



Course Syllabus

Course Information

Course Number and Title: CSCI 5103 Fundamentals of Informatics

College and Department: School of the Sciences, Division of Computer Science

Term: Fall 2023

Format: In-class

Class day(s) and time: Tuesday, 6:00 PM to 9:00 PM

Class Location: MCL 311

Weeks in length: 16

Class meetings per term: 15

Hours per class session: 3

Credit hours awarded: 3

Instructors Information

Instructor: Dr. Islam Akef Ebeid

Contact Number: (940) 898-2165

E-mail: iebeid@twu.edu

Office Hours: Mondays, Tuesdays, Fridays 3:00 - 5:00 PM

Mode: Drop by, appointment outside these hours

Office: MCL 412

Zoom: <https://twu-edu.zoom.us/j/8362252819>

Teaching Assistant: Nancy Costen

Office Hours: Wednesdays 7 PM to 8:30 PM (3rd Wednesdays of the Month unavailable unless otherwise posted) via Zoom with appointments recommended. Otherwise, email via Canvas to request an appointment.

Email: ncosten@twu.edu

Course Description

Fundamental computing concepts for informatics study. Topics include problem-solving, logic and algorithms, data management, information and knowledge discovery, security and ethics issues related to informatics, technology project management, user interface, and interprofessional application of informatics in specific field case studies. Prerequisites: Computer competence and experience with data analysis applications such as spreadsheet software. Three lecture hours a week.

Credit: Three hours.

Related: CSCI 1513, CSCI 4923, CSCI 5001, CSCI 5923

Course Objectives and Learning Outcomes

Informatics is a growing and vital interdisciplinary field at the intersection of computer sciences, data and information sciences, psychology, and social sciences. The study of informatics focuses on data, information and its structure, people's information behavior, the development of new technologies, security, ethics, information sharing, and the interaction among these components and society at the individual (user) and societal (community) levels. The study of informatics helps people rely on continuously increasing amounts of data with rapidly changing technologies. In addition, at the graduate level, the study of informatics prepares students to be leaders in their chosen technology-related future endeavors. It helps them apply their thinking critically to the technologies they will help create to align with community needs and society's values. So, technology creation is driven by people

and not by profit. The student will work on a final project through this course and deliver a fully developed and well-thought-out project related to information systems.

An information system is an integrated end-to-end information dissemination system that performs specific tasks in a particular domain. An integrated information system consists of multiple components: information persistence and modeling, information access and data mapping, and information presentation. Developing integrated information systems usually follows a well-defined process consisting of requirement collections, data modeling and management, user access, development, and evaluation. It is essential to understand that the user is the center of developing integrated information systems in the study of informatics. Compare that to software engineering, which focuses on code and its efficiency. For example, data collection is done while considering the type of audience the information system targets. In addition, the social aspects of the developed information system are studied through user studies and focus groups. The system is also assessed and analyzed from the perspective of security and accessibility. Students are encouraged to choose projects that interest them and reflect their background if they choose to. It is also essential to understand that programming tools and technologies will be discussed and taught to develop those information systems. For example, learning object-oriented programming is crucial because what follows data persistence is object-relational mapping so that the front-end layer can be integrated with data persistence layers easily. In addition, user experience design will be covered to build intuitive user interfaces for the target audience. Fundamentals of building user-centric and ethical algorithms for data analysis and insight extraction will also be covered to avoid perpetuating biases through the developed systems. A combination of Python, Java, and other front-end languages, such as HTML and JavaScript, might be used in instruction and creating the final project in addition to qualitative and quantitative methods. This course will be assessed through readings, assignments, and a final project.

The expected learning outcomes from this class are as follows:

1. The student shall learn to assemble solutions to multi-variable data analysis problems correctly.
2. The student shall learn to solve data analysis problems using Python effectively.
3. The student shall learn how to develop a complete information system aimed at a specific function from the target audience's perspective.
4. The student shall learn to combine multiple technologies to build a fully integrated system.
5. The student shall learn how to conduct user studies and surveys to evaluate the system from the user's perspective.
6. The student shall learn how to consider algorithmic biases.
7. The student shall learn best practices when collecting, storing, archiving, and securing data.
8. The student shall understand how to link the backend data storage to the front-end user interface via control layers and proper object-relational mapping.
9. The student shall understand the latest research in informatics.
10. The student shall learn how to appraise privacy and ethics related to the developed information system through case studies.
11. The student shall learn how to effectively evaluate types of security attacks and countermeasures.
12. The student shall learn how to manage projects where multiple people contribute.
13. The student shall learn to evaluate the system from an ethical and societal standpoint.

Course Format

During the semester, the instructor will meet with the students on campus on Tuesdays from 6 PM to 9 PM at the MCL 311 room on the third floor of the Multi-purpose Classroom and Learning building. The classroom will consist of 4 parts. Each part lasts for about 40 minutes with a 5-minute break. The first 40 minutes are dedicated to a lecture. I will discuss this week's topic and provide explanations and examples. The second part will be devoted to an open discussion on the readings that will last for 30

minutes and will be followed by a 15-minute short reading quiz. The third part of class time will be dedicated to in-class activities that eventually become homework assignments. Those assignments will vary from programming tasks to data modeling to running machine learning experiments or writing a paper on this week's reading topic. The student will start on the assignment, do whatever they can during class time, and then continue with the rest of the assignment as homework. The assignment will be due in either 1 or 2 weeks, depending on the complexity of this week's topic. Late submissions are not allowed unless permitted by the instructor individually. The fourth part of the class will be dedicated to the final project. Students can form groups, have meetings, and work on their proposals, progress reports, or even the technical work needed to finish the project. In the meantime, I will meet with the groups in class to check for any questions or concerns.

As mentioned before, there will be a reading quiz each week. Expect the reading quiz to be 5 to 10 multiple-choice questions in 15-20 minutes. The quiz will cover the reading material for this week. There will be roughly one assignment every two weeks. The students will work for about 30 minutes on their assignments and continue the rest at home. The assignments are individual work submitted through Canvas and will be subject to plagiarism inspection, including AI-generated content. The final exam will be multiple choice questions. The final project will be presented during the week right before the final exams.

The course is designed based on the general principles of informatics. The course will start with an introductory computer science and programming module. That is followed by a module that introduces basic information science and technology concepts. The next step would be an introduction to mathematics and statistics, leading to the data science module, which includes statistical modeling, machine learning, and deep learning methods. Following that is a module that introduces cognitive psychology and social sciences concepts related to informatics issues. For example, what are human values, and how are they incorporated into an information system? And how to evaluate a graphical user interface? This leads to the module that introduces user experience design. That is followed by a module that teaches society and ethics as they reflect on informatics. That is followed by the security module, which introduces encryption and cybersecurity as an integral part of informatics.



Course Material

The required textbooks are:

Think Python by Allen Downey

<https://greenteapress.com/wp/think-python-2e/>

Database Design 2nd Edition, Adrienne Watt

<https://opentextbc.ca/dbdesign01/>

Python Data Science Handbook by Jake VanderPlas

<https://jakevdp.github.io/PythonDataScienceHandbook/>

Human-Computer Interaction by Alan Dix et al.

http://www.skateboardingalice.com/papers/1998_Dix.pdf

The Wiley Handbook of Human-Computer Interaction by Kent Norman et al.

<https://onlinelibrary.wiley.com/doi/book/10.1002/9781118976005>

The Encyclopedia of Human-Computer Interaction, 2nd Ed. by a group of authors

<https://www.interaction-design.org/literature/book/the-encyclopedia-of-human-computer-interaction-2nd-ed>

Bit by Bit: Social Research in the Digital Age by Matthew Salganik
<https://www.bitbybitbook.com/en/1st-ed/preface/>

Network Science by Albert-Laszlo Barabasi
<http://networksciencebook.com/>

The books are free as offered by the publisher or the author through the links they provided, and I posted here. Each class will also have slides and assigned readings from research papers and articles. The slides will be uploaded regularly to Canvas. The assignments, quizzes, and final exams will mainly come from the required textbooks and slides. Some assignments will be inspired by multiple sources such as hackerrank.com, leetcode.com, and Kaggle.com. Those online communities offer plenty of solvable activities for students to review and engage with on their own time.

Grade Structure

Criteria	Number of Occurrences	Points per Occurrence	Total Points	Percentage of Total
Reading Quizzes	13/16	20	260	16%
In-class/Homework Assignments	8/16	55	440	30%
Final Exam	2/16	150	300	10%
Final Project	5/16	100	500	33%
Total	16/16	-	1500	100%

- Quizzes are only taken in class and not online.
- Late assignment submission is not allowed unless permitted by the instructor.
- Midterms and Finals will be half multiple-choice questions from lectures and books and half a programming task.
- The long homework assignment will comprise 1 to 8 tasks, depending on the week. The remaining tasks would be due next week if the class ran out of time.
- The second part of the class will be dedicated to book discussion and solving short in-class exercises.

Grade Policy

A	90%-100%
B	80%-90%
C	70%-80%
D	50%-70%
F	Below 50%

Please note that to get an entire grade on either the short in-class exercises or the long homework assignment, you need to solve the problem. Incorrect outputs will be considered if sufficient effort is shown and demonstrated. 100% scores will be reserved for extraordinary answers.

Course Plan

Week	Topic	Subtopics	Hands-on Lab	Readings	Activities
1 August 28	Introduction	Python for Informatics (CS) What is Informatics?	Introductions	Syllabus	Survey
2 September 4	Programming for Informatics	Data Structures and Algorithms (CS) Software Engineering (CS) Front-end Development (CS) Back-end Development (CS) Full-stack Development (CS) Software Architecture (CS) Software Engineering (CS) Algorithm Design (CS)	Setting up a Python local environment Basic programming concepts	Think Python: Chapters 1 – 3	Assignment 1 – September 18 Quiz 1 – September 5 Project Proposal – September 29
3 September 11	Information Science and Technology for Informatics	Data Modeling (IS) Database Management (IS) Ontology and Data Semantics (IS) The Semantic Web and Linked Open Data (IS) Information Modeling (IS) What is Information? (IS) Digital Libraries and Archiving (IS) Information Architecture (IS)	How to build a database? How to convert Excel data to a database?	Think Python: Chapters 4, 5 (conditionals only, no recursion), 7 Database Design: Chapters 1 and 2	Assignment 2 – September 29 Quiz 2 – September 12 Project Proposal - October 2
4 September 18	Information Science and Technology for Informatics	Archiving and Metadata (IS) Digitization of Information (IS) Data Storytelling (IS) Digital Asset Management (IS) Media and Archiving (IS) Crowdsourcing (IS) History of Information in the US (IS) Records Management (IS) Electronic and Digital Records (IS) Digital Archiving and Preservation (IS) Political Informatics (IS) Information Risk and Benefit Analysis (IS) Information Systems Analysis and Management (IS) Cooperative Software Development (IS) Information Retrieval (IS) Open-Source Software (IS) Library Instruction and Information Literacy (IS) Digital Humanities (IS) Collection Management (IS)	How to connect a database? Object Relational Mapping	Think Python: Chapters 15, 16, 17 Database Design: Chapters 3, 4, 5	Assignment 2 – September 29 Quiz 3 – September 19 Project Proposal - October 2

		Information Seeking (IS) Information Needs (IS) Health Informatics (IS)			
5 September 25	Mathematics and Statistics for Informatics	Research Methods in Informatics (STATS/MATH) Experimental Design (STATS/MATH) Qualitative Research (STATS/MATH) Quantitative Research (STATS/MATH) Probability Theory (STATS/MATH) Frequentist vs. Bayesian Analysis (STATS/MATH) Prediction vs. Inference in Statistics (STATS/MATH)		https://greenteapress.com/wp/think-bayes/ https://greenteapress.com/wp/think-stats-2e/ This webpage on Algorithms: https://allendowney.github.io/DSIRP/analysis.html	Assignment 3 – October 5 Quiz 4 – September 26 Project Proposal - September 29
6 October 2	Data Science for Informatics	Linear Algebra (STATS/MATH) Optimization (STATS/MATH) Human-Centered Data Science (DS) Human-Centered AI (DS) Data Science for Social Good (DS) Data Engineering (DS) Data Visualization (DS)		Chapters 1 and 2 from VanderPlas	Assignment 4 – October 13 Quiz 5 – October 3 Progress Report 1 – October 13
7 October 9	Data Science for Informatics	Social Network Analysis (DS) Information Networks (DS) Data Management and the Research Lifecycle (DS) Machine Learning for Informatics (DS) Data Mining (DS)		Chapters 1 and 2 from The Network Science Book Chapters 1 and 2 from Bit by Bit	Assignment 4 – October 13 Quiz 6 – October 10 Progress Report 1 – October 13
8 October 16	Psychology and Social Science for Informatics	Understanding and Serving Users (PSY) Technology and Culture (PSY) Intellectualism and Informatics (PSY) Computational Social Science (PSY) Information Behavior (PSY) Child Psychology (PSY) Organizational Psychology (PSY) Cognitive Psychology (PSY)		Chapters 3 and 4 from Bit by Bit	Assignment 5 – October 20 Quiz 7 – October 17 Progress Report 2 – October 20
9 October 23	User Experience Design and Evaluation	Eye-tracking (UX) User Studies (UX) Retrospective Think Aloud (UX) Biometrics in User Studies (UX) Informatics for Children (UX)		Chapters 1 and 2 from the Human-Computer Interaction book	Assignment 6 – November 17 Quiz 8 – October 24 Progress Report 3 – November 1
10 October 30	User Experience Design and Evaluation	User Experience and Design Thinking (UX) Understanding Usability and Accessibility (UX) Graphic Design (UX) User Research (UX)		Chapters 3 and 4 from the Human-Computer Interaction book	Assignment 6 – November 17 Quiz 9 – October 31

		User Interfaces for Children (UX) Participatory Design and Inclusion for Special Populations (UX) UX Prototyping (UX)			Progress Report 3 – November 1
11 November 6	User Experience Design and Evaluation	User Behavior and Search Experience (UX) Interaction Design (UX) User Experience Design for Schools (UX) Socio-Technical Design (UX) Human-Computer Interaction (UX) Interfaces in Virtual and Augmented Realities (UX) Web Design (UX)		Chapters 4 and 5 from the Human-Computer Interaction book	Assignment 6 – November 10 Quiz 10 – November 7 Progress Report 3 – November 10
12 November 13	Society and Ethics in Informatics	Social Informatics (SETH) Social Justice in Informatics (SETH) Ethical foundations for informatics (SETH) Design for Social Impact (SETH) Legal issues in informatics (SETH) Digital Diversity, Equity, and Inclusion (SETH) Ethics of AI (SETH) Case Study: HIPPA		https://www.microsoft.com/en-us/research/wp-content/uploads/2016/02/p58-sellen.pdf	Assignment 7 – November 24 Quiz 11 – November 14 Progress Report 4 – November 24
13 November 20	Society and Ethics in Informatics	Surveillance and Society (SETH) Gender, Technology, and Information (SETH) Copyright and Legal Issues in Informatics (SETH) Information and Privacy in Society (SETH) Misinformation (SETH) Socio-Technical Ethnography (SETH) Community Informatics (SETH)		Bit by bit	Assignment 7 – November 24 Quiz 12 – November 21 Progress Report 4 – November 24
14 November 27	Security in Informatics	Foundations of Cyber Security (SECURITY) Digital Forensics (SECURITY) Information Security (SECURITY) Cryptography (SECURITY)		Bit by bit	Assignment 8 – December 1 Quiz 13 – November 28 Progress Report 5 – December 1
15 December 4	Course Recap	Course Recap		Study Guide	Final Project Presentation Final Project Report Final Project Code
16 December 11	Final Exam	Final Exam		Final Exam	Final Exam

Academic Resources

How to succeed in this class

You will receive it if you work hard, put in the effort, and use all your resources to achieve the highest grade in this class. In that regard, I recommend the following to succeed in this class:

- 1- Please attend all classes and inform the instructor if you cannot participate.
- 2- Please work separately and independently during the in-class and homework assignments unless otherwise made clear.
- 3- Using internet resources is allowed with restrictions that the instructor will mention during the classroom. Yet please don't copy and paste code or answers for any questions.
- 4- If you are having trouble finishing an in-class assignment, that will NOT automatically result in a lousy grade. A good grade could be achieved if you showed effort and explained your thought process despite having an incorrect result.
- 5- Complete all your assignments to the best of your abilities.
- 6- See your errors and mistakes as opportunities to learn more.
- 7- Please ask questions if things need to be clarified.
- 8- Use email as the preferred way of communicating.

Technology

Please let me know if you need a computer or a laptop for this class. If you need any assistance with technology, please reach out to the IT Solutions (<https://twu.edu/technology/>)

Library Services

Please don't buy textbooks or software that you might need for this class before checking in at the library first. <https://twu.edu/library/>. If you have any questions about the library or how to find a resource, please get in touch with me or Susan Whitmer (swhitmer@twu.edu)

Food Security

Minerva's Market is in The Student Union at Hubbard Hall, Room 1203
Social Work Food Pantry is in the Old Main Building, Room 406

Mental Health

If you need help with any issue that is affecting your academic performance, please refer to:
<https://twu.edu/student-health-services/mental-health/>

or

<https://twu.edu/counseling/>

If you need immediate help, please go directly to Jones Hall Room 269 (M-F 8 AM to 6 PM) or call the Crisis Line: (940) 898-4357

Writing

If you have difficulty communicating in written English language, please let the instructor know, and please refer to the following:

<https://twu.edu/write-site/>

Tutoring

If you would like additional help for the class or any other classes, please notify the instructor and refer to:

<https://catalog.twu.edu/graduate/services-available-students/tutoring-centers/>

University Policies

Disability Access Policy Statement

Texas Woman's University strives to make all learning experiences as accessible as possible. If you anticipate or experience academic barriers based on your disability (e.g., mental health conditions, learning disabilities, chronic medical conditions, etc.), please register with Disability Services for Students (DSS) to establish reasonable academic accommodations. After registration with DSS, please contact me to discuss how to implement your accommodation.

DSS contact information: DSS website (<https://twu.edu/disability-services/>); dss@twu.edu; 940-898-3835; CFO Ste. 106.

If you have any questions regarding disability, please reach out to me or Nadaya Cross (ncross1@twu.edu)

Title IX: Sexual Violence Education

TWU is committed to providing a safe learning environment free of all forms of sexual misconduct, including sexual harassment, sexual assault, domestic violence, dating violence, and stalking. Federal laws (Title IX and the Violence Against Women Act) and TWU policies prohibit discrimination on the basis of sex and therefore prohibit sexual misconduct. As students, if you or someone you know is experiencing sexual harassment, relationship violence, stalking, or sexual assault, there are campus resources available to provide support and assistance. Alleged sexual misconduct can be non-confidentially reported to the Title IX Coordinator at the Report an Incident website (<https://twu.edu/civility/report-an-incident/>) or at (940) 898-2968. Additionally, please be aware that under Title IX of the Education Amendments of 1972, all employees are required to disclose information about such misconduct to the Title IX Office. Students who wish to speak to a confidential employee who does not have this reporting responsibility you can contact TWU Counseling and Psychological Services at (940) 898-3801 for the Denton Campus, (214) 689-6655 for the Dallas Campus, and (713) 794-2059 for the Houston Campus.

Title IX: Pregnant Students

Title IX is a federal law which requires schools that receive federal funds to provide reasonable accommodations to students who are pregnant or have pregnancy related conditions. This includes pregnancy, pre-natal doctor appointments, childbirth, false pregnancy, miscarriage, termination of pregnancy, or recovery from any of these conditions. Students who may need academic accommodations due to pregnancy related conditions should complete the Pregnancy Accommodation form (<https://twu.edu/pregnancy-accommodation-form/>) to coordinate educational needs.

Academic Integrity

Honesty in completing assignments is essential to the mission of the University and the development of the personal integrity of students. In submitting graded assignments, students affirm that they have neither given nor received unauthorized assistance and abided by all other provisions of the Academic Integrity Policy and the Student Code of Conduct as found on the TWU website and in the TWU Student Handbook. Cheating, plagiarism, collusion, dual submission of a paper, or other academic dishonesty will not be tolerated. It will result in appropriate sanctions, including failing an assignment, failing the class, being removed from an educational program, or being suspended or expelled. Allegations of academic dishonesty in this course may be reported to the Office of Civility and Community Standards. The specific disciplinary process for academic dishonesty is in the TWU Student Code of Conduct (<https://public.powerdms.com/TWU1/documents/1745742>) and Academic Integrity Academic Integrity Policy (<https://public.powerdms.com/TWU1/documents/1748544>). For details on avoiding plagiarism, review the Library Tutorial: Avoiding Plagiarism (<https://libguides.twu.edu/c.php?g=270163&p=1803990>).

To ensure the integrity of the academic process, Texas Woman's University vigorously affirms the importance of academic honesty as defined by the Academic Integrity Policy and the TWU Student Code of Conduct. Therefore, Texas Woman's University faculty members may use Turnitin to compare a student's work with multiple sources to detect and prevent plagiarism. It then reports a percentage of similarity and provides links to those specific sources. The tool itself does not determine whether a paper has been plagiarized. Instead, that judgment must be made by the individual faculty member. Some of the required assignments in this course may be checked for plagiarism using Turnitin.com.

TWU Attendance Policy

Consistent attendance is vital to academic success and is expected of all students. Grades are determined by academic performance, and instructors may give students written notice that attendance related to specific classroom activities is required. Absence does not exempt students from academic requirements. Excessive absences, even if documented, may result in a student's failing the course. Excused absences are within the purview of the instructor. Students must consult with instructors regarding make-up work.

Departmental Policies

Grading Policy

[https://docs.google.com/document/d/1eeTJG916awbljyMG6zIOSuak2U_ozbCN/edit?usp=drive link](https://docs.google.com/document/d/1eeTJG916awbljyMG6zIOSuak2U_ozbCN/edit?usp=drive_link)

AI Usage Policy

[https://docs.google.com/document/d/1rPm6TjS8FRFTLbWD9ERbbBySfXCcHg9j/edit?usp=drive link](https://docs.google.com/document/d/1rPm6TjS8FRFTLbWD9ERbbBySfXCcHg9j/edit?usp=drive_link)

Academic Honesty

[https://docs.google.com/document/d/1n2yJvdRV2BzUb0QezPLeZwJyUJp_eE3Z/edit?usp=drive link](https://docs.google.com/document/d/1n2yJvdRV2BzUb0QezPLeZwJyUJp_eE3Z/edit?usp=drive_link)

Instructor Policies

Holidays

The instructor will follow the federally and state-recognized holiday schedule by the University which can be found here:

<https://twu.edu/media/documents/registrar/Calendar-at-a-Glance-2022-2023.pdf>

However, if you need special accommodation for religious or other types of holidays that you observe please let the instructor know beforehand.

Diversity

The instructor is committed to diversity, inclusion, and equality in the classroom and accordance with the university policies regardless of any cultural background, country of origin, religion, race, ethnicity, and sexual orientation.

Please let the instructor know in what way you would like to be addressed. During the first lecture, the instructor will ask the students about their names, pronouns, and other forms of addressing they want to be referred to. Please notify the instructor if that changed or if you were addressed mistakenly.

Office Hours

- First come, first served.
- Maximum 15 minutes if people are waiting,
- If two or more students come at the same time, it will be in the order of the last name.
- Please come prepared to office hours with questions.

Conflict

In case of conflict between students in the classroom, the instructor will act as a mediator until proper university authorities are notified.