

PI-Grau (Internet Protocols)

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- **PI-Grau Professor:**

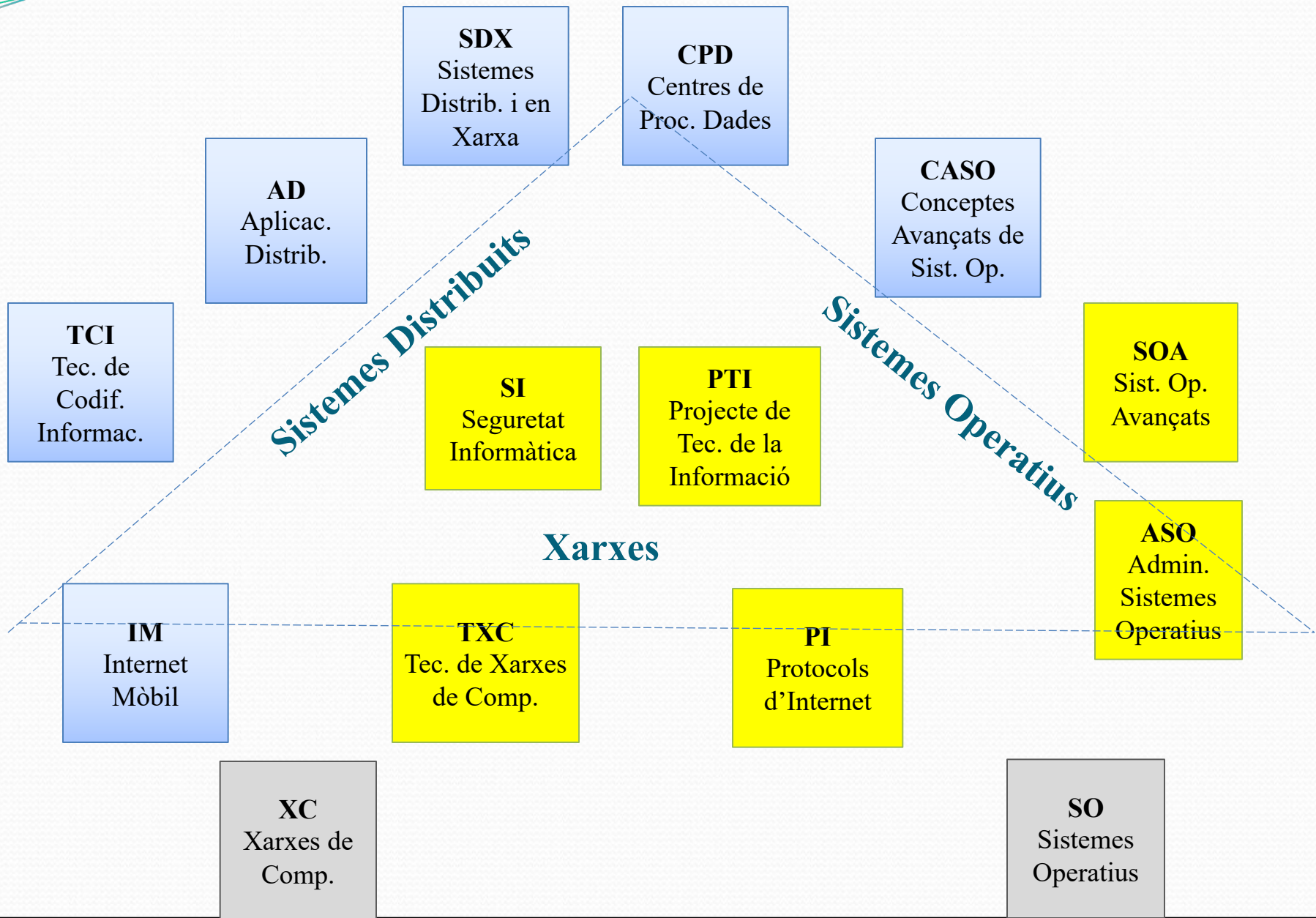
- **José M^a Barceló Ordinas**

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See files with the planning of the course that are published in RACO

- **Theory (Monday, 14:00-15:00, Thursday 14:00-16:00, A6203)**
- **Lab g11 (Tuesday, 14:00-16:00, D6003) is given by José M. Barceló**
- **Lab g12 (Tuesday, 16:00-18:00, D6003) is given by José M. Barceló**
- **Tutorships dates: requested and agreed via e-mail**

Especialitat Tecnologies de la Informació



- **PI-grau**

- Theory: audios + 2h/week of clarifying concepts and 1h solving exercises.
- Lab: 1h/week \rightarrow 2h/2weeks \rightarrow 6 Labs + 1 Lab exam for a total of 7 weeks over 15 weeks of course.
- Students will have to write a work at the end of the course. The topic can be anything related to the specialization.
- **Two exams:**
 - Exam 1: Topics 1 and 2 (35% of the course),
 - Exam 2: Topics 3 to 6 (35% of the course)

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● **Theory:**

● **Topic 1: Internet Architecture and Addressing (3 weeks)**

- Internet Architecture: ISP's, corporate networks and access networks.
- Organizations that manage the operation of businesses on the Internet: RIR (Regional Internet Registers), LIR (Local Internet Registries), Customer Cones.
- An Introduction to Content Distribution Networks (CDN).
- Internet Addressing: IPv4 depletion and IPv6.
- Exchange Points.

● **Topic 2: Corporate Network: switching blocks (4 weeks)**

- Ethernet switching.
- Virtual Networks (VLANs, IEEE 802.1Q) and aggregation (IEEE 802.3ad).
- Reliability level 2: Spanning Tree Protocol (IEEE 802.1D).
- Reliability Level 3: VRRP.
- Design of the switching block. Data Processing Centre (CPD): design and basic concepts.

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- **Topic 3: Intra-domain Routing (2 weeks)**
 - Basics for routing.
 - Link state routing.
 - OSPF: single-area and multi-area systems
- **Topic 4: Inter-domain Routing (2 weeks)**
 - Autonomous systems.
 - BGP (internal/external), attributes, multi-homing, load balancing.
 - Scalability in BGP: route reflectors and confederations.
 - Design of ISP
- **Topic 5: Corporate Networks revisited: VPN (1 week)**
 - Virtual Private Networks: MPLS-BGP and Metro-Ethernet
- **Topic 6: Applications and Services II (2 weeks).**
 - An introduction to Multimedia Services and QoS architectures.
 - Multimedia principles: coding
 - Taxonomy of QoS supporting protocols: RTP, RTCP, RTSP, SIP
 - Multimedia architectures: IntServ, DiffServ

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- Labs: 6 Labs + 1 Lab exam
 1. **STP** : learn the impact of Spanning Tree Protocol in a switched network.
 2. **Dynamic VLAN and VRRP Lab**: configure Ethernet switches using dynamic VLAN and the VRRP protocol.
 3. **OSPF Lab (inter-domain routing)**: configure OSPF in a single-area and in a multi-area
 4. **BGP Lab (intra-domain routing)**: configure BGP (EBGP/IBGP) and interconnect several AS's
 5. **Multi-homing and Communities Lab**: configure active policies between AS's using communities.
 6. **Scalability Lab**: configure route reflectors in a BGP network.
- Lab Exams using Webtest tool. Lab professor will explain the dynamic of the Labs at class.

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- Written work

- The work will consist on searching for information about a challenge topic proposed by by the students,
- The work can be individual or in groups of two (in this case, indicate which part has been worked by each student, e.g. put a color or some type of mark).

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- Examples of Topics for the works (a doc with ideas and topics can be found in the drive):
 - IPv4-IPv6 transition mechanisms
 - Advantages/disadvantages of using IPv6 with respect IPv4
 - Content Distribution Networks
 - Web services
 - Data Processing Centers
 - CAIDA
 - RIR activities
 - Growth (topology) of Internet
 - ...

Students have the possibility to propose any topic he/she is interested (related to the contents of the course) in and it is not in the list.

- **Course Evaluation:**

- **Exam 1 at mid-term (Topics 1,2) → 35%**
- **Exam 2 at the end of the course (Topics 3, 4, 5 and 6) → 35%**
- **Written work (WW) about a given topic → 10%**
- **Lab → 20%**
 - **Lab = $0.75 * \text{ExamLab} + 0.25 * \text{Sum}_i (\text{miniLabs})$, where $i=1,2, \dots, 6$**

Calculus of Final mark:

$$\text{NF} = 0,20 * \text{Lab} + 0,10 * \text{WW} + 0,35 * \text{Ex1} + 0,35 * \text{Ex2}$$

- **Competencia Transversal (CT):**

Work responsibility

- **Written Work (WW)** about a given work → **40%**
- **Lab and class participation (Lprt)** (attendance/delivery, ...) → **30%**
- **Lab grading** → **30%**

Calculus of Final mark for the CT:

$$\text{CT} = 0,40 * \text{WW} + 0,30 * \text{Lprt} + 0.3 * \text{Lab}$$

The final mark will be normalized to A (9-10), B (7.0-8.99), C (5-6.99), D (<5)