ALGORITHMS & DATA STRUCTURES

Bachelor in Data and Business Analytics BDBA SEP-2023
ADS-DBA.2.M.A

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Alejandro Martínez holds a Master's Degree in Behavioral & Health Science Methodology from the Universidad Autónoma de Madrid (Spain), an MBA from the Lazarus project developed by the "Escuela de Organización Industrial" and the "Caja Rural" and is certified Big Data developer course in python. His research interests include natural language processing, quantum models, machine learning and deep learning techniques, image processing, and statistical computing in R and Python. He has developed several technological solutions throughout his career, including an automatic system of constructed responses evaluation based on natural language processing, an automatic system of risk assessment in cases of violence against women and a solution based on artificial intelligence systems for social media management. He has worked as a researcher at the Instituto de Ciencias Forenses y de la Seguridad of the Universidad Autónoma de Madrid, has created the company Wibber and currently works in his own Artificial Intelligence consultancy (Compai) in which they carry out training and implementation projects of digitization based on Artificial Intelligence systems for big companies.

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SUBJECT DESCRIPTION

I'm not sure that you know that every app you are using in your mobile is based on an awesome algorithm that some genius has developed, but I'm sure you want to be the one who will develop the next revolutionary algorithm. Did you know about the only algorithm that has its own song? Why don't you take a minute to check the following: quicksort song. It is quite impressive, isn't it?

For every data scientist, knowing the data structures and the tools necessary to manipulate them is essential. When a problem arises, the first step is to establish the relevant model to manage the data and optimize the solution. In other words, it is crucial to determine the data structures to be used in managing the data in order to create the algorithm(s) that automate all of the data management processes.

Algorithms development and analysis for basic data structure management are covered in this course using Python as the main programming language. R is also used as a secondary programming tool.

At the end of the course, students will know how to generate relevant data models for specific problems and automate data management processes using Python algorithms.

The following program is tentative. Although we will attempt to cover all the listed topics, the pace of the class depends on the group performance.

The main topics covered in this course are the following:

1. Introduction to algorithms and data structures
2. Big O notation
3. Selection sort
4. Recursion
5. Divide and Conquer and Quicksort
6. Hash tables
7. Breadth-First search / Depth first search
8. Dijkstra's algorithm
9. Greedy algorithms

LEARNING OBJECTIVES

At the end of the course, students will be able to:

- Analyze the efficiency of an algorithm
- Develop algorithms in Python
- Handle basic data structures
- Work with graphs

CORE TOPICS

The core topics of this course are the following:

- Basic Algorithms
- Programming Techniques
- Data Structures

TEACHING METHODOLOGY

This course is divided into 12 modules (Each module will have a lecture and a lab) . All lectures and labs will be in synchronous sessions, live in person.

The distribution of the course work refers to two different types of learning:

On the one hand, the type related to lectures, labs, discussions, working with classmates on team projects in a work-room or getting help and feedback from professors. Learning that happens in real-time.
On the other hand, the type related to debating topics in a digital forum, critiquing the work of classmates posted in a digital gallery, working on a proposal or project using a collaborative document-sharing platform, getting help and learning support in a messaging-based system or solving quizzes with automatic feedback after each session to reinforce what has been learned. Learning that happens interactively and in out of class time using collaboration tools and digital platforms.
In this format, special emphasis will be placed on student Individual Inquiry & Discovery; a foundational learning that students carry out on their own. For example, reading (textbooks, articles, cases), doing multimedia simulators and labs, completing homework assignments, carrying out individual projects and reviewing for quizzes and exams.

Throughout this course, a series of activities will be carried out to cover the core topics of the subject. Each of these activities are explained below:

- **Readings:** Before each synchronous class a reading will be recommended so that students have a base of knowledge that facilitates learning.
- **Lectures:** lessons will be one of the main learning methods of this course. These will be face-to-face. In these classes the students will be able to acquire the knowledge and comprehend the essential concepts of this course.
- **Quiz Challenges:** Students will be able to perform a quiz after each of the synchronous classes of the course. These challenges are designed to help students grasp the most important concepts of each session.
- **Labs:** In the labs the student will be able to put the learned concepts into practice. These labs will consist of a series of programming exercises in which each student will develop, in pairs with another classmate, solutions to specific problems. All labs must be submitted via Turnitin on Campus Online in .html format. No work will be accepted if submitted otherwise.
- **User-Cases:** At the end of the course, students will work on one or more real cases in which the concepts learned in the course are applied.

In addition, we propose a series of transversal activities that will help students to internalize much better the concepts learned in this course. These activities are explained below:

- **Slack:** Students will have access to a Slack workspace in which they can interact to share knowledge of the course. Disclaimer: This is not an IEU tool, so it will be considered a course tool that will be managed entirely by the professors. The objective of using this tool is that students can support each other for the development of the practices of the course in a less formal environment.
- **Group Project:** Students will complete a project in which they integrate the most important concepts of the subject. During this project, students will also learn to operate in a much more applied context. This will help to improve their soft skills.

IE University teaching method is defined by its collaborative, active, and applied nature. Students actively participate in the whole process to build their knowledge and sharpen their skills. Professor's main role is to lead and guide students to achieve the learning objectives of the course. This is done by engaging in a diverse range of teaching techniques and different types of learning activities such as the following:

Learning Activity	Weighting	Estimated time a student should dedicate to prepare for and participate in
Lectures	16.0 %	24.0 hours
Discussions	15.33 %	23.0 hours
Exercises in class, Asynchronous sessions, Field Work	18.0 %	27.0 hours
Group work	26.67 %	40.0 hours
Individual studying	24.0 %	36.0 hours
TOTAL	100.0 %	150.0 hours

PROGRAM

SESSIONS 1 - 2 (LIVE IN-PERSON)

Pre-work (15 min)

- Recorded Video-lecture with slides: Introduction to Algorithms and Data Structures (15 min)
    - Subject description and subject expectative
    - Subject introduction
    - What is an algorithm? The Role of algorithms in computing
- Python level assessment (15 min)
- Reading: Bhargava (2016). Chapter 1 (30 min)

Session 1: Big O and Search Algorithms (80 min - Synchronous)

Block 1 (10 min) - Introduction to the course

- Method: Quick Lecture with slides
- Channel: F2F

Block 2 (60 min) - Complete review from pre-work

- Method: Lecture with Q&A
- Channel: F2F
- Contents:
    - Algorithm running time
    - Asymptotic analysis
    - Big O notation
    - Simple search vs. Binary search

Related readings:

- Goodrich, Tamassia and Goldwasser (2013). Chapter 3
- Bhargava (2016). Chapter 1

Block 3 (10 min) - Resolve questions from pre-work

- Method: Discussion/Q&A
- Channel: F2F

Post - work (10 min)

- Quiz (10 min): Kahoot challenge that covers the concepts learned in session 1

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Session 2: Big O and Search Algorithms LAB (80 min - Synchronous)

Skills Development LAB (80 min): Search Algorithms and Running Time Lab

- Method: Exercise in Pairs – Discuss Results & Doubts

Post - work (10 min)

- Upload LAB via Turnitin (.html) (5 min)
- Lab correction with Jupyter Notebook (5 min)

Book Chapters: Goodrich, Tamassia and Goldwasser (2013). Chapter 3 (See Bibliography)
Book Chapters: Bhargava (2016). Chapter 1 (See Bibliography)

SESSIONS 3 - 4 (LIVE IN-PERSON)

Pre-work (30 min)

- Reading: Bhargava (2016). Chapter 2 (30 min)

Session 3: Selection sort (80 min- Synchronous)

Block 1 (70 min) - Complete review from pre-work

- Method: Lecture with Q&A
- Channel: F2F
- Contents:
  - Arrays
  - Linked lists
  - Insertion and Deletion
  - Selection sort

Related readings:

- Bhargava (2016). Chapter 2

Block 2 (10 min) - Resolve questions from pre-work

- Method: Discussion/Q&A
- Channel: F2F

Post - work (10 min)

Quiz (10 min): Kahoot challenge that covers the concepts learned in session 3

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Session 4: Selection sort LAB (80 min - Synchronous)

Skills development LAB (80 min): Selection Sort LAB

- Method: Exercise in Pairs – Discuss Results & Doubts

Post - work (10 min)

- Correct and upload LAB via Turnitin (.html

Book Chapters: Bhargava (2016). Chapter 2 (See Bibliography)

SESSIONS 5 - 6 (LIVE IN-PERSON)

Pre-work (30 min)

- Reading: Bhargava (2016). Chapter 3 (30 min)

Session 5: Recursion (80 min - Synchronous)

Block 1 (70 min) - Complete review from pre-work

- Method: Lecture with Q&A
- Channel: F2F
- Contents:
    - Recursion
    - Illustrative examples
    - Analyzing recursive algorithms
    - Designing recursive algorithms
    - The stack with or without recursion

Related readings:

- Goodrich, Tamassia and Goldwasser (2013). Chapter 4
- Bhargava (2016). Chapter 3

Block 2 (10 min) - Resolve questions from pre-work

- Method: Discussion/Q&A
- Channel: F2F

Post - work (10 min)

- Quiz (10 min): Kahoot challenge that covers the concepts learned in session 5

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Session 6: Recursion LAB (80 min - Synchronous)

Skills Development LAB (80 min): Recursion Lab

- Method: Exercise in Pairs – Discuss Results & Doubts

Post - work (10 min)

- Upload LAB via Turnitin (.html) (5 min)
- Lab correction with Jupyter Notebook (5 min)

Book Chapters: Goodrich, Tamassia and Goldwasser (2013). Chapter 4 (See Bibliography)
Book Chapters: Bhargava (2016). Chapter 3 (See Bibliography)

SESSIONS 7 - 8 (LIVE IN-PERSON)

Pre-work (30 min)

- Reading: Bhargava (2016). Chapter 4 (30 min)

Session 7: Divide and Conquer (80 min - Synchronous)

Block 1 (70 min) - Complete review from pre-work

- Method: Lecture with Q&A
- Channel: F2F
- Contents:
    - Divide and conquer introduction
    - Some illustrative examples
    - Quicksort
    - Big O notation comparison
    - Divide and conquer lab in python

Related readings:

- Bhargava (2016). Chapter 4

Block 2 (10 min) - Resolve questions from pre-work

- Method: Discussion/Q&A
- Channel: F2F

Post - work (10 min)

- Quiz (10 min): Kahoot challenge that covers the concepts learned in session 7

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Session 8: Divide and Conquer LAB (80 min - Asynchronous)

Skills development LAB (80 min): Divide and Conquer LAB

- Method: Exercise in Pairs – Discuss Results & Doubts

Post - work (10 min)

- Correct and upload LAB via Turnitin (.html)

Book Chapters: Bhargava (2016). Chapter 4 (See Bibliography)

SESSIONS 9 - 10 (LIVE IN-PERSON)

Pre-work (30 min)

- Reading: Bhargava (2016). Chapter 5 (30 min)

Session 9: Hash Tables (80 min - Synchronous)

Block 1 (70 min) - Complete review from pre-work

- Method: Lecture with Q&A
- Channel: F2F
- Contents:
    - Hash functions
    - Use cases
    - Collisions
    - Performance

Related readings:

- Goodrich, Tamassia and Goldwasser (2013). Chapter 10
- Bhargava (2016). Chapter 5

Block 2 (10 min) - Resolve questions from pre-work

- Method: Discussion/Q&A
- Channel: F2F

Post - work (10 min)

Quiz (10 min): Kahoot challenge that covers the concepts learned in session 9

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Session 10: Hash Tables LAB (80 min - Synchronous)

Skills development LAB (80 min): Hash Tables LAB

- Method: Exercise in Pairs – Discuss Results & Doubts

Post - work (10 min)

- Correct and upload LAB via Turnitin (.html)

Book Chapters: Goodrich, Tamassia and Goldwasser (2013). Chapter 10 (See Bibliography)
Book Chapters: Bhargava (2016). Chapter 5 (See Bibliography)

SESSIONS 11 - 12 (LIVE IN-PERSON)

Pre-work (30 min)

- Reading: Goodrich, Tamassia and Goldwasser (2013). Chapters 1 and 2

Session 11: Object-Oriented Programming (80 min - Synchronous)

Block 1 (70 min) - Complete review from pre-work

- Method: Lecture with Q&A
- Channel: F2F
- Contents:
    - Classes, attributes and methods
    - Inheritance
    - Special methods

Related readings:

- Goodrich, Tamassia and Goldwasser (2013). Chapters 1 and 2

Block 2 (10 min) - Resolve questions from pre-work

- Method: Discussion/Q&A
- Channel: F2F

Post - work (10 min)

- Quiz (10 min): Kahoot challenge that covers the concepts learned in session 11

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Session 12: Object-Oriented Programming LAB (80 min - Synchronous)

Skills Development LAB (80 min): Object-Oriented Programming Lab

- Method: Exercise in Pairs – Discuss Results & Doubts

Post - work (10 min)

- Upload LAB via Turnitin (.html) (5 min)
- Lab correction with Jupyter Notebook (5 min)

Book Chapters: Goodrich, Tamassia and Goldwasser (2013). Chapters 1 and 2 (See Bibliography)

SESSIONS 13 - 14 (LIVE IN-PERSON)

Pre-work (30 min)

- Reading: Goodrich, Tamassia and Goldwasser (2013). Chapters 8 and 9

Session 13: Trees and Priority Queues (80 min - Synchronous)

Block 1 (70 min) - Complete review from pre-work

- Method: Lecture with Q&A
- Channel: F2F
- Contents:
    - Trees
    - Depth and Height

- Binary trees
- Traversal Algorithms
- Priority queues
- Heaps

Related readings:

- Goodrich, Tamassia and Goldwasser (2013). Chapters 8 and 9

Block 2 (10 min) - Resolve questions from pre-work

- Method: Discussion/Q&A
- Channel: F2F

Post - work (10 min)

- Quiz (10 min): Kahoot challenge that covers the concepts learned in session 13

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Session 14: Trees and Priority Queues LAB (80 min - Synchronous)

Skills Development LAB (80 min): Trees and Priority Queues Lab

- Method: Exercise in Pairs – Discuss Results & Doubts

Post - work (10 min)

- Upload LAB via Turnitin (.html) (5 min)
- Lab correction with Jupyter Notebook (5 min)

Book Chapters: Goodrich, Tamassia and Goldwasser (2013). Chapters 8 and 9 (See Bibliography)

SESSION 15 (LIVE IN-PERSON)

Session 15: Review (80 min)

- Method: Lecture with Slides and Q&A
- Channel: F2F

SESSION 16 (LIVE IN-PERSON)

Session 16: Midterm exam (80 min - Synchronous)

SESSIONS 17 - 18 (LIVE IN-PERSON)

Pre-work (30 min)

- Reading: Goodrich, Tamassia and Goldwasser (2013). Chapter 11

Session 17: Search Trees (80 min - Synchronous)

Block 1 (70 min) - Complete review from pre-work

- Method: Lecture with Q&A
- Channel: F2F
- Contents:
  - Binary Search Trees
  - Balanced Search Trees
  - AVL Trees
  - Red Back Trees

Related readings:

- Goodrich, Tamassia and Goldwasser (2013). Chapter 11

Block 2 (10 min) - Resolve questions from pre-work

- Method: Discussion/Q&A
- Channel: F2F

Post - work (10 min)

- Quiz (10 min): Kahoot challenge that covers the concepts learned in session 17

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Session 18: Search Trees LAB (80 min - Synchronous)

Skills development LAB (80 min): Search Trees LAB

- Method: Exercise in Pairs – Discuss Results & Doubts

Post - work (10 min)

- Correct and upload LAB via Turnitin (.html)

Book Chapters: Goodrich, Tamassia and Goldwasser (2013). Chapter 11 (See Bibliography)

SESSIONS 19 - 20 (LIVE IN-PERSON)

Pre-work (30 min)

- Reading: Bhargava (2016). Chapter 6

Session 19: Graph Algorithms (80 min - Synchronous)

Block 1 (70 min) - Complete review from pre-work

- Method: Lecture with Q&A
- Channel: F2F
- Contents:
  - Introduction to graphs
  - Breadth-first search
  - Depth-first search
  - Implementing the graph
  - Implementing the algorithm

Related readings:

- Goodrich, Tamassia and Goldwasser (2013). Chapter 14
- Bhargava (2016). Chapter 6

Block 2 (10 min) - Resolve questions from pre-work

- Method: Discussion/Q&A
- Channel: F2F

Post - work (10 min)

- Quiz (10 min): Kahoot challenge that covers the concepts learned in session 19

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Session 20: Graph Algorithms LAB (80 min - Synchronous)

Skills Development LAB (80 min): Graph Algorithms Lab

- Method: Exercise in Pairs – Discuss Results & Doubts

Post - work (10 min)

- Correct and upload LAB via Turnitin (.html)

- Lab correction with Jupyter Notebook (5 min)

Book Chapters: Goodrich, Tamassia and Goldwasser (2013). Chapter 14 (See Bibliography)
Book Chapters: Bhargava (2016). Chapter 6 (See Bibliography)

SESSIONS 21 - 22 (LIVE IN-PERSON)

Pre-work (30 min)

- Reading: Bhargava (2016). Chapter 7

Session 21: Weighted Graphs Algorithms (80 min - Synchronous)

Block 1 (70 min) - Complete review from pre-work

- Method: Lecture with Q&A
- Channel: F2F
- Contents:
    - Shortest paths introduction
    - Dijkstra's Algorithm
    - Bellman-Ford Algorithm
    - Shortest path algorithms implementation

Related readings:

- Goodrich, Tamassia and Goldwasser (2013). Chapter 14
- Bhargava (2016). Chapter 7

Block 2 (10 min) - Resolve questions from pre-work

- Method: Discussion/Q&A
- Channel: F2F

Post - work (10 min)

- Quiz (10 min): Kahoot challenge that covers the concepts learned in session 21

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Session 22: Weighted Graphs Algorithms LAB (80 min - Synchronous)

Skills development LAB (80 min): Weighted Graphs Algorithms LAB

- Method: Exercise in Pairs – Discuss Results & Doubts

Post - work (10 min)

- Correct and upload LAB via Turnitin (.html)

Book Chapters: Goodrich, Tamassia and Goldwasser (2013). Chapter 14 (See Bibliography)
Book Chapters: Bhargava (2016). Chapter 7 (See Bibliography)

SESSIONS 23 - 24 (LIVE IN-PERSON)

Pre-work (30 min)

- Reading: Bhargava (2016). Chapter 8

Session 23: Greedy Algorithms (80 min - Synchronous)

Block 1 (70 min) - Complete review from pre-work

- Method: Lecture with Q&A
- Channel: F2F
- Contents:
    - Greedy algorithms introduction

- An illustrative example
- Elements of the greedy strategy

Related readings:

- Bhargava (2016). Chapter 8

Block 2 (10 min) - Resolve questions from pre-work

- Method: Discussion/Q&A
- Channel: F2F

Post - work (10 min)

- Quiz (10 min): Kahoot challenge that covers the concepts learned in session 23

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Session 24: Greedy Algorithms LAB (80 min - Synchronous)

Skills Development LAB (80 min): Greedy ALgorithms Lab

- Method: Exercise in Pairs – Discuss Results & Doubts

Post - work (10 min)

- Upload LAB via Turnitin (.html) (5 min)
- Lab correction with Jupyter Notebook (5 min)

Book Chapters: Bhargava (2016). Chapter 8 (See Bibliography)

SESSIONS 25 - 26 (LIVE IN-PERSON)

Pre-work (30 min)

- Reading: Bhargava (2016). Chapter 9

Session 25: Dynamic programming (80 min - Synchronous)

Block 1 (70 min) - Complete review from pre-work

- Method: Lecture with Q&A
- Channel: F2F
- Contents:
  - Understanding dynamic programming
  - Really understanding dynamic programming
  - Dynamic programming code example

Related readings:

- Bhargava (2016). Chapter 9

Block 2 (10 min) - Resolve questions from pre-work

- Method: Discussion/Q&A
- Channel: F2F

Post - work (10 min)

- Quiz (10 min): Kahoot challenge that covers the concepts learned in session 25

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Session 26: Dynamic programming LAB (80 min - Synchronous)

Skills development LAB (80 min): Dynamic Programming LAB

- Method: Exercise in Pairs – Discuss Results & Doubts

Post - work (10 min)

- Correct and upload LAB via Turnitin (.html)

Book Chapters: Bhargava (2016). Chapter 9 (See Bibliography)

SESSIONS 27 - 28 (LIVE IN-PERSON)

Session 27: Group Project Presentations (80 min - Synchronous)

- Method: Presentation
- Channel: F2F

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Session 28: Use-Case (80 min - Synchronous)

In this exercise, students will apply the knowledge acquired during the entire course to solve a real life case.

- Method: Jupyter Notebook
- Channel: F2F

SESSION 29 (LIVE IN-PERSON)

Session 29: Review (80 min)

- Method: Lecture with Slides and Q&A
- Channel: F2F

SESSION 30 (LIVE IN-PERSON)

Sesssion 30: Final exam (80 min - Synchronous)

EVALUATION CRITERIA

A variety of teaching and learning strategies will be used in this course. You will be assigned a grade based on your demonstrated knowledge on in-class quizzes, a group project, a group presentation, a midterm and final exam, and your participation in various class activities and discussions.

Participation (10%)

Active participation in class activities, discussions, and labs is an especially important aspect in this course because our focus will be on understanding how the concepts discussed in class can be applied in real-world contexts. The following criteria will be assessed for participation:

- Synchronous participation:
    - Active participation in F2F classes
- Asynchronous participation:
    - Kahoots challenges completion. For each Kahoot challenge, the completion of the quiz will ensure the 50% of the grade. The punctuation of the last trial will be used to compute each quiz grade.
    - Interaction and participation alongside with the Professor and other students through forums, email and other communication platforms outside of class time.
    - Submission of the recommended reading summaries in the Pre work of each synchronous session

Labs (20%)

A total of 12 labs will be conducted throughout the course. These labs are a tool to help the student applying the concepts acquired during each session. During the labs, students will work in pairs, so the delivery will be also in pairs. These pairs will be formed in the first synchronous class using the students “python level assessment”. The pairs may vary throughout the course depending on the students' needs.

Midterm Exam (20%)

The midterm exam will only include material from class. The exam format will be “Multiple Choice” and “Open Answer Questions”.

Group Project (25%)

In small groups you will be tasked with critically analyzing an issue that requires applying the knowledge you have learned in this course. As a group, you will need to discuss the issue, analyze the problems, and then propose evidence-based solutions that will be communicated in a short, written report. A detailed description of the project requirements can be found in the “Assignments” folder on Blackboard.

Final Exam (25%)

The final exam will only include material from the PowerPoint slides covered in class. The exam format will include multiple choice, short answer and long answer questions.

Late Assignments/Presentation:

Will be penalized **2% per 24-hour period**, starting on the day they are due. Only in cases of emergency or illness can changes be made to due dates of assignments or projects. ALL such arrangements are the full responsibility of the student and must be made PRIOR to the due date. Failure to confirm any changes to the due date with the professor **prior to the due date** will result in a grade of zero.

Minimum passing grade

To ensure quality, we will set a minimum passing grade in the final exam (3.5). If your score is lower than this minimum you will have to go to June retake, irrespective of your overall course grade. Also keep in mind that the overall passing course grade is 5.0.

criteria	**percentage**	**Learning Objectives**	**Comments**
Final Exam	25 %		
Midterm Exam	20 %		
Group Project	25 %		
Labs	20 %		
Class Participation	10 %		

RE-SIT / RE-TAKE POLICY

As per University Policy:

Each student has 4 chances to pass any given course distributed in two consecutive academic years (regular period and July period).

It is mandatory to attend 100% of the classes. Students who do not comply with at least 70% attendance will lose their 1st and 2nd chance, and go directly to the 3rd one (they will need to enroll again in this course the next academic year).

Grading for retakes will be subject to the following rules:

1. Those students who failed the subject in the first regular period will have to do a retake in July

(except those not complying with attendance rules who are banned from this possibility).

2. Dates and location of the July retakes will be posted in advance and will not be changed. Please take this into consideration when planning your summer.
3. The maximum grade that a student may obtain in the 2nd exam session is 8 out of 10. Those students in the 3rd call will be required to attend 50% of the classes. If due to schedule overlap, a different option will be discussed with the professor in order to pass the subject.

BIBLIOGRAPHY

Compulsory

- Aditya Y. Bhargava. (2016). *Grokking Algorithms: An illustrated guide for programmers and other curious people.* Annotated. Manning Publications. ISBN 9781617292231 (Digital)

Grokking Algorithms is a fully illustrated, friendly guide that teaches you how to apply common algorithms to the practical problems you face every day as a programmer. You'll start with sorting and searching and, as you build up your skills in thinking algorithmically, you'll tackle more complex concerns such as data compression and artificial intelligence. Each carefully presented example includes helpful diagrams and fully annotated code samples in Python.

- Michael T. Goodrich, Roberto Tamassia and Michael H. Goldwasser. (2016). *Data Structures & Algorithms in Python.* Wiley. ISBN 9788126562923 (Printed)

BEHAVIOR RULES

Please, check the University's Code of Conduct here. The Program Director may provide further indications.

1. Be on time: : Students arriving late will be marked as “Absent”. Only students that notify in advance in writing that they will be late for a specific session may be granted an exception (at the discretion of the professor).

2. If applicable, bring your name card and strictly follow the seating chart. It helps faculty members and fellow students to learn your names.

3. Do not leave the room during the lecture: Students are not allowed to leave the room during lectures. If a student leaves the room during lectures, he/she will not be allowed to re-enter and, therefore, will be marked as “Absent”. Only students that notify that they have a special reason to leave the session early will be granted an exception (at the discretion of the professor).

4. Do not engage in side conversation. As a sign of respect toward the person presenting the lecture (the professor as well as fellow students), side conversations are not allowed. If you have a question, raise your hand and ask it. It you do not want to ask it during the lecture, feel free to approach your professor after class. If a student is disrupting the flow of the lecture, he/she will be asked to leave the classroom and, consequently, will be marked as “Absent”.

5. Use your laptop for course-related purposes only. The use of laptops during lectures must be authorized by the professor. The use of Social Media or accessing any type of content not related to the lecture is penalized. The student will be asked to leave the room and, consequently, will be marked as “Absent”.

6. No cellular phones: IE University implements a “Phone-free Classroom” policy and, therefore, the use of phones, tablets, etc. is forbidden inside the classroom. Failing to abide by this rule entails expulsion from the room and will be counted as one absence.

7. Escalation policy: 1/3/5. Items 4, 5, and 6 above entail expulsion from the classroom and the consequent marking of the student as “Absent.” IE University implements an “escalation policy”: The first time a student is asked to leave the room for disciplinary reasons (as per items 4, 5, and 6 above), the student will incur one absence, the second time it will count as three absences, and from the third time onward, any expulsion from the classroom due to disciplinary issues will entail 5 absences.

ATTENDANCE POLICY

Please, check the University's Attendance Policy here. The Program Director may provide further indications.

For In-Person programs, students should attend their live in-person sessions on campus.

Attendance at all scheduled classes is mandatory and essential for success in the course. In order to pass the course the student must attend, at least, 70% of the sessions. Students attending less than 70% of sessions will be graded with a FAIL for the course. This fail will apply to the ordinary and extraordinary calls of the current academic year.

If you miss class for any reason, you are responsible for getting notes from classmates. If you have questions about any assignment please send me an email. Under most circumstances, students who miss a class in which a presentation, mid-term, or final exam is held will not be granted an exception or given an opportunity to do a make-up assignment or exam. However, if illness or other circumstances prevent you from adhering to the assignment/presentation due dates stated in this syllabus, contact your academic director to ask for an exception.

Students with Special Needs:

To request academic accommodations due to a disability, please contact Robert Polding via email at: rpolding@faculty.ie.edu

ETHICAL POLICY

Please, check the University's Ethics Code here. The Program Director may provide further indications.

Student Privacy Statement:

At times, students may disclose personal information through class discussions. It is expected that all members of the class will respect the privacy of their classmates. This means that the information disclosed in the class will not be repeated or discussed with other students outside of the course.

Decisions about Grades:

Decisions about grades are made very carefully, and are final at the end of the course. If you have questions regarding a certain grade or you would like to receive personal feedback, you must request a meeting with me to discuss grades on specific assignments before the last class of the course. Any disputes regarding grades must be resolved before the final exam. “Extra credit” or makeup assignments will only be allowed under extenuating circumstances at the sole discretion of the course professor.

ACADEMIC INTEGRITY

Unless you are specifically instructed to work with other students in a group, all of your assignments, papers, projects, presentations, and any work I assign must reflect your own work and thinking.

What is academic integrity? When you do the right thing even though no one is watching. The core values of integrity, both academic and otherwise include: honesty, fairness, respect, responsibility, and trust. Academic Integrity requires that all students within Instituto de Empresa (IE) act in accordance with these values in the conduct of their academic work, and that they follow the rules and regulations concerning the accepted conduct, practices and procedures of academic research and writing. Academic Integrity violations are defined as Cheating, Plagiarism or other violations of academic ethics.

Cheating and plagiarism are very serious offenses governed by the IE student code of conduct. Any student found cheating or plagiarizing on any assignment or component of this course will at a minimum receive a “0” on the affected assignment. Moreover, the student will also be referred to the University Judicial System for further action. Additional penalties could include a note on your transcript, failing the class, or expulsion from the university.

It is important to note that, while the list below is comprehensive, it should not be considered exhaustive.

Cheating includes:

1. An act or attempt to give, receive, share, or utilize unauthorized information or unauthorized assistance at any time for assignments, papers, projects, presentations, tests or examinations.
2. Students are permitted to mentor and/or assist other students with assignments by providing insight and/or advice. However, students must not allow other students to copy their work, nor will students be permitted to copy the work of other students. Students must acknowledge when they have received assistance from others.
3. Failure to follow rules on assignments, papers, projects, presentations, tests or examinations as provided by the course professor and/or as stipulated by IE.
4. Unauthorized co-operation or collaboration.
5. Tampering with official documents, including electronic records.
6. The impersonation of a student on presentations, exercises, tests or an examination. This includes logging onto any electronic course management tool or program (e.g. Black Board, etc.) using someone else’s login and password.

Plagiarism includes:

1. Using the work of others and attempting to present it as your own. For example, using phrases or passages from books, articles, newspapers, or the internet and not referencing

them properly in your document. This includes using information from others without citing it, misrepresentation of cited work, and misuse of quotation marks.

2. Submitting an assignment or paper that is highly similar to what someone else has written (i.e., minimal changes in wording, or where the sentences are similar, but in a different order).
3. You don't have to commit "word for word" copying to plagiarize – you can also plagiarize if you turn in something that is "thought for thought" the same as someone else.

Other violations of academic ethics include:

1. Not acknowledging that your work or any part thereof has been submitted for credit elsewhere.
2. Misleading or false statements regarding work completed.
3. Knowingly aiding or abetting anyone in committing any form of an Academic Integrity violation.