOMES:
- Clean, transform and analyze data in diverse formats and structures using programming languages used in data analytics.
- Produce and interpret numerical summaries and data visualizations to describe, explore and communicate insights from data.
- Identify and communicate the impacts of ethical and privacy related concerns that arise when sourcing, processing and analyzing data.

OUTCOMES BASED ASSESSMENT OF STUDENT LEARNING: For this course, students are expected to demonstrate the skills associated with the Institutional Learning Goals (ILG) identified below:
- Critical Thinking
- Ethical Reasoning
- Quantitative Skills
- Technological Competence
- Professional and Life Skills

1

In class students are assessed on their achievement of these outcomes. Names will not be used when reporting results. Outcomes-based assessment is used to improve instructional planning and design and the quality of student learning throughout the college.

COURSE MATERIALS REQUIRED
- Microsoft Excel
- Internet Access

TEXTBOOK(S), MANUALS, REFERENCES, AND OTHER READINGS

1. Data Literacy Fundamentals: Understanding the Power and Value of Data, Ben Jones, Data Literacy Press, 2020, ISBN: 978-1-7332634-2-9 (paperback) or ISBN-13: 978-1-7332634-3-6 (eBook)

Notes:
- Students will access sections of additional books using their O'Reilly Media account which will be addressed in the first week of class.
- Additional resources, online materials, videos and podcasts will be available on the Blackboard site.

GENERAL INSTRUCTIONAL METHODS
- Demonstrations / Hands on (learning by doing)
- Assigned Reading / Viewing / Listening
- Active and Collaborative Teamwork
- Discussions

STANDARDS AND METHODS FOR EVALUATION

First Week Quiz—The first week quiz is designed to assess that students are familiar with the course, course navigation, and course expectations. Students will have unlimited attempts to complete this quiz, and may not progress through the remaining course units until it has been completed with a score of 100%.

Unit Practice —Practice assignments are designed to provide practice of skills and concepts introduced in class. Practice will be submitted through Blackboard before the due date, and are designed to allow students unlimited attempts to work through problems and receive immediate feedback.

Discussion Boards—Graded discussions are designed to explore topics of interest in greater depth, to interact with peers and to receive feedback on thoughts and ideas. No late discussion boards will be accepted unless arrangements have been made with the Instructor prior the discussion board due date.

Course Mini Projects – Course Mini projects are designed to give students an opportunity to work more extensively on concepts learned in class. These projects build on themselves as students skill and data literacy increases. Mini Projects are graded for completion and effort toward stated assignment objectives, and are designed for students to receive feedback on the work that they have completed. Work on the mini projects should be taken seriously as they will help the students to build and receive feedback on parts of the final course project.

Final Project Report—Students will complete one final project report for the course. The final project is designed to give the student a chance to build their analytics portfolio polishing the concepts and techniques learned in class and practiced in the course mini-projects. Students are expected to take mini-project feedback into consideration when working to compile the final project report. Final project reports are graded for professionalism, accuracy, and clarity.

Course Goals Journal and Final Reflection Essay – The course goals journal provides students with the opportunity to reflect on their individual data goals and course goals. The final reflection essay is assigned to encourage students to reflect on their own data-related goals and learning process. The final reflection assignment requires students to reflect on their course goals journal to compose one final reflective composition.

Analytics Toolbox Assignment – This assignment allows students to explore a data-related role and to evaluate their own skills in relation to the requirements of the role being explored.

Final Exam—Students will complete one comprehensive final exam as scheduled by the College. The final exam will assess that course outcomes have been achieved and will consist of knowledge-based questions (know) as well as data analysis tasks (show). Students have one attempt at the final exam. Students not available for the Final Exam are expected to inform the Instructor as far in advance of the exam as possible to make alternate arrangements. The exam must be attempted to successfully complete the course.

Item	Points	Percentage
First Week Quiz	10	2%
Course Goals Journal	25	5%
Discussion Boards (Current Event Discussion (1 @ 50 points); Unit Discussions (3 @ 10 points each))	80	16%
Unit Practice Assignments (10 @ 10 points each)	100	20%
Course mini projects (4 @ 15 points each)	60	12%
Final Project Report	40	8%
Analytics Toolbox Assignment	30	6%
Final Reflection Essay	30	6%
Final Exam (knowledge test - 50, analysis problems - 75)	125	25%
Total Points	**500**	**100%**

GRADING SCALE

450-500 points	90 - 100%	A
400-449 points	80 - 89%	B
350-399 points	70 – 79%	C
300-349 points	60 – 69%	D
299 and below	0 – 59%	E

SPECIAL COURSE REQUIREMENTS
None

COURSE POLICIES:

ATTENDANCE POLICY

You are expected to log in to the class Blackboard site frequently. Course materials will be available to you online, and you will be expected to study, read, and complete activities, quizzes and assignments on your own.

I do keep attendance as part of student financial aid reporting requirements, but I do not grade attendance. Attendance is considered to be logging onto the Blackboard course website at least once a week and participating by completing and submitting assignments and other course work on time.

You are expected to be present at every Live Online class session that you can, and you will be responsible for the material covered in the class sessions. Live Online class sessions will be recorded, and will be made available to the class after the session has concluded.

If you are going to be absent, it is your responsibility to ensure that you arrange with another student, or students, to get the materials you missed. It isn't a bad thing to start making connections and networking with others. You may find that in providing help to others, you might in turn receive help when you need it.

I do not provide notes of my lectures and I won't hold a one-on-one session with you to repeat the material that I covered in class.

ASSIGNMENT SUBMISSION POLICY

Assignments will not be accepted via e-mail. They must be submitted in the manner requested in Blackboard to receive credit.

LATE POLICY

Many of the assignments in this class build upon one another. It is, therefore, important that you make every effort to keep current with the course and assignment submission schedule. I will provide feedback on assignments that you submit. You can use this feedback to improve future assignment submissions. If you miss assignments, you forfeit the benefit of making incremental improvements to your work over time.

Because of this, I expect that all work is turned in by the deadline established on the course schedule. Assignments not submitted by the established deadline will not receive credit.

The exception to this policy is when you talk to me in advance of the deadline. If you cannot get an assignment turned in, let me know a few days before the due date and we can make other arrangements. If you talk to me after the due date, it is unlikely that I will extend a deadline.

ADDITIONAL POLICIES

Meetings with faculty:
Feel free to schedule a meeting with me during my regular meeting hours, or email me to make an appointment to meet sometime when you can. Meetings will take place on Zoom or via phone this semester.

Formalities:
Please call me Britney. If it makes you more comfortable, you may address me as Mrs. Williams-Ward. Please also write emails to me in polite form, with a salutation, complete English sentences, etc. These do not have to be especially formal, but they do have to meet basic professional standards.

Email:
As a general rule, I try to respond to emails within 24 hours. I often take off weekends, so if you email me on Friday afternoon, you may not get a response until Monday. Also, you must send emails from your CSCC email address to be in compliance with federal privacy regulations. I will not respond to any student emails that originate from other than CSCC. Always provide a clear subject line. Always include your first and last name in the email message along with the class that you are taking from me.

Working Ahead:
Course readings, recordings, activities, and supplementary materials will be provided in the 'Our Classroom' section of Blackboard. ***You will be expected to understand and work through each unit as set forth in the Units of Instruction document.*** The Units of Instruction guides you through the appropriate units and assignments for each week. This will enable you to work through the content as it fits best into your schedule each week. ***Feel free to read ahead – you may, however, find that additional resources, recordings, and instruction are shared during the week that the unit is covered.***

Group Work:
I encourage you to form study groups and find informal opportunities to interact with your classmates. While I expect assignments and quizzes to be completed independently, you may find that discussing ideas and activities is helpful to your learning process. You may also find that in providing help to others, you might in turn receive help when you need it.

Academic Misconduct:
I take matters of academic integrity seriously and do not tolerate plagiarism or academic misconduct of any kind. No matter how seemingly insignificant, any plagiarism (or other academic dishonesty) of any kind at any point in the course can result in the following: (a) a failing grade for the assignment and/or course, and (b) report of misconduct to the department and College.

No student shall engage in behavior which, in my judgment may be construed as academic dishonesty. This may include, but is not limited to, plagiarism, presenting another individual's ideas, data, words, images, or other products without giving credit to the originator, or other forms of academic dishonesty, such as the acquisition (without permission) of tests or other academic materials and/or distribution of the same, or acts of collusion. This includes students who aid and abet, as well as those who attempt such behavior.

Please familiarize yourself with examples and types of **academic misconduct** and let me know immediately if you have any questions.

COLLEGE SYLLABUS STATEMENTS Columbus State Community College required College Syllabus Statements on College Policies and Student Support Services can be found at
- Standard Syllabus Statement: Student Resources, Rights, and Responsibilities

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Syllabus Disclaimer: I do not anticipate any changes to the syllabus. This syllabus acts as a set of principles and guidelines to the direction of the course, but I may change it if I deem it necessary to do so to ensure an effective learning experience for all.

Any changes will be announced in class, and subsequent revisions of the syllabus will be posted to Blackboard accompanied by a Blackboard announcement and email to all students.

Units of Instruction | CSCI-1420 Foundations of Data Analytics I

	Week	Unit of Instruction	Description	Assignments	Assignment Due Date*
Set Up and Foundations					
	Week 1 8/29-9/4	Unit A: Welcome to Class	In this unit, you will gain familiarity with the course site, contents, and where we are headed in this class.	First Week Quiz	Week 2 (9/5)
				Course Goals Journal	Week 2 (9/5)
				Introduce Yourself Discussion	Week 2 (9/5)
	Week 1 8/29-9/4	Optional – Excel Tutorials	Excel resources, tutorials, and enrichment	na	na
Data Literacy Fundamentals					
	Week 1 8/29-9/4	Unit B: Data: The Foundation of Information, Knowledge, and Wisdom	In this unit, you will gain an understanding of how data is at the foundation of information, knowledge and wisdom, how data informs decision making, and how intuitive thinking and analytical thinking work together.	Unit B Practice	Week 2 (9/5)
	Week 2 9/5-9/11	Unit C: Data: Domains and Scales	In this unit, you will define different domains in our lives where data is generated and consumed. You will also be able to discuss data in terms of its structure and the types of analysis that can be done with it.	Data In Your Life Discussion	Week 3 (9/12)
				Unit C Practice	Week 3 (9/12)

All assignments are due by 2pm on the date specified unless otherwise indicated

Units of Instruction | CSCI-1420 Foundations of Data Analytics I

	Week	Unit of Instruction	Description	Assignments	Assignment Due Date*
	Week 2 9/5-9/11	Unit D: Spreadsheet Foundations I: Exploring and Documenting Datasets	In this unit, you will use spreadsheets to read data and organize data. Additionally, you will experience how spreadsheets are used to document and communicate information about a dataset. Data dictionaries are introduced.	Unit D Practice Mini Project 1 – Data Dictionary	Week 3 (9/12) Week 3 (9/12)
	Week 3 9/12-9/18	Unit E: Using Data for Analysis	In this unit, you will distinguish between different types of data analysis, and identify when each type of analysis is appropriate (i.e. for what types of analysis questions).	Unit E Practice Assign Current Event Discussion	Week 4 (9/21) Original Post due by Week 6 (now to 10/4) Responses due Week 8 (now to 10/18)
	Week 3 9/12-9/18	Unit F: Spreadsheet Foundations II: Descriptive and Inferential Data Analysis	In this unit, you will analyze data using descriptive and inferential data analysis.	Unit F Practice Mini Project 2 – Describing Data	Week 4 (9/21) Week 4 (9/21)
	Week 4 9/19-9/25	Unit G: Representing Data Visually	In this unit, you will describe the purpose of visualizing data, and identify different ways in which data are represented visually. You will also discuss the value of data storytelling.	Unit G Practice	Week 5 (9/27)

All assignments are due by 2pm on the date specified unless otherwise indicated

Units of Instruction | CSCI-1420 Foundations of Data Analytics I

	Week	Unit of Instruction	Description	Assignments	Assignment Due Date*
	Week 4 9/19-9/25	Unit H: Spreadsheet Foundations III: Visualizing Data	In this unit, you will create displays of data using spreadsheets to communicate information about data.	Unit H Practice Mini Project 3 – Visualizing Data	Week 5 (9/27) Week 5 (9/27)
	Week 5 9/26-10/2	Unit I: Data Activities from Creation to Decision	In this unit, you will identify various types of data activities within an organization. You will relate data activities with roles in various data-related professions, and you will be able to detail the types of activities that each role engages in.	Unit I Practice	Week 6 (10/4)
	Week 5 9/26-10/2	Unit J: Spreadsheet Foundations IV: Sorting and Organizing Data	In this unit, you will practice tasks performed by data analysts to prepare data for analysis. Topics explored will include sorting, organizing, and cleaning data in order to prepare it for analysis.	Unit J Practice Mini Project 4 – Spreadsheet Analysis	Week 6 (10/4) Week 6 (10/4)
Building Data Awareness					
	Week 6 10/3-10/9	Unit K: Privacy and Ethics in Data Analytics	In this unit, you will identify and describe privacy and ethical considerations that exist in the world of data.	Unit K Practice Code of Ethics Discussion	Week 7 (10/11) Week 7 (10/11)

All assignments are due by 2pm on the date specified unless otherwise indicated

	Week	Unit of Instruction	Description	Assignments	Assignment Due Date*
	Week 7 10/10-10/16	Unit L: Building Your Analytics Toolbox	In this unit, you will be introduced to the different tools and skills that are used in the analytics, data science and business intelligence space and identify what we will use in the analytics curriculum. You will also understand the layout of the analytics program of study and be introduced to the analysts portfolio. You will develop a personal plan for studies and outlook in the space	Building Your Analytics Toolbox Assignment

Final Project Report | Week 8 (10/18)

Week 8 (10/18) |
	Week 7 10/10-10/16	Unit M: Bringing it All Together (Framing a Data Question)	In this unit, you will practice forming questions for analysis and discuss what it means to follow a line of inquiry.	Final Reflection Essay	Week 8 (10/20) – *due Thursday by 11pm*
	Week 8 10/17-10/23	Wrap Up / Review	Wrap Up / Review	na	na
	Week 8 10/17-10/23	Final Exam	Final Exam	Final Exam	Week 8 (10/20) – *due Thursday by 11pm*

All assignments are due by 2pm on the date specified unless otherwise indicated

Columbus State Community College
Computer Science Department

COURSE NUMBER: CSCI 1421
COURSE TITLE: Analytical and Computational Foundations of Data Analytics II
INSTRUCTOR: **Britney Williams-Ward**   CONTACT: bwilliams32@cscc.edu
Credits / Class Hours per Week: 2/4   **PREREQUISITES:** CSCI 1420 and CSCI 1103

DESCRIPTION OF COURSE: Analytical and Computational Foundations for Data Analytics II continues the course sequence that provides the analytical and computational foundations for the study of more advanced topics in analytics, visualization and data mining. This sequence will discuss what data are, how they are sourced, and how they are managed. Additionally, the mathematical, statistical, and programming foundations of data analytics and visualization will be introduced.

This course offers practical, hands-on foundations in analytical and computational thinking using Python and R, the two leading programming languages used in Data Science & Analytics. Not only will you practice your coding skills (more tools for your toolbox), you will also be challenged to exercise your problem solving and critical thinking skills.

COURSE STUDENT LEARNING OUTCOMES:
- Practice computational thinking in the design and implementation of solutions to analytical problems.
- Read and write datasets using R and Python.
- Identify appropriate packages and libraries used to explore, analyze, and visualize data.
- Create programs using R and Python to explore data, analyze data, and visualize data.
- Identify and use common Integrated Development Environments (IDEs) used in Data Science and Analytics.
- Solve analytical problems and interpret results.

PROGRAM OUTCOMES:
- Determine and document project requirements.
- Clean, transform and analyze data in diverse formats and structures using programming languages used in data analytics.
- Produce and interpret numerical summaries and data visualizations to describe, explore and communicate insights from data.
- Identify and apply programming logic concepts.
- Identify and communicate the impacts of ethical and privacy related concerns that arise when sourcing, processing and analyzing data.

OUTCOMES BASED ASSESSMENT OF STUDENT LEARNING: For this course, students are expected to demonstrate the skills associated with the Institutional Learning Goals (ILG) identified below:
- Critical Thinking
- Quantitative Skills
- Technological Competence

In class students are assessed on their achievement of these outcomes. Names will not be used when reporting results. Outcomes-based assessment is used to improve instructional planning and design and the quality of student learning throughout the college.

COURSE MATERIALS REQUIRED
- Internet Access
- Microsoft Excel
- Python (Anaconda distribution)
- Jupyter Notebook
- R
- RStudio

TEXTBOOK(S), MANUALS, REFERENCES, AND OTHER READINGS
1. **Python for Data Analysis**, Wes McKinney, 3rd Edition, 2022, O'Reilly Media, Inc. ISBN-13: 978-1098104030
2. **Learning R**, Richard Cotton, 2013, O'Reilly Media, Inc. ISBN-13: 978-1449357108

Note: There are no texts that you will need to purchase for this course. All course materials are available online via the class O'Reilly Media playlist and/or other resource provided in class.

GENERAL INSTRUCTIONAL METHODS
- Demonstrations / Hands on (learning by doing)
- Assigned Reading / Viewing / Listening
- Active and Collaborative Learning
- Discussions

STANDARDS AND METHODS FOR EVALUATION

Assignments—Assignments are designed to provide independent practice and additional investigation into the skills and concepts introduced in class. These exercises are to be submitted through Blackboard before the due date. No late submissions will be accepted unless arrangements have been made with the Instructor prior to the assignment due date.

Guided Practice—Guided Practice exercises are designed to supplement in class introduction of the course topics and to drill on the computational and syntax aspects of programming languages and tools. These assignments must be submitted through Blackboard to receive credit. No late assignments will be accepted unless arrangements have been made with the Instructor prior to the assignment due date.

Discussion Boards—Graded discussions are designed to generate interaction with peers and to receive feedback on thoughts and ideas. No late discussion boards will be accepted unless arrangements have been made with the Instructor prior to the discussion board due date.

Set Up Check Ins—Set Up Check Ins provide students with the opportunity to document and receive feedback on their setup of course-required programming tools and environments. These assignments will require screenshots which will be submitted in Blackboard.

Course Goals Essay and Final Reflection Essay – The course goals essay provides students with the opportunity to reflect on their individual data goals and course goals. The final reflection essay is assigned to encourage students to reflect on their own data-related goals and learning process. Students will reflect on their course goals essay to compose one final reflective composition. These assignments will be turned in on Blackboard. No late essays will be accepted unless arrangements have been made with the Instructor prior to the due date.

Exams—Students will complete two exams, one focusing on problem solving / critical thinking skills using the Python programming language, and the other focusing on problem solving / critical thinking skills using the R programming language. The exams will assess that course outcomes have been achieved and will consist of knowledge-based questions and open-ended programming and essay questions. Students have one attempt at each exam. Both exams must be attempted to successfully complete the course.

Item	Points	Percentage
Assignments (5 @ 30 points each)	150	30%
Guided Practice (4 @ 25 points each)	100	20%
Discussion Boards (2 @ 15 points each)	30	6%
Set Up Check Ins (2 @ 15 points)	30	6%
Exams (2 @ 75 points each)	150	30%
Course Goals Essay	20	4%
Final Reflection Essay	20	4%
Total Points	**500**	**100%**

GRADING SCALE

450-500 points	90 - 100%	A
400-449 points	80 - 89%	B
350-399 points	70 – 79%	C
300-349 points	60 – 69%	D
299 and below	0 – 59%	E

SPECIAL COURSE REQUIREMENTS
None.

ATTENDANCE POLICY

You are expected to log in to the class Blackboard site frequently. Course materials will be available to you online, and you will be expected to study, read, and complete activities, quizzes and assignments on your own.

I do keep attendance as part of student financial aid reporting requirements, but I do not grade attendance. Attendance is considered to be logging onto the Blackboard course website at least once a week and participating by completing and submitting assignments and other course work on time.

You are expected to be present at every Live Online class session that you can, and you will be responsible for the material covered in the class sessions. Live Online class sessions will be recorded, and will be made available to the class after the session has concluded.

If you are going to be absent, it is your responsibility to ensure that you arrange with another student, or students, to get the materials you missed. It isn't a bad thing to start making connections and networking with others. You may find that in providing help to others, you might in turn receive help when you need it.

I do not provide notes of my lectures and I won't hold a one-on-one session with you to repeat the material that I covered in class.

ASSIGNMENT SUBMISSION POLICY

Assignments will not be accepted via e-mail. They must be submitted in the manner requested in Blackboard to receive credit.

LATE POLICY

Many of the assignments in this class build upon one another. It is, therefore, important that you make every effort to keep current with the course and assignment submission schedule. I will provide feedback on assignments that you submit. You can use this feedback to improve future assignment submissions. If you miss assignments, you forfeit the benefit of making incremental improvements to your work over time.

Because of this, I expect that all work is turned in by the deadline established on the course schedule. Assignments not submitted by the established deadline will be accepted for up to 1 week after the deadline and will receive a grade penalty of 25%. This means that I will accept

late assignments, but the maximum score that you will receive for late assignments is 75% of the available assignment points. After one week, late assignments will receive no credit.

The exception to this policy is when you talk to me in advance of the deadline. If you cannot get an assignment turned in, let me know a few days before the due date and we can make other arrangements. If you talk to me after the due date, it is unlikely that I will waive the late penalty.

Please adhere to the due dates published on the course Units of Instruction. All assignments are due by 11pm on the dates published.

ADDITIONAL POLICIES

Meetings with faculty:
Feel free to schedule a meeting with me during my regular meeting hours, or email me to make an appointment to meet sometime when you can. Meetings will take place on Zoom or via phone this semester.

Formalities:
Please call me Britney. If it makes you more comfortable, you may address me as Mrs. Williams-Ward. Please also write emails to me in polite form, with a salutation, complete English sentences, etc. These do not have to be especially formal, but they do have to meet basic professional standards.

Email:
As a general rule, I try to respond to emails within 24 hours. I often take off weekends, so if you email me on Friday afternoon, you may not get a response until Monday. Also, you must send emails from your CSCC email address to be in compliance with federal privacy regulations. I will not respond to any student emails that originate from other than CSCC. Always provide a clear subject line. Always include your first and last name in the email message along with the class that you are taking from me.

Working Ahead:
Course readings, recordings, activities, and supplementary materials will be provided in the 'Our Classroom' section of Blackboard. ***You will be expected to understand and work through each unit as set forth in the Units of Instruction document.*** The Units of Instruction guides you through the appropriate units and assignments for each week. This will enable you to work through the content as it fits best into your schedule each week. ***Feel free to read ahead – you may, however, find that additional resources, recordings, and instruction are shared during the week that the unit is covered.***

Group Work:
I encourage you to form study groups and find informal opportunities to interact with your classmates. While I expect assignments and quizzes to be completed independently, you may

find that discussing ideas and activities is helpful to your learning process. You may also find that in providing help to others, you might in turn receive help when you need it.

Academic Misconduct:
I take matters of academic integrity seriously and do not tolerate plagiarism or academic misconduct of any kind. No matter how seemingly insignificant, any plagiarism (or other academic dishonesty) of any kind at any point in the course can result in the following: (a) a failing grade for the assignment and/or course, and (b) report of misconduct to the department and College.

No student shall engage in behavior which, in my judgment may be construed as academic dishonesty. This may include, but is not limited to, plagiarism, presenting another individual's ideas, data, words, images, or other products without giving credit to the originator, or other forms of academic dishonesty, such as the acquisition (without permission) of tests or other academic materials and/or distribution of the same, or acts of collusion. This includes students who aid and abet, as well as those who attempt such behavior.

Please familiarize yourself with examples and types of **academic misconduct** and let me know immediately if you have any questions.

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Any changes will be announced in class, and subsequent revisions of the syllabus will be posted to Blackboard accompanied by a Blackboard announcement and email to all students.

Units of Instruction | CSCI-1421 Foundations of Data Analytics II

	Week	Unit of Instruction	Description	Assignments	Assignment Due Date
Set Up and Foundations					
	Week 1 10/24-10/30	Unit A: Welcome to Class	In this unit, you will gain familiarity with the course site, contents, and where we are headed in this class.	Introduce Yourself Discussion Board 1 Course Goals Reflection	Week 2 (11/1)
		Unit B: Intro to Computational Thinking	In this unit, we will formalize computational thinking and related concepts. From Unit C, we will set up our environment so that we can dive in with Python next week	Practicing Computational Thinking Discussion Board 2 Python Set Up Check In	Week 2 (11/1) Week 2 (10/31 – please complete before class)
Adding to Our Toolbox: Python/Jupyter Notebook					
	Week 2 10/31-11/6	Unit C: Introduction to Python and Jupyter Notebook	In this unit, we will introduce and use Python and Jupyter Notebook.	Assignment 1 Guided Practice 1	Week 3 (11/8)
	Week 3 11/7-11/13	Unit D: Python for Data Analysis	In this unit, we will use Python libraries for data analysis including numpy, pandas, and matplotlib.	Assignment 2 Guided Practice 2	Week 4 (11/15)
	Week 4 11/14-11/20	Unit E: Problem Solving with Python	In this unit, will continue to use Python as we explore additional problems and applications.	Assignment 3	Week 5 (11/22)

*All assignments are due by 11pm on the date specified unless otherwise indicated

Units of Instruction | CSCI-1421 Foundations of Data Analytics II

	Week	Unit of Instruction	Description	Assignments	Assignment Due Date
Adding to Our Toolbox: R/RStudio					
	Weeks 5 11/21-11/27	Unit F: Introduction to R and R Studio	In this unit, we will introduce and install R and RStudio.	Assign Exam 1 R Set Up Check In	Week 6 (11/29) Week 6 (11/28 – please complete before class)
	Week 6 11/28-12/4	Unit G: R Foundations	In this unit, we will explore programming foundations in R.	Assignment 4 Guided Practice 3	Week 7 (12/6)
	Week 7 12/5-12/11	Unit H: R for Data Analysis	In this unit, we will use R to analyze data and create visualizations.	Assignment 5 Guided Practice 4 Assign Exam 2 Assign Final Reflection	Week 8 (12/13) Week 8 (12/15 – note this is a Thursday)
Course Wrap Up					
	Week 8 12/12-12/18	Final Review and Exam	Students will complete the Final Exam and Reflection	Final Exam due Final Reflection due	

*All assignments are due by 11pm on the date specified unless otherwise indicated

Columbus State Community College
Computer Science Department

COURSE NUMBER: CSCI 2420
COURSE TITLE: Data Analysis I
INSTRUCTOR: **CONTACT:**
Credits / Class Hours per Week: 2/4   **PREREQUISITES:** CSCI 1421

DESCRIPTION OF COURSE: Data science is about 80% data preparation and 20% modeling. Data Analysis I begins a two-course sequence that explores the better part of the 80%: methods for collecting and extracting data, joining data, aggregating data, cleaning and pre-processing data. Students will learn how to ask questions of the data that they have, how to enrich data, clean data, handle missing values and how to aggregate it so that the data are ready for analysis. Ethical considerations for decisions made in data pre-processing will also be discussed. Use cases for both structured and unstructured data will be explored. Current methodologies for conducting data analysis and data mining will be used.

COURSE STUDENT LEARNING OUTCOMES:
- Students will demonstrate knowledge of common data sources and processes used to get data and clean.
- Students will demonstrate knowledge of approaches and techniques to assess and improve data quality.
- Students will demonstrate knowledge of data munging and wrangling techniques to derive insights from data.

PROGRAM OUTCOMES:
- Determine and document project requirements.
- Clean, transform and analyze data in diverse formats and structures using programming languages used in data analytics.
- Produce and interpret numerical summaries and data visualizations to describe, explore and communicate insights from data.
- Identify and apply programming logic concepts.
- Manage data (extract, merge, transform, check for quality, etc.) using a relational database language and other programming languages as appropriate.
- Identify and communicate the impacts of ethical and privacy related concerns that arise when sourcing, processing and analyzing data.

OUTCOMES BASED ASSESSMENT OF STUDENT LEARNING: For this course, students are expected to demonstrate the skills associated with the Institutional Learning Goals (ILG) identified below:
- Critical Thinking

- Ethical Reasoning
- Quantitative Skills
- Technological Competence

In class students are assessed on their achievement of these outcomes. Names will not be used when reporting results. Outcomes-based assessment is used to improve instructional planning and design and the quality of student learning throughout the college.

COURSE MATERIALS REQUIRED
- Microsoft Excel
- Internet Access
- Jupyter Notebooks

TEXTBOOK(S), MANUALS, REFERENCES, AND OTHER READINGS

1. *Python for Data Analysis,* Wes McKinney, O'Reilly Media Inc, 2017 ISBN: 9781491957660

2. *Data Wrangling with Python*, Shubhadeep Roychowdhury and Dr. Tirthajyoti Sarkar, Packt Publishing, 2019 ISBN: 9781789800111

3. *Principles of Data Wrangling*, Sean Kandel, Connor Carreras, Tye Rattenbury, Joseph M. Hellerstein, Jeffrey Heer, O'Reilly Media, 2017 ISBN: 9781491938928

Note: The books for this class are provided to you through the Columbus State library's Safari Online database. There are no books for you to purchase; your books will be available to you online. You are, of course, welcome to purchase the book on your own, but it is not necessary to do so for this class.

The occasional chapter from another book as well as online materials, videos and podcasts will be available on the Blackboard site as well.

GENERAL INSTRUCTIONAL METHODS
- Demonstrations / Hands on (learning by doing)
- Assigned Reading / Viewing / Listening
- Active and Collaborative Teamwork
- Discussions

STANDARDS AND METHODS FOR EVALUATION

Assignments—Assignments are designed to provide practice of skills and concepts introduced in class. Assignments will be submitted through Blackboard before the due date. No late submissions will be accepted unless arrangements have been made with the Instructor prior to the assignment due date. The lowest assignment score will be dropped when computing final grades.

Lab Activities—Lab activities are designed to provide a guided learning experience and to serve as a measure of participation in and progress through the course material. As such, labs will be graded as complete (full credit) or incomplete (no credit). Labs must be submitted through Blackboard to receive credit. No late labs will be accepted unless arrangements have been made with the Instructor prior to the lab due date. The lowest lab score will be dropped when computing final grades.

Discussion Boards—Graded discussions are designed to explore topics of interest in greater depth, to interact with peers and to receive feedback on thoughts and ideas. No late discussion boards will be accepted unless arrangements have been made with the Instructor prior the discussion board due date.

Quizzes—Quizzes will be provided on Blackboard. Students will have one attempt to complete each quiz and will receive feedback upon submission. Quizzes are not cumulative and must be completed within a single session. No late quizzes will be accepted unless arrangements have been made with the Instructor prior to the quiz due date. The lowest quiz score will be dropped when computing final grades.

Final Project—Students will complete one final project assigned early in the semester. The final project is designed to give the student a chance to build their analytics portfolio while practicing the concepts and techniques learned in class.

Final Exam—Students will complete one comprehensive final exam as scheduled by the College. The final exam will assess that course outcomes have been achieved and will consist of knowledge-based questions as well as response and execution problems. Students have one attempt at the final exam. Students not available for the Final Exam are expected to inform the Instructor as far in advance of the exam as possible to make alternate arrangements. The exam must be attempted to successfully complete the course.

Item	Points	Percentage
Assignments (7 @ 10 points each)	70	14%
Lab Activity (weekly) (7 @ 5 points each)	35	7%
Discussion Boards (7 @ 5 points each)	35	7%
Quizzes (5 @ 25 points each)	125	25%
Final Project	110	22%
Final Exam	125	25%
Total Points	**500**	**100%**

GRADING SCALE

450-500 points	90 - 100%	A
400-449 points	80 - 89%	B
350-399 points	70 – 79%	C
300-349 points	60 – 69%	D
299 and below	0 – 59%	E

SPECIAL COURSE REQUIREMENTS
None.

ATTENDANCE POLICY

You are expected to attend every class session that you can. I do keep attendance as part of student financial aid reporting requirements, but I do not grade attendance. It is up to you to determine your participation in this class. However, please know that I will discuss, demonstrate, and help you to concretize concepts in class that otherwise will be very difficult without a great amount of effort on your part reading through websites, blogs, and other materials to find what you missed. Also, I do not provide notes of my lectures and I won't hold a one-on-one session with you to repeat the material that I covered in class.

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Any changes will be announced in class, and subsequent revisions of the syllabus will be posted to Blackboard accompanied by a Blackboard announcement and email to all students.

Week	Unit of Instruction	Learning Objectives/Goals	Assessment Methods	Assignments	Assignment Due Date
Week 1	Welcome to Class | What is Data Analysis and the Data Analysis process?	• Review syllabus and set up of the course • Discuss how to be successful in this class • Define data analysis and EDA • Set forth the goals of data analysis (quality, insight, reproducibility, etc) • Review the data analysis process; contextualize where we are in CRISP-DM model	Assignments Labs Discussion Quizzes Final	Quiz 1 Discussion Board 1	Week 2
Week 2	Getting Data: Primary Data	• Define primary and secondary data • Identify primary data sources • Discuss potential limitations / considerations of primary data	Assignments Labs Discussion Quizzes Final	Lab 1 Assignment 1	Week 3
Week 3	Getting Data: Secondary Data	• Identify secondary data sources • Identify and explore publicly available data sources • Practice downloading data from public sites	Assignments Labs Discussion Quizzes Final	Quiz 2	Week 4

Week	Unit of Instruction	Learning Objectives/Goals	Assessment Methods	Assignments	Assignment Due Date
		• Discuss potential limitations / considerations related to secondary data			
Week 4	Getting Data: Web scraping	• Understand what web scraping is • Scrape data from a site • Discuss ethical considerations when scraping data from a site	Assignments Labs Discussion Quizzes Final	Discussion Board 2	Week 5
Week 5	Data Preprocessing Overview	• Discuss the need for data preprocessing • Review tools available for data preprocessing • Introduce thinking critically about data quality and how to identify / approach preprocessing (marrying business and data understanding with data analysis plan) • Import data into tools across various file types • Discuss and conduct basic EDA to identify candidate preprocessing concerns	Assignments Labs Discussion Quizzes Final	Lab 2 Assignment 2	Week 6
Week 6	Data Preprocessing: Handling Missing Data	• Identify missing data in a dataset • Discuss the impact of missing data on analysis	Assignments Labs Discussion Quizzes	Discussion Board 3 Quiz 3	Week 7

Week	Unit of Instruction	Learning Objectives/Goals	Assessment Methods	Assignments	Assignment Due Date
		• Understand and define strategies to fill and/or remove missing data • Implement strategies to fill missing data in tool • Discuss the implications and ethics of decisions to handle missing data • Practice judgement in filling missing data on dataset	Final		
Week 7	Data Preprocessing: Data Transformation I	• Deduplicating data • Modifying and replacing values • Renaming Axis Indexes • Discretization and Binning • Detecting and Filtering Outliers • Permutations and Random Sampling • Computing Indicator / Dummy Variables • Normalizing Data • Perform data transformation on dataset	Assignments Labs Discussion Quizzes Final	Lab 3 Assignment 3	Week 8
Week 8	Data Preprocessing: Data Transformation II	• Feature creation • Combining Variables (computing ratios)	Assignments Labs Discussion Quizzes	Discussion Board 4	Week 9

Week	Unit of Instruction	Learning Objectives/Goals	Assessment Methods	Assignments	Assignment Due Date
		• New Frequency Distribution • Logical cleaning • Converting data between types (i.e. text to numbers) and impacts • Perform data transformation on dataset	Final		
Week 9	Data Preprocessing: String Manipulation	• String Object Methods (split, strip, concatenate, join, index, find, count, replace, etc) • Regular Expressions • Perform string manipulation on dataset	Assignments Labs Discussion Quizzes Final	Lab 4 Assignment 4	Week 10
Week 10	Data Preprocessing: Time Series Data	• Discuss special considerations related to time series data • Convert between string and datetime • Periods and frequency	Assignments Labs Discussion Quizzes Final	Discussion Board 5 Quiz 4	Week 11
Week 11	Data Wrangling / Munging Overview	• Discuss the need for data wrangling / munging • Review tools available for data wrangling • Discuss thinking critically about data wrangling approach and plan	Assignments Labs Discussion Quizzes Final	Lab 5 Assignment 5	Week 12

Week	Unit of Instruction	Learning Objectives/Goals	Assessment Methods	Assignments	Assignment Due Date
Week 12	Data Wrangling / Munging: Combining and Merging Datasets	• Database-style Data Frame Joins • Hierarchical Indexing	Assignments Labs Discussion Quizzes Final	Discussion Board 6	Week 13
Week 13	Data Wrangling / Munging: Reshaping and Pivoting	• Pivoting • Transposing	Assignments Labs Discussion Quizzes Final	Lab 6 Assignment 6	Week 14
Week 14	Taking a step back	• Identify gaps in data • Data Validation best practices • Discuss ways to augment data sets	Assignments Labs Discussion Final	Discussion Board 7 Quiz 5	Week 15
Week 15	Bringing it all together: Practice and case studies	• Discuss examples, issues and ethical considerations with getting and cleaning data	Assignments Labs Final	Lab 7 Assignment 7	Week 16
Week 16	Finals Week			Final Exam & Project	

Columbus State Community College
Computer Science Department

COURSE NUMBER: CSCI 2421
COURSE TITLE: Data Analysis II
INSTRUCTOR: **CONTACT:**
Credits / Class Hours per Week: 2/4   **PREREQUISITES:** CSCI 2420

DESCRIPTION OF COURSE: Data science is about 80% data preparation and 20% modeling. Data Analysis II continues the two-course sequence and explores problem solving with data to generate insights. With well-prepared data, a variety of descriptive, diagnostic, predictive, and prescriptive analytic approaches will be explored. This course introduces some of the tools and techniques that can be used to support the data-driven decision making process, enriching those processes with insights and actionable recommendations.

COURSE STUDENT LEARNING OUTCOMES:
- Students will demonstrate knowledge of approaches and techniques to analyze data and to derive insights.
- Students will demonstrate knowledge of using data to drive decision-making, create tools, and make actionable recommendations.
- Students will demonstrate knowledge of ways that organizations compete using data and analytics.

PROGRAM OUTCOMES:
- Determine and document project requirements.
- Clean, transform and analyze data in diverse formats and structures using programming languages used in data analytics.
- Produce and interpret numerical summaries and data visualizations to describe, explore and communicate insights from data.
- Identify and apply programming logic concepts.
- Manage data (extract, merge, transform, check for quality, etc.) using a relational database language and other programming languages as appropriate.
- Identify and communicate the impacts of ethical and privacy related concerns that arise when sourcing, processing and analyzing data.

OUTCOMES BASED ASSESSMENT OF STUDENT LEARNING: For this course, students are expected to demonstrate the skills associated with the Institutional Learning Goals (ILG) identified below:
- Critical Thinking

- Quantitative Skills
- Technological Competence

In class students are assessed on their achievement of these outcomes. Names will not be used when reporting results. Outcomes-based assessment is used to improve instructional planning and design and the quality of student learning throughout the college.

COURSE MATERIALS REQUIRED
- Microsoft Excel
- Internet Access
- Jupyter Notebooks

TEXTBOOK(S), MANUALS, REFERENCES, AND OTHER READINGS

1. ***Competing on Analytics: The New Science of Winning***, Thomas H. Davenport and Jeanne G. Harris, Harvard Business Review Press, 2017 ISBN: 9781633693722

2. ***Data Science for Business***, Tom Fawcett and Foster Provost, O'Reilly Media, Inc., 2013 ISBN: 9781449351327

Important Note: The books for this class are provided to you through the Columbus State library's Safari Online database. There are no books for you to purchase; your books will be available to you online.

You are, of course, welcome to purchase the book on your own, but it is not necessary to do so for this class.

GENERAL INSTRUCTIONAL METHODS
- Demonstrations / Hands on (learning by doing)
- Assigned Reading / Viewing / Listening
- Active and Collaborative Teamwork
- Discussions

STANDARDS AND METHODS FOR EVALUATION

Assignments—Assignments are designed to provide practice of skills and concepts introduced in class. Assignments will be submitted through Blackboard before the due date. No late submissions will be accepted unless arrangements have been made with the Instructor prior to the assignment due date. The lowest assignment score will be dropped when computing final grades.

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Discussion Boards (7 @ 5 points each)	35	7%
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Week	Unit of Instruction	Learning Objectives/Goals	Assessment Methods	Assignments	Assignment Due Date
Week 1	Welcome to Class | Revisiting the Data Analysis process	- Review syllabus and set up of the course - Discuss how to be successful in this class - Revisit the goals of data analysis (quality, insight, reproducibility, etc) - Review the data analysis process and context within CRISP-DM and Competing on Analytics	Assignments Labs Discussion Quizzes Final	Quiz 1 Discussion Board 1	Week 2
Week 2	Curiosity / Asking Good Questions of data	- Data Analysis as art - Developing Subject matter expertise - Developing Business Understanding - Translating Requirements into analyses	Assignments Labs Discussion Quizzes Final	Lab 1 Assignment 1	Week 3
Week 3	What happened? Descriptive Data Analysis and Standard Reporting	- Review central tendency / frequency concepts - Introduce Exploratory Data Analysis (EDA) - Discuss aggregation and grouping / data granularity - Prepare group summaries, profiles and Crosstabs - Prepare summary tables and charts	Assignments Labs Discussion Quizzes Final	Quiz 2	Week 4

Week	Unit of Instruction	Learning Objectives/Goals	Assessment Methods	Assignments	Assignment Due Date
Week 4	How many, how often, where? Analyzing variability in data	• Create distributions from data • Continue discussion and application of EDA and apply approaches in tool • Prepare ad hoc reporting and charts	Assignments Labs Discussion Quizzes Final	Discussion Board 2	Week 5
Week 5	Where's the problem? Querying and Drilling Down into Data	• Slicing and Dicing data • Digging deeper in our lines of questioning • Continue discussion of EDA and apply approaches in tool	Assignments Labs Discussion Quizzes Final	Lab 2 Assignment 2	Week 6
Week 6	What actions are needed? Alerts	• Analyzing normal behavior of a system • Identify deviations from normal process • Introduce Six Sigma principles and discuss the intuition behind control charts	Assignments Labs Discussion Quizzes Final	Discussion Board 3 Quiz 3	Week 7
Week 7	Why is this happening?	• Explore applications of statistical significance and confidence intervals • Discuss correlation vs causation	Assignments Labs Discussion Quizzes Final	Lab 3 Assignment 3	Week 8
Week 8	What if these trends continue? Time Series	• Define time series analysis and forecasting	Assignments Labs Discussion	Discussion Board 4	Week 9

Week	Unit of Instruction	Learning Objectives/Goals	Assessment Methods	Assignments	Assignment Due Date
	Analysis and Forecasting	• Be able to generate a time series forecast • Discuss considerations faced with time series analysis and forecasts	Quizzes Final		
Week 9	What will happen next? Regression and Model Fitting I	• Understand when linear regression is appropriate • Understand the intuition behind linear regression • Be able to generate a linear regression and interpret key outputs	Assignments Labs Discussion Quizzes Final	Lab 4 Assignment 4	Week 10
Week 10	What will happen next? Other types of predictive models	• Be able to discuss and interpret key outputs to identify goodness of fit, and best regression model • Overview of Data Mining approaches for prediction (i.e. KNN, recommendation engines, etc.)	Assignments Labs Discussion Quizzes Final	Discussion Board 5 Quiz 4	Week 11
Week 11	What's the best that can happen? Prescriptive Models I	• Understand the purpose of building a model • Understand the various parameters and inputs into a model • Understand how to define a target	Assignments Labs Discussion Quizzes Final	Lab 5 Assignment 5	Week 12

Week	Unit of Instruction	Learning Objectives/Goals	Assessment Methods	Assignments	Assignment Due Date
		• Practice best practices when it comes to model building • Build a model and interpret the output			
Week 12	What's the best that can happen? Prescriptive Models II	• Scenario Analysis • Linear Optimization • Sensitivity Analysis	Assignments Labs Discussion Quizzes Final	Discussion Board 6	Week 13
Week 13	What's the best that can happen? Prescriptive Models III	• Decision Trees • Cost Benefit Analysis	Assignments Labs Discussion Quizzes Final	Lab 6 Assignment 6	Week 14
Week 14	What's the best that can happen? Prescriptive Models IV Simulation	• Monte Carlo Simulation	Assignments Labs Discussion Final	Discussion Board 7 Quiz 5	Week 15
Week 15	Revisiting Requirements and making actionable recommendations	• Discuss evaluation of insights and findings • Discuss what makes insights and recommendations actionable	Assignments Labs Final	Lab 7 Assignment 7	Week 16
Week 16	Finals Week			Final Exam & Project	

Columbus State Community College
Computer Science Department

COURSE NUMBER: CSCI 2422
COURSE TITLE: Data Visualization I
INSTRUCTOR: **CONTACT:**
Credits / Class Hours per Week: 2/4   **PREREQUISITES:** CSCI 1421

DESCRIPTION OF COURSE: In this course, students will learn strategies to communicate effectively with data by turning data into compelling and actionable stories and recommendations. Students will learn how to visualize diverse types of data (amounts, distributions, time series, geographic, etc.) and will work with current tools and techniques to practice creating visual stories and dashboards. Design principles will be discussed and ethical implications in the visual presentation of information will be central to the course discussions.

COURSE STUDENT LEARNING OUTCOMES:
- Identify key terms and approaches used in data visualization and storytelling with data.
- Use Tableau and other tools of interest to create various types of charts and graphs used to tell a story with data.
- Distinguish between bad, ugly and incorrect visualizations when critiquing visual displays of information.
- Recognize and use techniques to focus audience attention, and produce well-designed, aesthetically-pleasing and accessible data visualizations.
- Practice telling stories with data and providing feedback on the stories others tell.

PROGRAM OUTCOMES:
- Produce and interpret numerical summaries and data visualizations to describe, explore and communicate insights from data.
- Manage data (extract, merge, transform, check for quality, etc.) using a relational database language and other programming languages as appropriate.
- Identify and communicate the impacts of ethical and privacy related concerns that arise when sourcing, processing and analyzing data.

OUTCOMES BASED ASSESSMENT OF STUDENT LEARNING: For this course, students are expected to demonstrate the skills associated with the Institutional Learning Goals (ILG) identified below:
- Critical Thinking
- Ethical Reasoning
- Quantitative Skills
- Communication Competence

In class students are assessed on their achievement of these outcomes. Names will not be used when reporting results. Outcomes-based assessment is used to improve instructional planning and design and the quality of student learning throughout the college.

COURSE MATERIALS REQUIRED
- Microsoft Excel
- Internet Access
- Tableau Desktop (student license for use outside of lab time)
- Safari Books Online

TEXTBOOK(S), MANUALS, REFERENCES, AND OTHER READINGS

- ***Fundamentals of Data Visualization: A Primer on Making Informative and Compelling Figures*** by Claus O. Wilke, O'Reilly, 2019, ISBN: 978-1-492-03108-6

- ***Storytelling with Data: A Data Visualization Guide for Business Professionals*** by Cole Nussbaumer Knaflic, Wiley, 2015, ISBN: 978-1-119-00225-3

- ***Storytelling with Data: Let's Practice*** by Cole Nussbaumer Knaflic, Wiley, 2020, ISBN: 978-1-119-62149-2

- ***The Truthful Art: Data Charts and Maps for Communication*** by Alberto Cairo, New Riders, 2016, ISBN: 978-0-321-93407-9

Note: The books for this class are provided to you through the Columbus State library's Safari Online database. There are no books for you to purchase; your books will be available to you online. You are, of course, welcome to purchase the book on your own, but it is not necessary to do so for this class.

The occasional chapter from another book as well as online materials, videos and podcasts will be available on the Blackboard site as well.

GENERAL INSTRUCTIONAL METHODS
- Demonstrations / Labs / Hands on (learning by doing)
- Assigned Reading / Viewing / Listening
- Active and Collaborative Teamwork
- Discussions

STANDARDS AND METHODS FOR EVALUATION

Quizzes—Students will complete twelve quizzes in the course. Quizzes will be provided on Blackboard and will consist of a variety of close-ended (e.g. multiple choice) questions. Students will have two attempts to complete each quiz (unless specified otherwise) and will receive feedback upon submission. Quiz scores will be the average of the submitted attempts

unless stated otherwise. Quizzes are not cumulative and must be completed within a single session.

Assignments— Assignments are designed to provide practice of skills and concepts introduced in class as well as to provide an opportunity to receive feedback on submitted work. Assignments will be submitted through Blackboard in the manner specified before the due date. No late submissions will be accepted unless arrangements have been made with the Instructor prior to the assignment due date.

Discussion Boards— Graded discussions are designed to explore topics of interest in greater depth, to interact with peers, and to receive feedback on thoughts and ideas. No late discussion boards will be accepted unless arrangements have been made with the Instructor prior the discussion board due date. Discussion Boards will be completed via Blackboard. It is incumbent upon each student to check discussion boards for updates throughout the week in order to remain actively involved.

Tableau Fundamentals Training —During the first part of the semester, students will complete a self-paced training through the software provider, Tableau. This training is designed to introduce the fundamentals of using the Tableau software, and is suggested preparation for the Tableau Desktop Specialist Certification. Additional details on the assignment and requirements for submission (via Blackboard) will be provided.

Final Project—Students will complete a final project during the term. Students will refine assignments over the course of the term and present original work in the final project. The final project will be submitted via Blackboard. Additional requirements for completion of the final project will be provided.

Final Reflection—Students will complete one final reflection essay where they will reflect on their achievement in the course as well as opportunities for continued study. The reflection will be submitted through Blackboard before the due date.

Final Exam—Students will complete one final exam. The final exam will be submitted through Blackboard before the due date and will cover all topics presented over the term.

Item	Points	Percentage
Quizzes (1 @ 12 and 11 @ 8 points each)	100	20%
Assignments (6 @ 15 points each)	90	18%
Discussion Board (Good vs. Bad Visualizations – for example grading)	5	1%
Discussion Boards (weekly – graded at the end of the term)	30	6%
Tableau Fundamentals Training	35	7%
Final Project	150	30%
Final Reflection	15	3%
Final Exam	75	15%

Total Points	500	100%

GRADING SCALE

450-500 points	90 - 100%	A
400-449 points	80 - 89%	B
350-399 points	70 – 79%	C
300-349 points	60 – 69%	D
299 and below	0 – 59%	E

SPECIAL COURSE REQUIREMENTS
None.

ATTENDANCE POLICY

You are expected to attend every class session that you can. I do keep attendance as part of student financial aid reporting requirements, but I do not grade attendance. It is up to you to determine your participation in this class. However, please know that I will discuss, demonstrate, and help you to concretize concepts in class that otherwise will be very difficult without a great amount of effort on your part reading through websites, blogs, and other materials to find what you missed. Also, I do not provide notes of my lectures and I won't hold a one-on-one session with you to repeat the material that I covered in class.

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ASSIGNMENT SUBMISSION POLICY Assignments will not be accepted via e-mail. They must be submitted in the manner requested in Blackboard to receive credit. No late assignments will be accepted, unless arrangements have been made with the Instructor, prior to that class.

All assignments are due by 11:59pm the night before class. Assignments that are submitted after the due date and time will not receive credit.

COLLEGE SYLLABUS STATEMENTS Columbus State Community College required College Syllabus Statements on College Policies and Student Support Services can be found at
- Standard Syllabus Statement: Student Resources, Rights, and Responsibilities

Syllabus Disclaimer: I do not anticipate any changes to the syllabus. This syllabus acts as a set of principles and guidelines to the direction of the course, but I may change it if I deem it necessary to do so to ensure an effective learning experience for all.

Any changes will be announced in class, and subsequent revisions of the syllabus will be posted to Blackboard accompanied by a Blackboard announcement and email to all students.

	Week	Unit of Instruction	Description	Assignments	Assignment Due Date
Set Up and Foundations					
	Week 1 mm/dd-mm/dd	Unit A: Welcome to Class	In this unit, you will gain familiarity with the course site, contents and get up and running with the tools and software you will need for a successful term.	Introduce Yourself Discussion Board Quiz 1	Week 2 (mm/dd) Week 2 (mm/dd)
	Week 1 mm/dd-mm/dd	Unit B: The Truth Continuum	We begin our study of data visualization by thinking about ourselves as consumers of visualizations, and how we can distinguish between visualizations that we trust versus those that we do not.	Quiz 2 Good vs. Bad Visualizations (Discussion)	Week 2 (mm/dd) Week 2 (mm/dd)
	Week 2 mm/dd-mm/dd	Unit C: Principles of Data Visualization & Chart Scaffolding	In this unit, we study the elements that we use to structure our data visualizations and identify important considerations that will influence the rest of the topics that we discuss in this class. Additionally, we will introduce aspects of chart design and chart types that will set our direction for the next several course units.	Quiz 3 Assignment 1	Week 3 (mm/dd) Week 3 (mm/dd)
Visualizing Information					
	Week 2 mm/dd-mm/dd	Unit D: Visualizing Amounts	In this unit, we explore charts and graphs to visualize amounts and proportions. Specific charts include heat maps and bar charts.	Quiz 4 Assignment 2	Week 3 (mm/dd) Week 3 (mm/dd)

	Week	Unit of Instruction	Description	Assignments	Assignment Due Date
				Paper and Pencil for Data Visualization (Discussion)	Week 3 (mm/dd)
				Assign Tableau Desktop Fundamentals I	Week 5 (mm/dd)
				Assign Final Project	Week 8 (mm/dd)
	Week 3 mm/dd-mm/dd	Unit E: Visualizing Distributions and Proportions	In this unit, we explore charts and graphs used to visualize distributions and proportions. Specific charts include box plots and histograms.	Quiz 5	Week 4 (mm/dd)
				Feedback in Data Viz	Week 4 (mm/dd)
	Week 3 mm/dd-mm/dd	Unit F: Visualizing Change Over Time	In this unit, we explore charts and graphs to visualize changes over time. Specific charts include line charts and related variations.	Quiz 6	Week 4 (mm/dd)
				Assignment 3	Week 4 (mm/dd)
	Week 4 mm/dd-mm/dd	Unit G: Visualizing Relationships	In this unit, we explore charts and graphs used to visualize relationships. Specific charts include scatterplots.	Quiz 7	Week 5 (mm/dd)
	Week 4 mm/dd-mm/dd	Unit H: Visualizing Geographic Information	In this unit, we explore maps, projections and how geographic information is mapped to aesthetics.	Quiz 8	Week 5 (mm/dd)
				Post a Viz You Have Created (Discussion – Part 1)	Week 5 (mm/dd)

	Week	Unit of Instruction	Description	Assignments	Assignment Due Date
				Assignment 4	Week 5 (mm/dd)
				Tableau Training Assignment (Desktop I: Fundamentals) Due	*Week 5 (mm/dd)*
Design and Storytelling					
	Week 5 mm/dd-mm/dd	Unit I: Effective Communication with Data	In this unit, we will explore how to communicate with data and choose effective visuals to support the message that you want to share.	Quiz 9	Week 6 (mm/dd)
	Week 5 mm/dd-mm/dd	Unit J: Perception	In this unit, we will introduce some of the Gestalt Principles that help us to understand what makes effective data visualizations by understanding the influence of perception on how we design our data vizzes.	Quiz 10	Week 6 (mm/dd)
				Post a Viz You Have Created (Discussion – Part 2)	**Week 6 (mm/dd) – at least two days before assignment 5 is due**
				Assignment 5	Week 6 (mm/dd)
	Week 6 mm/dd-mm/dd	Unit K: Preattentive Attributes and Accessibility	In this unit, we discuss preattentive attributes that can be leveraged to improve the clarity of the messages that our visualizations communicate. We also introduce	Quiz 11	Week 7 (mm/dd)
				Post a Viz You Have Created (Discussion – Part 3)	**Week 7 (mm/dd) – at**

	Week	Unit of Instruction	Description	Assignments	Assignment Due Date
			topics related to accessibility that need to be front of mind as we design data visualizations.		**least two days before assignment 6 is due**
				Assignment 6	Week 7 (mm/dd)
	Week 7 mm/dd-mm/dd	Unit L: Intro to Storytelling	This unit discusses the importance of storytelling with data through exploring the narrative arc, and the importance of conveying emotion so that our visualizations inspire action.	Quiz 12	Week 8 (mm/dd)
				Narrative Arc Discussion Board	Week 8 (mm/dd)
				Final Reflection	Week 8 (mm/dd)
				Final Project Due	Week 8 (mm/dd)
Course Wrap Up					
	Week 8 mm/dd-mm/dd	Course Wrap Up		*Final Exam*	Week 8 (mm/dd)

Columbus State Community College
Computer Science Department

COURSE NUMBER: CSCI 2423
COURSE TITLE: Data Visualization II
INSTRUCTOR: **CONTACT:**
Credits / Class Hours per Week: 2/4   **PREREQUISITES:** CSCI 2422

DESCRIPTION OF COURSE: In this course, students deepen their study of communicating with data. Students will work with current tools and techniques to further explore topics in data visualization such as interactivity. Students will practice creating additional types of visualizations and build models and explore how to visualize model effectiveness.

COURSE STUDENT LEARNING OUTCOMES:
- Identify and create visualizations that employ visual analytics.
- Evaluate and interpret analytic models based on visual displays.
- Design dashboards and other interactive visual displays of data.
- Produce and present visualizations publicly.
- Document and share work products, presentations, and reports.

PROGRAM OUTCOMES:
- Determine and document project requirements.
- Produce and interpret numerical summaries and data visualizations to describe, explore and communicate insights from data.
- Manage data (extract, merge, transform, check for quality, etc.) using a relational database language and other programming languages as appropriate.
- Identify and communicate the impacts of ethical and privacy related concerns that arise when sourcing, processing and analyzing data.

OUTCOMES BASED ASSESSMENT OF STUDENT LEARNING: For this course, students are expected to demonstrate the skills associated with the Institutional Learning Goals (ILG) identified below:
- Critical Thinking
- Quantitative Skills
- Technological Competence
- Communication Competence
- Professional and Life Skills

In class students are assessed on their achievement of these outcomes. Names will not be used when reporting results. Outcomes-based assessment is used to improve instructional planning and design and the quality of student learning throughout the college.

COURSE MATERIALS REQUIRED
- Microsoft Excel
- Microsoft Power BI
- Internet Access
- Tableau Desktop ([student license](#) for use outside of lab time)

TEXTBOOK(S), MANUALS, REFERENCES, AND OTHER READINGS

1. *Visual Analytics with Tableau* by Alexander Loth, Wiley, 2019, ISBN: 9781119560203

2. *#MakeoverMonday* by Andy Kriebel and Eva Murray, Wiley, 2018, ISBN: 9781119510772

3. *The Big Book of Dashboards* by Steve Wexler, Jeffrey Shaffer and Andy Cotgreave, Wiley, 2017, ISBN 9781119282716

Note: The first two books for this class are provided to you through the Columbus State library's Safari Online database.

You only need to purchase *The Big Book of Dashboards.* You are, of course, welcome to purchase the other two books on your own, but it is not necessary to do so for this class.

The occasional chapter from another book as well as online materials, videos and podcasts will be available on the Blackboard site as well.

GENERAL INSTRUCTIONAL METHODS
- Demonstrations / Labs / Hands on (learning by doing)
- Assigned Reading / Viewing / Listening
- Active and Collaborative Teamwork
- Discussions

STANDARDS AND METHODS FOR EVALUATION

Assignments—Assignments are designed to provide practice of skills and concepts introduced in class. Assignments will be submitted through Blackboard before the due date. No late submissions will be accepted unless arrangements have been made with the Instructor prior to the assignment due date. The lowest assignment score will be dropped when computing final grades.

Lab Activities—Lab activities are designed to provide a guided learning experience and to serve as a measure of participation in and progress through the course material. As such, labs will be graded as complete (full credit) or incomplete (no credit). Labs must be submitted through

Blackboard to receive credit. No late labs will be accepted unless arrangements have been made with the Instructor prior to the lab due date. The lowest lab score will be dropped when computing final grades.

Discussion Boards—Graded discussions are designed to explore topics of interest in greater depth, to interact with peers and to receive feedback on thoughts and ideas. No late discussion boards will be accepted unless arrangements have been made with the Instructor prior the discussion board due date.

Quizzes—Quizzes will be provided on Blackboard. Students will have one attempt to complete each quiz and will receive feedback upon submission. Quizzes are not cumulative and must be completed within a single session. No late quizzes will be accepted unless arrangements have been made with the Instructor prior to the quiz due date. The lowest quiz score will be dropped when computing final grades.

Final Project—Students will complete one final project assigned early in the semester. The final project is designed to give the student a chance to build their analytics portfolio while practicing the concepts and techniques learned in class.

Final Exam—Students will complete one comprehensive final exam as scheduled by the College. The final exam will assess that course outcomes have been achieved and will consist of knowledge-based questions as well as response and execution problems. Students have one attempt at the final exam. Students not available for the Final Exam are expected to inform the Instructor as far in advance of the exam as possible to make alternate arrangements. The exam must be attempted to successfully complete the course.

Item	Points	Percentage
Assignments (7 @ 10 points each)	70	14%
Lab Activity (weekly) (7 @ 5 points each)	35	7%
Discussion Boards (7 @ 5 points each)	35	7%
Quizzes (5 @ 25 points each)	125	25%
Final Project	110	22%
Final Exam	125	25%
Total Points	**500**	**100%**

GRADING SCALE

450-500 points	90 - 100%	A
400-449 points	80 - 89%	B
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SPECIAL COURSE REQUIREMENTS
None.

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Week	Unit of Instruction	Learning Objectives/Goals	Assessment Methods	Assignments	Assignment Due Date
Week 1	Welcome to Class | Going deeper into Data Viz – Visual Analytics, Dashboards, Interactivity	• Review syllabus and set up of the course • Discuss how to be successful in this class • Review important visualization concepts from prior Data Viz I • Introduce course project	Assignments Labs Discussion Quizzes Final Exam	Quiz 1 Discussion Board 1	Week 2
Week 2	#MakeoverMonday; #SWD and other Data Viz communities	• Explore Visualization challenges, blogs and competitions	Assignments Labs Discussion Quizzes Final Exam	Lab 1 Assignment 1	Week 3
Week 3	Iteration, Feedback and Remaking Visualizations	• Identify various approaches to iterating on visualizations • Remake visualizations from #MakeoverMonday	Assignments Labs Discussion Quizzes Final Exam	Quiz 2	Week 4
Week 4	Visual Analytics I	• Define Visual Analytics • Explore Visual Analytics in tool – trendlines, forecasts and other calculations	Assignments Labs Discussion Quizzes Final Exam	Discussion Board 2	Week 5
Week 5	Visual Analytics II	• Explore the intuition behind clustering • Explore cluster visualizations in tool	Assignments Labs Discussion Quizzes Final Exam	Lab 2 Assignment 2	Week 6

Week	Unit of Instruction	Learning Objectives/Goals	Assessment Methods	Assignments	Assignment Due Date
Week 6	Visually evaluating models I	• Explore common visualizations for evaluating models (i.e. lift charts, gains charts, response charts, profit charts, ROI charts)	Assignments Labs Discussion Quizzes Final Exam	Discussion Board 3 Quiz 3	Week 7
Week 7	Visually evaluating models II	• Practice evaluating clustering model using evaluation visualizations	Assignments Labs Discussion Quizzes Final Exam	Lab 3 Assignment 3	Week 8
Week 8	Visually evaluating models III	• Explore the intuition behind association models • Perform market-basket analysis and visually evaluate the results	Assignments Labs Discussion Quizzes Final Exam	Discussion Board 4	Week 9
Week 9	Dashboards	• Define what a dashboard is • Explore ways to categorize dashboards	Assignments Labs Discussion Quizzes Final Exam	Lab 4 Assignment 4	Week 10
Week 10	Interactivity	• Understand and implement Dashboard Actions: filtering and drilldowns	Assignments Labs Discussion Quizzes Final Exam	Discussion Board 5 Quiz 4	Week 11
Week 11	Interactivity II	• Understand and implement Dashboard	Assignments Labs Discussion	Lab 5 Assignment 5	Week 12

Week	Unit of Instruction	Learning Objectives/Goals	Assessment Methods	Assignments	Assignment Due Date
		Actions: adding web content and alerts	Quizzes Final Exam		
Week 12	Dashboard Examples	• Review and analyze data inputs as well as methods of organizing different types of dashboards • Understand and Identify KPIs and metrics for a variety of dashboard use cases	Assignments Labs Discussion Quizzes Final Exam	Discussion Board 6	Week 13
Week 13	Interactive Dashboards and Time Lapse Visualization	• Explore Effective Dashboard layouts and examples • Practice building dashboards with interactivity	Assignments Labs Discussion Quizzes Final Exam	Lab 6 Assignment 6	Week 14
Week 14	Going Public with Visualization	• Make a visualization public • Explore Visualization challenges and competitions	Labs Discussion Final Exam	Discussion Board 7 Quiz 5	Week 15
Week 15	Analysis and Visualization Project Presentations	• Practice Presentation skills • Practice Giving and Receiving Feedback	Labs Final Exam	Lab 7 Assignment 7	Week 16
Week 16	Finals Week			Final Exam & Project	