Course Description

Systems Sciences Foundations

Author: Eng. Carlos Andrés Sierra, M.Sc.
cavirguezs@udistrital.edu.co

Lecturer
Computer Engineering
School of Engineering
Universidad Distrital Francisco José de Caldas

2025-I

UNIVERSIDAD DISTRITAL
FRANCISCO JOSÉ DE CALDAS

Outline

1. You Don't Know Who I Am
2. Course Overview
3. Grading & Rules
4. Bibliography

UNIVERSIDAD DISTRITAL
FRANCISCO JOSÉ DE CALDAS

Outline

1. You Don't Know Who I Am
2. Course Overview
3. Grading & Rules
4. Bibliography

UNIVERSIDAD DISTRITAL
FRANCISCO JOSÉ DE CALDAS

Academic Experience

- **Computer Engineer**, **MSc.** in Computer Engineering, and *researcher* for the past 15 years.
- 8 years as a **full-time associate professor** at various colleges for Computer Engineering programs.
- 3 years as a **lecturer** at colleges and in government STEM programs.
- **Speaker** in Colombia, Brazil, and Bolivia at IEEE events and colleges.

Academic Experience

- **Computer Engineer**, **MSc.** in Computer Engineering, and *researcher* for the past 15 years.
- 8 years as a **full-time associate professor** at various colleges for Computer Engineering programs.
- 3 years as a **lecturer** at colleges and in government STEM programs.
- **Speaker** in Colombia, Brazil, and Bolivia at IEEE events and colleges.

Academic Experience

- **Computer Engineer**, **MSc.** in Computer Engineering, and *researcher* for the past 15 years.
- 8 years as a **full-time associate professor** at various colleges for Computer Engineering programs.
- 3 years as a **lecturer** at colleges and in government STEM programs.
- **Speaker** in Colombia, Brazil, and Bolivia at IEEE events and colleges.

Academic Experience

- **Computer Engineer**, **MSc.** in Computer Engineering, and *researcher* for the past 15 years.
- 8 years as a **full-time associate professor** at various colleges for Computer Engineering programs.
- 3 years as a **lecturer** at colleges and in government STEM programs.
- **Speaker** in Colombia, Brazil, and Bolivia at IEEE events and colleges.

Non-academic Experience

- **Co-organizer** of PyCon Colombia and Python Bogotá; collaborated with *ScipyLATAM* and *Jupyter LATAM*.
- +3 years working as a **Software Engineer** for several tech companies in Colombia.
- 3 years working as a **Technical Leader** in Machine Learning and Data Science at a U.S. startup.
- +1 year working as an **MLOps Senior Engineer** for a fintech in LATAM.

Non-academic Experience

- **Co-organizer** of PyCon Colombia and Python Bogotá; collaborated with *ScipyLATAM* and *Jupyter LATAM*.
- +3 years working as a **Software Engineer** for several tech companies in Colombia.
- 3 years working as a **Technical Leader** in Machine Learning and Data Science at a U.S. startup.
- +1 year working as an **MLOps Senior Engineer** for a fintech in LATAM.

Non-academic Experience

- **Co-organizer** of PyCon Colombia and Python Bogotá; collaborated with *ScipyLATAM* and *Jupyter LATAM*.
- +3 years working as a **Software Engineer** for several tech companies in Colombia.
- 3 years working as a **Technical Leader** in Machine Learning and Data Science at a U.S. startup.
- +1 year working as an **MLOps Senior Engineer** for a fintech in LATAM.

Non-academic Experience

- **Co-organizer** of PyCon Colombia and Python Bogotá; collaborated with *ScipyLATAM* and *Jupyter LATAM*.
- +3 years working as a **Software Engineer** for several tech companies in Colombia.
- 3 years working as a **Technical Leader** in Machine Learning and Data Science at a U.S. startup.
- +1 year working as an **MLOps Senior Engineer** for a fintech in LATAM.

Outline

1 You Don't Know Who I Am

2 Course Overview

3 Grading & Rules

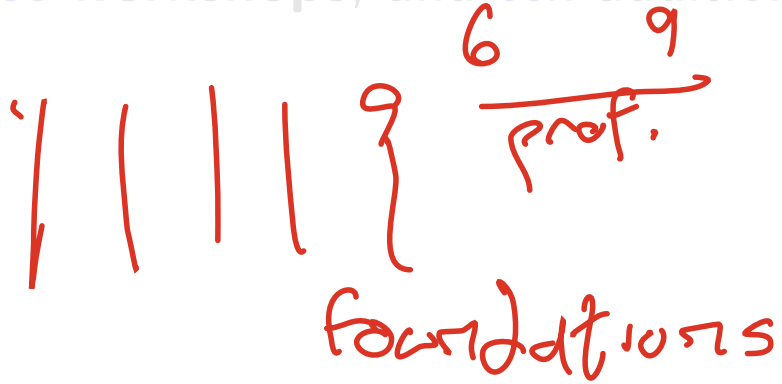
4 Bibliography

UNIVERSIDAD DISTRITAL
FRANCISCO JOSÉ DE CALDAS

Overview

This course is designed to introduce undergraduate students to foundations of **systems sciences** as an integration of artificial intelligence and cybernetics. Also, it will provide students with tools and models for solve complex problems in systems.

Classes will consist of lectures, **discussions**, and practical examples. Also, you will be required to complete some readings in *computer sciences*. In addition, there will be a **semester-long project**, as well one **final test**, three **workshops**, and ten additional **assignments**.



UNIVERSIDAD DISTRITAL
FRANCISCO JOSÉ DE CALDAS

Overview

This course is designed to introduce undergraduate students to foundations of **systems sciences** as an integration of artificial intelligence and cybernetics. Also, it will provide students with tools and models for solve complex problems in systems.

Classes will consist of lectures, **discussions**, and practical examples. Also, you will be required to complete some readings in *computer sciences*. In addition, there will be a **semester-long project**, as well one **final test**, three **workshops**, and ten additional **assignments**.

Goals

The main goal of this course is to provide undergraduate students with different **concepts** and **tools** for solving real-life problems using **artificial intelligence** & **cybernetics**.

At the end of this course you should be able to **create** a full system design of an **enginnering solution** using artificial intelligence/cybernetics.

UNIVERSIDAD DISTRITAL
FRANCISCO JOSÉ DE CALDAS

Goals

The main goal of this course is to provide undergraduate students with different **concepts** and **tools** for solving real-life problems using **artificial intelligence** & **cybernetics**.

At the end of this course you should be able to **create** a full system-design of an **enginnering solution** using artificial intelligence/cybernetics.

UNIVERSIDAD DISTRITAL
FRANCISCO JOSÉ DE CALDAS

Prerequisites

This is a basic course, so you should have some knowledge of:

- **Programming** in Java, Python, or C++.
- **Object-Oriented Programming** fundamentals.
- Basic concepts of **Systems Analysis and Design**.
- Basic usage of **Git** and **GitHub**.
- Using **IDEs** such as VS Code, Eclipse, or PyCharm.

UNIVERSIDAD DISTRITAL
FRANCISCO JOSÉ DE CALDAS

Syllabus

Period	Topic	Time
Period I	Systems Sciences Introduction	6 sessions
	Workshop on Systems Design	1 session
	Systems Sciences Fundamentals I	7 sessions
	Workshop on Dynamical Systems	1 session
	Course Project Catch-Up	1 session
Period II	Systems Sciences Fundamentals II	6 sessions
	Workshop on Machine Learning	1 session
	Systems Sciences Applications	7 sessions
	Workshop on Cybernetics	1 session
	Final Test	1 session
Period III	Projects Dissertation	2 sessions

Table: Schedule for Period I

UNIVERSIDAD DISTRITAL
FRANCISCO JOSÉ DE CALDAS

Outline

1 You Don't Know Who I Am

2 Course Overview

3 Grading & Rules

4 Bibliography

UNIVERSIDAD DISTRITAL
FRANCISCO JOSÉ DE CALDAS

Grades Percentages

Period	Item	Percentage
Period I	Assignments	5%
	Workshops	20%
	Project Catch-Up	10%
Period II	Assignments	5%
	Workshops	15%
	Final Test	15%
Period III	Paper + Poster	5%
	Project Implementation	10 %
	Project Report	15 %

Table: Systems Sciences Foundations Grades Distribution

Don't hate the player, hate the game

- All asignments must be submitted hand-written on **time** and in **english**. Grammar and spelling will **not** be evaluated.
- Copying and pasting from internet is **forbidden**. Please, **develop** your own solutions.
- Class attendance is **not mandatory**. If you **miss** classes, you must *study by yourself*.
- No cell-phones, no smartwatches, no whatsapp, no tinder, no smartanything. **Just you and your brain**. Pay attention at clase.
- Communications with me must be done by **email** or by **slack**. I will **not** answer any question by *WhatsApp*.

UNIVERSIDAD DISTRITAL
FRANCISCO JOSÉ DE CALDAS

Don't hate the player, hate the game

- All asignments must be submitted hand-written on **time** and in **english**. Grammar and spelling will **not** be evaluated.
- Copying and pasting from internet is **forbidden**. Please, **develop** your own solutions.
- Class attendance is **not mandatory**. If you **miss** classes, you must *study by yourself*.
- No cell-phones, no smartwatches, no whatsapp, no tinder, no smartanything. **Just you and your brain**. Pay attention at clase.
- Communications with me must be done by **email** or by **slack**. I will **not** answer any question by *WhatsApp*.

UNIVERSIDAD DISTRITAL
FRANCISCO JOSÉ DE CALDAS

Don't hate the player, hate the game

- All asignments must be submitted hand-written on **time** and in **english**. Grammar and spelling will **not** be evaluated.
- Copying and pasting from internet is **forbidden**. Please, **develop** your own solutions.
- Class attendance is **not mandatory**. If you **miss** classes, you must *study by yourself*.
- No cell-phones, no smartwatches, no whatsapp, no tinder, no smartanything. **Just you and your brain**. Pay attention at clase.
- Communications with me must be done by **email** or by **slack**. I will **not** answer any question by *WhatsApp*.

UNIVERSIDAD DISTRITAL
FRANCISCO JOSÉ DE CALDAS

Don't hate the player, hate the game

- All asignments must be submitted hand-written on **time** and in **english**. Grammar and spelling will **not** be evaluated.
- Copying and pasting from internet is **forbidden**. Please, **develop** your own solutions.
- Class attendance is **not mandatory**. If you **miss** classes, you must *study by yourself*.
- No cell-phones, no smartwatches, no whatsapp, no tinder, no smartanything. **Just you and your brain**. Pay attention at clase.
- Communications with me must be done by **email** or by **slack**. I will **not** answer any question by *WhatsApp*.

UNIVERSIDAD DISTRITAL
FRANCISCO JOSÉ DE CALDAS

Don't hate the player, hate the game

- All asignments must be submitted hand-written on **time** and in **english**. Grammar and spelling will **not** be evaluated.
- Copying and pasting from internet is **forbidden**. Please, **develop** your own solutions.
- Class attendance is **not mandatory**. If you **miss** classes, you must *study by yourself*.
- No cell-phones, no smartwatches, no whatsapp, no tinder, no smartanything. **Just you and your brain**. Pay attention at clase.
- Communications with me must be done by **email** or by **slack**. I will **not** answer any question by *WhatsApp*.

UNIVERSIDAD DISTRITAL
FRANCISCO JOSÉ DE CALDAS

Code of Conduct

- Always be **respectful** to your classmates and to me. You must be **kind** with everyone inside (*and outside*) the classroom.
- There is no a better programming language, tool, or technology. There are only **better** or **worse** solutions.
- You must be **honest** with your work. If you don't know something, just **ask** me. I will be glad to help you.
- You must be **responsible** with your work. If you don't submit **on time**, please don't cry.
- You must **not be annoying**, or affect the **classroom environment**. If you do, I will ask you to **leave** the classroom.

UNIVERSIDAD DISTRITAL
FRANCISCO JOSÉ DE CALDAS

Code of Conduct

- Always be **respectful** to your classmates and to me. You must be **kind** with everyone inside (*and outside*) the classroom.
- There is no a better programming language, tool, or technology. There are only **better** or **worse** solutions.
- You must be **honest** with your work. If you don't know something, just **ask** me. I will be glad to help you.
- You must be **responsible** with your work. If you don't submit **on time**, please don't cry.
- You must **not be annoying**, or affect the **classroom environment**. If you do, I will ask you to **leave** the classroom.

UNIVERSIDAD DISTRITAL
FRANCISCO JOSÉ DE CALDAS

Code of Conduct

- Always be **respectful** to your classmates and to me. You must be **kind** with everyone inside (*and outside*) the classroom.
- There is no a better programming language, tool, or technology. There are only **better** or **worse** solutions.
- You must be **honest** with your work. If you don't know something, just **ask** me. I will be glad to help you.
- You must be **responsible** with your work. If you don't submit **on time**, please don't cry.
- You must **not be annoying**, or affect the **classroom environment**. If you do, I will ask you to **leave** the classroom.

UNIVERSIDAD DISTRITAL
FRANCISCO JOSÉ DE CALDAS

Code of Conduct

- Always be **respectful** to your classmates and to me. You must be **kind** with everyone inside (*and outside*) the classroom.
- There is no a better programming language, tool, or technology. There are only **better** or **worse** solutions.
- You must be **honest** with your work. If you don't know something, just **ask** me. I will be glad to help you.
- You must be **responsible** with your work. If you don't submit **on time**, please don't cry.
- You must **not be annoying**, or affect the **classroom environment**. If you do, I will ask you to **leave** the classroom.

UNIVERSIDAD DISTRITAL
FRANCISCO JOSÉ DE CALDAS

Code of Conduct

- Always be **respectful** to your classmates and to me. You must be **kind** with everyone inside (*and outside*) the classroom.
- There is no a better programming language, tool, or technology. There are only **better** or **worse** solutions.
- You must be **honest** with your work. If you don't know something, just **ask** me. I will be glad to help you.
- You must be **responsible** with your work. If you don't submit **on time**, please don't cry.
- You must **not be annoying**, or affect the **classroom environment**. If you do, I will ask you to **leave** the classroom.

UNIVERSIDAD DISTRITAL
FRANCISCO JOSÉ DE CALDAS

Outline

1 You Don't Know Who I Am

2 Course Overview

3 Grading & Rules

4 Bibliography

UNIVERSIDAD DISTRITAL
FRANCISCO JOSÉ DE CALDAS

Bibliography

Recommended bibliography:

- Systems Science by Peter Checkland.
- Systems Thinking, Systems Practice by Peter Checkland.
- Introduction to Systems Thinking by Daniel Aronson.
- Thinking in Systems by Donella Meadows.
- Cybernetics by Norbert Wiener.
- An Introduction to Cybernetics by W. Ross Ashby.
- Cybernetics and Systems by R. Trappl.
- Cybernetics and Systems Theory in Management by Fredmund Malik.
- Cybernetics and Management by Stafford Beer.
- Cybernetics and the Philosophy of Mind by Kenneth Sayre.

UNIVERSIDAD DISTRITAL
FRANCISCO JOSÉ DE CALDAS

Outline

1 You Don't Know Who I Am

2 Course Overview

3 Grading & Rules

4 Bibliography

UNIVERSIDAD DISTRITAL
FRANCISCO JOSÉ DE CALDAS

Thanks!

Questions?

URL: www.linkedin.com/in/casierrav