



# Overview Course 2025/2026



Network Information System Technologies



# Schedule and Instructor

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- ▶ Group 3E Theory + Seminars
  - ▶ Wednesday 1:00 to 2:30 PM
  - ▶ Friday 9:30 to 11:00 AM
- ▶ Francisco Daniel Muñoz Escoí
  - ▶ [fmunyo@dsic.upv.es](mailto:fmunyo@dsic.upv.es), [fmunyo@iti.es](mailto:fmunyo@iti.es)
  - ▶ Consultations:
    - ▶ By appointment
  - ▶ Office:
    - ▶ ID43 (DSIC)
- ▶ Questions and doubts about theory and labs are welcome.



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# I. Goals

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## ▶ General:

- ▶ Provide a pragmatic approach to the design and implementation of distributed systems.

## ▶ Specific:

1. Understand the main properties of distributed systems
2. Ability to leverage some relevant technologies and approaches
3. Understand some architectures to resolve specific problems



# I. Goals

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- ▶ **General:**

- ▶ Provide a pragmatic approach to the design and implementation of distributed systems.

- ▶ **Specific:**

- I. Understand the main properties of distributed systems:

- ▶ Problems that need to be addressed
    - ▶ Attainable properties, use cases
    - ▶ Impact of system architecture on the attainable properties, and ability to address potential problems



# I. Goals

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- ▶ **General:**

- ▶ Provide a pragmatic approach to the design and implementation of distributed systems.

- ▶ **Specific:**

- 1. Understand the main properties of distributed systems
  - 2. Ability to leverage some relevant technologies and approaches
    - ▶ Asynchronous programming for component implementation
    - ▶ Middleware to ease component composition and interaction



# I. Goals

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## ▶ General:

- ▶ Provide a pragmatic approach to the design and implementation of distributed systems.

## ▶ Specific:

1. Understand the main properties of distributed systems
2. Ability to leverage some relevant technologies and approaches
3. Understand some architectures to resolve specific problems
  - ▶ Study and analysis of system examples
  - ▶ Hands-on usage of relevant technologies for lab assignments



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## 2. Structure

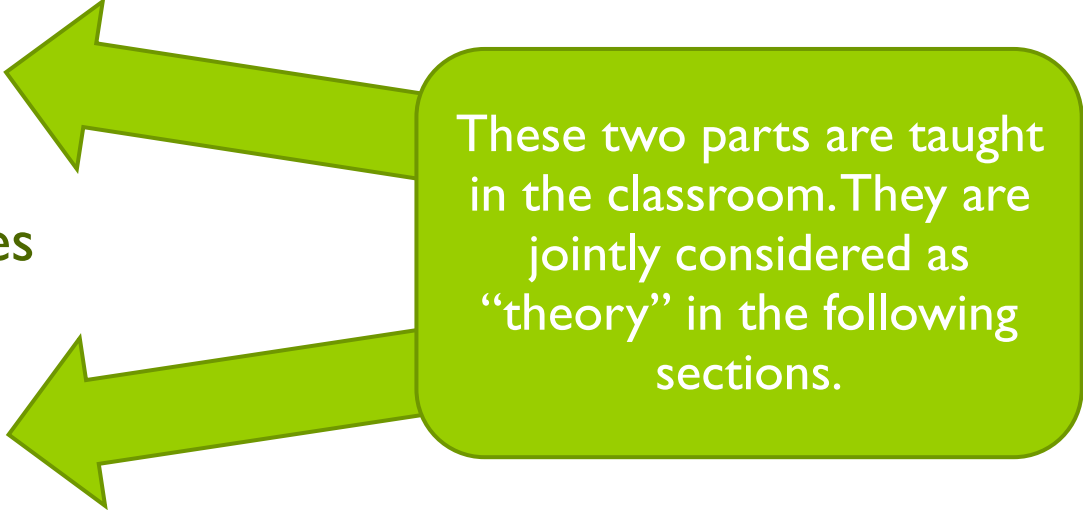
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- ▶ Course with 6 credits
  - ▶ Theory and seminars have a common set of units
- ▶ Theory (1.5 cr)
  - ▶ General principles
  - ▶ Reachable properties
  - ▶ Problems imposed
- ▶ Seminars (3 cr)
  - ▶ Basic technologies
  - ▶ Examples, case studies, and problem resolution
- ▶ Labs (1.5 cr)
  - ▶ Implementation of simple systems



## 2. Structure

- ▶ Course with 6 credits
  - ▶ Theory and seminars have a common set of units
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These two parts are taught in the classroom. They are jointly considered as “theory” in the following sections.



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## 3.Theory. Units

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1. Introduction and Motivation
2. JavaScript and NodeJS
3. Middleware. ZeroMQ
4. Service deployment. Docker
5. Failure management
6. Scalability



## 3.Theory. Units

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- ▶ Considering the 28 classes in this first semester, those units will be distributed in the following way:
  - ▶ Unit 1: 3 sessions (including also the current overview)
  - ▶ Unit 2: 7 sessions
  - ▶ Unit 3: 6 sessions
  - ▶ Unit 4: 6 sessions
  - ▶ Unit 5: 3 sessions
  - ▶ Unit 6: 3 sessions
- ▶ In each unit, at [PoliformaT](#), there are:
  - ▶ The classroom **presentations** and their bulletins of **activities**.
  - ▶ **A student guide**
    - ▶ Equivalent to a textbook for this course.
  - ▶ **Screencasts** that explain each one of its parts.
    - ▶ Available at PoliformaT, in its "flip teaching" section.
    - ▶ Available for all groups.
  - ▶ **Self-assessment tests**, one per unit section.
    - ▶ Available at PoliformaT, in its "Tests & Quizzes" section.

**You should study all these elements carefully, participate actively in the classroom sessions and solve the activities proposed in the bulletins. That will have a significant effect on your final mark.**

- ▶ Unit 5: 3 sessions
- ▶ Unit 6: 3 sessions
- ▶ In each unit, at [PoliformaT](#), there are:
  - ▶ The classroom **presentations** and their bulletins of **activities**.
  - ▶ **A student guide**
    - ▶ Equivalent to a textbook for this course.
  - ▶ **Screencasts** that explain each one of its parts.
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## 4. Labs

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- ▶ Introductory lab sessions start next week.
  - ▶ Project 0: JavaScript basics. Without supervision.
- ▶ **Technologies** to be used:
  - ▶ JavaScript + NodeJS
  - ▶ ØMQ (NodeJS mapping)
  - ▶ Docker
- ▶ **Four projects** that use those technologies:
  1. Minimal component development in NodeJS (3 sessions)
  2. Component development in NodeJS and ØMQ (2 sessions)
  3. Distributed application development in NodeJS and ØMQ (2 sessions)
  4. Deployment (3 sessions)
- ▶ **poliLabs cannot be used** in the labs, since our projects demand frequent port usage in their communication



**Lab projects** will use virtual machines with an Ubuntu 24.04 distribution that includes some needed tools:

- Node.js
- ZeroMQ
- Docker
- Visual Studio Code

Every student will have a VM to be managed at:

<https://portal-ng.dsic.upv.es>

We **STRONGLY RECOMMEND** to download and use at your own computer a copy of that VM. Its image (12.1 GB) is available (without authentication) at:

<https://filesender.rediris.es/?s=download&token=6a9cc231-c3bf-e364-lab2-f6ce17730b82>

**WARNING! THE IMAGE WILL ONLY REMAIN AVAILABLE TILL  
DECEMBER 5!**

sessions,

#### 4. Deployment (3 sessions)

- ▶ **poliLabs cannot be used** in the labs, since our projects demand frequent port usage in their communication



## 4. Lab projects

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- I. Project I: Minimal component development in NodeJS (3 sessions)
  - ▶ Technology: JavaScript, NodeJS
  - ▶ Goals: Warm-up to JavaScript+NodeJS development, server asynchronous programming, callbacks, application development
  - ▶ Assessment: In the 1<sup>st</sup> partial



## 4. Lab projects

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1. Project 1: Minimal component development in NodeJS (3 sessions)
2. Project 2: Component development in NodeJS and ØMQ (2 sessions)
  - ▶ **Assessment:**
    - ▶ In the first partial
3. Project 3: Distributed application development in NodeJS and ØMQ (2 sessions)
  - ▶ **Assessment:**
    - ▶ In the second partial



## 4. Lab projects

1. Project 1: Minimal component development in NodeJS (3 sessions)
2. Project 2: Component development in NodeJS and ØMQ (2 sessions)
  - ▶ **Assessment:**
    - ▶ In the first partial
3. Project 3: Distributed application development in NodeJS and ØMQ (2 sessions)

Common to both projects:

- Technology: ØMQ, JSON
- Goals: Distributed application development whose components are processes that communicate, adopting specific roles, using the ØMQ messaging system



## 4. Lab projects

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1. Project 1: Minimal component development in NodeJS (3 sessions)
2. Project 2: Component development in NodeJS and ØMQ (2 sessions)
3. Project 3: Distributed application development in NodeJS and ØMQ (2 sessions)
4. **Project 4: Deployment (3 sessions)**
  - ▶ **Technology: Docker**
  - ▶ **Goals:** To understand and manage a multi-component distributed service deployment, using current technologies about containers and deployment configuration / automation.
  - ▶ **Assessment:** In the 2<sup>nd</sup> partial.



## 4. Lab projects

- ▶ Lab sessions on Tuesdays:
  - ▶ L1-3E (10:00-11:30).
  - ▶ L2-3E (15:30-17:00).
- ▶ Lab teacher:
  - ▶ L1-3E: To be assigned
  - ▶ L2-3E: Pablo Galdámez Saiz ([pgaldamez@dsic.upv.es](mailto:pgaldamez@dsic.upv.es))

Project	1			2				3		
Session	1	2	3	4	5	6	7	8	9	10
Date	7 Oct	14 Oct	21 Oct	28 Oct	11 Nov	18 Nov	25 Nov	2 Dec	9 Dec	16 Dec



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## 5. Grading

- ▶ There are two parts to be considered:
    1. Theory
    2. Lab projects
  - ▶ Those parts are arranged in two exams:
    1. First partial (40%):
      - ▶ Theory: Units 1, 2 and (part of) 3
      - ▶ Lab projects: Lab 1 and Lab 2
    2. Second partial (40%):
      - ▶ Theory: Units (remaining part of) 3, 4, 5 and 6
      - ▶ Lab projects: Lab 3 and Lab 4
- ...and observation tests in the classroom (10%) and labs (10%)
- ▶ Those students with attendance exemption will not take the observation tests.
    - ▶ In that case, each partial provides 50% of the global grade.





## 5. Grading

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- I. Two partial exams (with second-chance) (80%)
  - ▶ Individual objective assessment
    - ▶ Multiple choice test
    - ▶ Minimum grade: 3 points
  - ▶ These exams include the contents of:
    - ▶ Theory
    - ▶ Labs
  - ▶ Dates:
    - ▶ 1<sup>st</sup> partial: 3 November.
    - ▶ 2<sup>nd</sup> partial: 16 January.



## 5. Grading

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1. Two partial exams (with second-chance) (80%)
2. Remedial exam
  - ▶ Provides a second chance to the partials.
  - ▶ Date: 29 January
  - ▶ If this remedial is taken, the previous grade is lost.



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## 6. Bibliography

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- ▶ No text fitting properly the course material.
  - ▶ Although we have provided a **student guide for each unit**.
    - ▶ TO BE INTERPRETED AS THE TEXTBOOK FOR THIS COURSE.
    - ▶ ALL GUIDES MUST BE STUDIED!
  - ▶ They are available at the PoliformaT site.
- ▶ Tons of available material to consult, though.
- ▶ General texts and web sites, to further dig into the material presented in theory.



## 6. Bibliography

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### ► General sources

- *Distributed Systems: Principles and Paradigms* (2<sup>nd</sup> Edition). Andrew S. Tanenbaum and Maarten van Steen. Prentice Hall International, 2006.
- *Distributed Systems: Concepts and Design* (5<sup>th</sup> Edition). George Coulouris, Jean Dollimore, Tim Kindberg, Gordon Blair. Addison-Wesley, 2011.
- <http://zguide.zeromq.org>. Good source of discussions and structural examples.



## 6. Bibliography

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### ▶ Technology

#### ▶ Basic sources.

- ▶ <http://nodejs.org>
- ▶ <http://zguide.zeromq.org>
- ▶ <http://mongodb.org>
- ▶ <http://docker.com/>

### ▶ Case studies

- ▶ For each case, the instructor will provide references.