Objective of the lectures: 1) Evaluate the impact of the tremendous explosion of the use of Internet is having in the networking technology evolution. 2) Analyze the contribution of the Internet in the global energy consumption, and study mechanisms to counteract this fact. 3) Review the new networking paradigms and its consistence with the existing ones.

Objective of the discussion sessions based on selected readings: Foster autonomous learning and team work skills.

Objective of preparing a set of question for feeding the midterm exams: Foster comprehensive learning and the ability to summarise and of abstracting concepts.
Objective of the technical report: Enhance the cooperative learning and the capacity of synthesising and transmit concepts.

<table>
<thead>
<tr>
<th>Study load</th>
<th>Hours large group:</th>
<th>39h</th>
<th>31.20%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total learning time:</td>
<td>125h</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Self study:</td>
<td>86h</td>
<td>68.80%</td>
</tr>
</tbody>
</table>
Content

### Next Generation Internet

**Description:**
1) Internet trends

2) IP Traffic Monitoring and Analysis (TMA)
   2.1 IP traffic classification
   2.2 Anomaly detection and classification
   2.3 TMA in Software Defined Networks (SDN) environments
   2.4 Malware and network attack mitigation

3) Evolution of the IP network architecture
   3.1 Recursive Internet Architecture (RINA)
   3.2 The routing scalability in Internet
   3.3 Location/ID split (LISP)

4) The Internet of Things (IoT)

**Learning time:** 8h
**Theory classes:** 8h

### IP Transport networks, resources optimization and survivability

**Description:**
1) Multilayer Resilience Networks

2) From MPLS to SDN/OpenFLOW, the new paradigm

3) Deep Reinforcement Learning (DRL) for knowledge based routing and adaptive QoS

4) Optical Packet Switching Networks or the story of what could have been

**Learning time:** 8h
**Theory classes:** 8h

### Energy Oriented Internet

**Description:**
1) Energy consumption in Internet: The problem

2) Optimising the energy consumption in the network

3) The energy consumption in Datacenters and Clouds

**Learning time:** 5h
**Theory classes:** 5h
The evaluation and marking of the students of this course will be done according with the following percentages:

- Attendance to the lectures: 10%
- Panel Sessions on research papers (chairing the panel and participating in the debate): 10%
- Preparation of exam-like questions*: 10%
- Preparation and presentation of a Technical Report (in groups of 2 or 3 students): 20%
- Midterm exams (x 2): 50%

(* ) During the course the students will have to prepare three sets (one per each of the main subjects of the course) of 2 or 3 questions (and their answers) that can be included in the midterm exams of the course (i.e., they have to be not too easy or extremely difficult questions, but fitting with the level taught in the course).

New Networking Paradigms

<table>
<thead>
<tr>
<th>Description:</th>
</tr>
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<tbody>
<tr>
<td>1) Graphene-enabled Wireless Networks</td>
</tr>
<tr>
<td>1.1 Large scale Networks-on-Chip</td>
</tr>
<tr>
<td>1.2 Reconfigurable metamaterials- Optical Packet Switching Networks</td>
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<tr>
<td>2) Molecular Communications</td>
</tr>
</tbody>
</table>

Learning time: 5h
Theory classes: 5h

Miscellaneous

<table>
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<tbody>
<tr>
<td>- Panel sessions on the selected research papers</td>
</tr>
<tr>
<td>- Discussion of the exam-like questions prepared by the students</td>
</tr>
<tr>
<td>- Presentation of the Technical Reports done in groups</td>
</tr>
<tr>
<td>- Midterm exams (x2)</td>
</tr>
</tbody>
</table>

Learning time: 13h
Theory classes: 13h

Qualification system

The evaluation and marking of the students of this course will be done according with the following percentages:

- Attendance to the lectures: 10%
- Panel Sessions on research papers (chairing the panel and participating in the debate): 10%
- Preparation of exam-like questions*: 10%
- Preparation and presentation of a Technical Report (in groups of 2 or 3 students): 20%
- Midterm exams (x 2): 50%

(*) During the course the students will have to prepare three sets (one per each of the main subjects of the course) of 2 or 3 questions (and their answers) that can be included in the midterm exams of the course (i.e., they have to be not too easy or extremely difficult questions, but fitting with the level taught in the course).
Bibliography

Basic:


Complementary:
