

300026 - API - Internet Architecture and Protocols

Coordinating unit:	300 - EETAC - Castelldefels School of Telecommunications and Aerospace Engineering
Teaching unit:	744 - ENTEL - Department of Network Engineering
Academic year:	2018
Degree:	BACHELOR'S DEGREE IN AEROSPACE SYSTEMS ENGINEERINGS/BACHELOR'S DEGREE IN TELECOMMUNICATIONS SYSTEMS ENGINEERING - NETWORK ENGINEERING (AGRUPACIÓ DE SIMULTANEÏTAT) (Syllabus 2015). (Teaching unit Compulsory) BACHELOR'S DEGREE IN NETWORK ENGINEERING (Syllabus 2009). (Teaching unit Compulsory) BACHELOR'S DEGREE IN TELECOMMUNICATIONS SYSTEMS ENGINEERING (Syllabus 2009). (Teaching unit Compulsory) BACHELOR'S DEGREE IN AEROSPACE SYSTEMS ENGINEERING/BACHELOR'S DEGREE IN NETWORK ENGINEERING (Syllabus 2015). (Teaching unit Compulsory) BACHELOR'S DEGREE IN AEROSPACE SYSTEMS ENGINEERING/BACHELOR'S DEGREE IN TELECOMMUNICATIONS SYSTEMS ENGINEERING (Syllabus 2015). (Teaching unit Compulsory) BACHELOR'S DEGREE IN AIR NAVIGATION ENGINEERING (Syllabus 2010). (Teaching unit Optional) BACHELOR'S DEGREE IN AIRPORT ENGINEERING (Syllabus 2010). (Teaching unit Optional) BACHELOR'S DEGREE IN AEROSPACE SYSTEMS ENGINEERING (Syllabus 2015). (Teaching unit Optional)
ECTS credits:	6
Teaching languages:	Catalan, Spanish, English

Teaching staff

Coordinator: Definit a la infoweb de l'assignatura.

Others: Definit a la infoweb de l'assignatura.

Prior skills

X

Requirements

X

Degree competences to which the subject contributes

Specific:

1. CE 20 TELECOM. Conocimiento de la normativa y la regulación de las telecomunicaciones en los ámbitos nacional, europeo e internacional.(CIN/352/2009, BOE 20.2.2009.)
2. CE 7 TELECOM. Capacidad de utilizar aplicaciones de comunicación e informáticas (ofimáticas, bases de datos, cálculo avanzado, gestión de proyectos, visualización, etc.) para apoyar el desarrollo y explotación de redes, servicios y aplicaciones de telecomunicación y electrónica.(CIN/352/2009, BOE 20.2.2009.)

General:

6. EFFICIENT USE OF EQUIPMENT AND INSTRUMENTS - Level 2: Use the correct instruments, equipment and laboratory software for specific or specialized knowledge of their benefits. A critical analysis of the experiments and results. Correctly interpret manuals and catalogs. Working independently, individually or in groups, in the laboratory.

Transversal:

3. SELF-DIRECTED LEARNING - Level 1. Completing set tasks within established deadlines. Working with recommended information sources according to the guidelines set by lecturers.
4. THIRD LANGUAGE. Learning a third language, preferably English, to a degree of oral and written fluency that fits in with the future needs of the graduates of each course.
5. TEAMWORK - Level 1. Working in a team and making positive contributions once the aims and group and individual

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responsibilities have been defined. Reaching joint decisions on the strategy to be followed.

Teaching methodology

X

Learning objectives of the subject

X

Study load

Total learning time: 150h	Hours small group:	52h	34.67%
	Guided activities:	14h	9.33%
	Self study:	84h	56.00%

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Content

<p>Introduction</p>	<p>Learning time: 0h 34m Laboratory classes: 0h 34m</p>
<p>Description: (ENG) Presentació de l'assignatura i explicació del funcionament del laboratori. Resum dels objectius de l'assignatura i relació amb altres assignatures del pla d'estudis.</p> <p>Related activities: Activities A1, A13.</p>	
<p>Fundamentals of IPv4 addressing and routing</p>	<p>Learning time: 5h 17m Laboratory classes: 1h 41m Guided activities: 0h 36m Self study : 3h</p>
<p>Description: (ENG) Adreçament IPv4. Classes d'adreçes. Rangs públics i privats. Encaminament basat en classes. Subnetting i supernetting. Encaminament sense classes CIDR. Taules d'encaminament i Longest-Prefix Matching. Descripció funcional d'un router . Encaminament unicast estàtic.</p> <p>Related activities: Activities A1, A13.</p>	

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<p>Unicast IP Routing Protocols - Interior Gateway Protocols</p>	<p>Learning time: 20h 01m Laboratory classes: 7h 06m Guided activities: 1h 55m Self study : 11h</p>
<p>Description: (ENG) Encaminament dinàmic i algorismes: <ul style="list-style-type: none"> · Paradigma vector distància. Algorismes de Bellman-Ford i Ford-Fulkerson. · Paradigma d'estat d'enllaç. Algorisme de Dijkstra. Protocols RIPv1 i RIPv2 <ul style="list-style-type: none"> · Problema del count-to-infinity. · Split-horizon i Poison Reverse. · Temporitzadors. Protocol OSPF <ul style="list-style-type: none"> · LSAs i base de dades OSPF. · Elecció router designat i de backup. · Sincronització de bases de dades. · Actualitzacions. · Àrees i sumarització de prefixos. Related activities: Activities A2, A3, A13.</p>	
<p>Multicast IP routing protocols</p>	<p>Learning time: 13h 51m Laboratory classes: 4h 44m Guided activities: 1h 17m Self study : 7h 50m</p>
<p>Description: (ENG) Concepte de comunicació Multicast. Adreçament Multicast: rang d'adreces i relació amb adreçament de nivell 2. Protocols IGMPv1,v2,v3. Protocols d'encaminament dinàmic multicast: <ul style="list-style-type: none"> · CB-Trees,MOSPF, PIM-DM. · PIM-SM: <ul style="list-style-type: none"> - BSRs i Rendezvous Points. - Arbres compartits i de font. - Temporitzadors i llindars. - Senyalització PIM-SM. Related activities: Activities A4, A13.</p>	

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<p>Unicast IP Routing Protocols - Exterior Gateway Protocols</p>	<p>Learning time: 27h Laboratory classes: 9h 28m Guided activities: 2h 32m Self study : 15h</p>
<p>Description: (ENG) Estructura d'Internet: <ul style="list-style-type: none"> · Sistemes Autònoms i ASNs. · Repartiment d'espai d'adreces. Protocol BGP4: <ul style="list-style-type: none"> · Paradigma camí distància. EGP. · Funcionament d'un router BGP4. · Interacció amb IGP. · Atributs i polítiques d'encaminament. · Route-maps. · Reflectors de ruta i confederacions. Related activities: Activities A5, A13.</p>	
<p>Introduction to IPv6</p>	<p>Learning time: 13h 50m Laboratory classes: 4h 44m Guided activities: 1h 16m Self study : 7h 50m</p>
<p>Description: (ENG) Problemàtica actual amb IPv4. Protocol IPv6 <ul style="list-style-type: none"> · Diferències respecte a IPv4 i format dels paquets. · Adreçament IPv6. · Encaminament IPv6. · Funcionalitats noves: IGMPv6, autoconfiguració. Problemàtica de la transició IPv4 a IPv6: <ul style="list-style-type: none"> · Dual-Stacks. · Túnel. Related activities: Activities A6, A13.</p>	

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<p>Transport protocols in the Internet</p>	<p>Learning time: 13h 50m Laboratory classes: 4h 44m Guided activities: 1h 16m Self study : 7h 50m</p>
<p>Description: (ENG) Funcionalitats i necessitat de la capa de transport. Protocol UDP: · Control d'errors, multiplexat. Protocol TCP: · Limitacions del servei IP best-effort i UDP. · Funcionalitats afegides: fiabilitat, control flux i congestió. · Concepte de connexió, seqüencialment, reconeixement i retransmissió. · Control de flux i congestió a TCP: - Finestra de transmissió, finestra del receptor, finestra de congestió i llindars. - Slow-Start. - Congestion Avoidance. - Fast Retransmit i Fast Recovery. - Temportitzadors i RTO. - Variants del TCP: Tahoe, Reno, NewReno, Vegas, etc.</p> <p>Related activities: Activities A7, A13.</p>	
<p>The Domain Name System (DNS)</p>	<p>Learning time: 10h 31m Laboratory classes: 3h 33m Guided activities: 0h 58m Self study : 6h</p>
<p>Description: (ENG) Arquitectura del sistema DNS. FQDNs, TLDs,RRs. Registres i registrats. Concepte de domini, delegació, zona, Màster i slaves, resolvers i servidors. Protocol DNS. Resolució recursiva i iterativa. Desplegament a Internet. Suport de DNS per a IPv6.</p> <p>Related activities: Activities A8, A13.</p>	

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<p>Electronic mail (e-mail)</p>	<p>Learning time: 3h 34m Laboratory classes: 1h 14m Guided activities: 0h 20m Self study : 2h</p>
<p>Description: (ENG) Configuració d'un servidor de correu electrònic. Protocols SMTP, POP3 i IMAP4. Encaminament del correu electrònic.</p> <p>Related activities: Activities A9, A13.</p>	
<p>World Wide Web and HTTP protocol</p>	<p>Learning time: 13h 51m Laboratory classes: 4h 44m Guided activities: 1h 17m Self study : 7h 50m</p>
<p>Description: (ENG) Introducció a la World Wide Web (www) Arquitectures web. Configuració de servidors web. Protocol HTTP. Web estàtica. Serveis web (REST).</p> <p>Related activities: Activities A10, A13</p>	
<p>Firewall and Network Address Translation (NAT)</p>	<p>Learning time: 13h 51m Laboratory classes: 4h 44m Guided activities: 1h 17m Self study : 7h 50m</p>
<p>Description: (ENG) Seguretat bàsica en xarxa. Firewalls amb i sense estat. Polítiques i topologies. DMZs. Proxies. NATs: DNAT, SNAT i la seva utilitat.</p> <p>Related activities: Activities A11, A13.</p>	

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Multimedia and real-time services over IP networks

Learning time: 13h 50m

Laboratory classes: 4h 44m

Guided activities: 1h 16m

Self study : 7h 50m

Description:

(ENG) Motivació: serveis d'streaming, telefonia i vídeo sobre IP.

Protocol RTSP.

Protocol RTP/RTCP.

Protocol SDP.

Introducció al protocol SIP i aplicacions.

Related activities:

Activities A12, A13.

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Planning of activities

IPv4 addressing and static routing	Hours: 5h 44m Laboratory classes: 2h 10m Guided activities: 0h 34m Self study: 3h
Unicast IP Routing Protocols - Interior Gateway Protocols - RIP Protocol	Hours: 6h 13m Laboratory classes: 2h 10m Guided activities: 0h 33m Self study: 3h 30m
Unicast IP Routing Protocols - Interior Gateway Protocols - OSPF Protocol	Hours: 13h 03m Laboratory classes: 4h 20m Guided activities: 1h 13m Self study: 7h 30m
Multicast IP Routing Protocols. PIM-SM Protocol	Hours: 13h 23m Laboratory classes: 4h 20m Guided activities: 1h 13m Self study: 7h 50m
Unicast IP Routing Protocols - Exterior Gateway Protocols - BGP Protocol	Hours: 26h 08m Laboratory classes: 8h 40m Guided activities: 2h 28m Self study: 15h
An Introduction to the IPv6 Protocol	Hours: 13h 23m Laboratory classes: 4h 20m Guided activities: 1h 13m Self study: 7h 50m
Transport protocols in the Internet	Hours: 13h 23m Laboratory classes: 4h 20m Guided activities: 1h 13m Self study: 7h 50m

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The Domain Name System (DNS)	Hours: 10h 11m Laboratory classes: 3h 15m Guided activities: 0h 56m Self study: 6h
The Electronic Mail (e-mail)	Hours: 3h 23m Laboratory classes: 1h 05m Guided activities: 0h 18m Self study: 2h
World Wide Web and HTTP protocol	Hours: 13h 23m Laboratory classes: 4h 20m Guided activities: 1h 13m Self study: 7h 50m
Firewall and Network Address Translation (NAT)	Hours: 13h 23m Laboratory classes: 4h 20m Guided activities: 1h 13m Self study: 7h 50m
Multimedia and real-time services over IP networks	Hours: 13h 23m Laboratory classes: 4h 20m Guided activities: 1h 13m Self study: 7h 50m
Final activity that includes all the course contents	Hours: 5h Guided activities: 0h 40m Laboratory classes: 4h 20m

Qualification system

X

Regulations for carrying out activities

X

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Bibliography

Basic:

Stevens, W. Richard; Wright, Gary R.; Fall, Kevin R. TCP/IP illustrated [on line]. Reading, MA [etc.]: Addison-Wesley, 1994-1996 Available on: <<http://proquest.safaribooksonline.com/020163354X?uicode=politicat>>. ISBN 0201633469.

Stallings, William. Data and computer communications. 8th ed. Upper Saddle River, NJ: Pearson Education International, 2009. ISBN 9780135071397.

Keshav, Srinivasan. An engineering approach to computer networking : ATM networks, the internet, and the telephone network. Reading, Mass.: Addison-Wesley, 1997. ISBN 0201634422.

Hall, Eric A. Internet core protocols : the definitive guide [on line]. Cambridge, Mass.: O'Reilly, 2000 Available on: <<http://site.ebrary.com.recursos.biblioteca.upc.edu/lib/upcatalunya/detail.action?docID=10759064>>. ISBN 1565925726.

Huitema, Christian. Routing in the internet. 2nd ed. Upper Saddle River, NJ: Prentice Hall PTR, 2000. ISBN 0130226475.

Perlman, Radia. Interconnections : bridges, routers, switches, and internetworking protocols. 2nd ed. Reading, MA: Addison-Wesley Pub. Co, 2000. ISBN 0201634481.

Complementary:

Halabi, Bassam. Internet routing architectures. Indianapolis: Cisco Press, 2001. ISBN 157870233X.

Zwicky, Elizabeth D.; Chapman, D. Brent; Cooper, Simon. Building Internet Firewalls. 2nd ed. Sebastopol: O'Reilly & Associates, 2000. ISBN 1565928717.

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Malhotra, Ravi. IP routing. Beijing [etc.]: O'Reilly, 2002. ISBN 0596002750.

Kosiur, David R. IP multicasting : the complete guide to interactive corporate networks. New York [etc.]: John Wiley & Sons, 1998. ISBN 0471243590.

Zwicky, Elizabeth D; Chapman, D. Brent; Cooper, Simon. Building Internet Firewalls. 2nd ed. Sebastopol, CA: O'Reilly & Associates, cop. 2000. ISBN 1565928717.

Others resources: