

Faculty: FACULTY OF TELECOMMUNICATIONS AND MANAGEMENT
Department: INFORMATION TECHNOLOGIES
Professional Field: 5.3.Communication and Computer Engineering
Specialty: COMPUTER TECHNOLOGIES
Educational-qualification degree: BACHELOR

LEARNING COURSE DESCRIPTION

1. **Course title:** NETWORK LOAD BALANCE
2. **Course code:** B.42.048.2
3. **Type of the course:** eligible
4. **Level:** Bachelor
5. **Year of study:** third
6. **Semester:** sixed
7. **Number of credits:** 4,5
8. **Name of the lecturer (s):** Assoc. Prof. PhD Irina Topalova

9. **Course learning outcomes:** The aim of the course is to acquaint the students with Students receive theoretical and practical knowledge of balanced network load in local and WAN based traffic. Network load balancing algorithms, as well as load allocation policies, are utilized. The principles and methods of building load-balancing systems with high reliability are studied. The students who have completed their training in the course must acquire:

Basic knowledge of how to build a comprehensive project for managing and balancing local and WAN traffic.

Practical skills to implement the studied methods, by configuring the set functionality, to realize practical tasks in the mentioned field.

Competencies: After the successful completion of the course students should be able to:

- Plan and implement client-server communications;
- Manage and balance local traffic;
- Define variants of balanced IP traffic with static and dynamic routing;
- Balancing network IP traffic VLANs.
- Apply the Etherchannel and Multilink methods.

10. **Teaching methods:** The lectures are conducted in the classical way, as the students get acquainted with the material. The statements are illustrated with examples that make it easier for students to practice. The lectures are richly illustrated with graphic material, which is represented by presentations with a multimedia projector. Practical exercises are held in the computer labs of the department, equipped with the necessary network devices and software packages for simulation.

11. **Prerequisites:** The inputs are acquired knowledge of *Networks and Protocols 1* ", " *Operational systems basics*", etc. taught in previous semesters technical subjects.

12. **Course contents:** Students learn ways to manage and balance local traffic, provide alternative connections, aggregate traffic, design load balancing on web servers, learn permanent and converged load allocation policies. The methods of balancing routing of IP traffic using static and dynamic routing, balanced Spanning-Tree Protocol (STP) methods for balancing IP traffic between virtual local networks (VLANs), aggregation of traffic using Etherchannel and Multilink technologies.

13. Bibliography

Basic literature:

1. Tony Bourke, Server Load Balancing, ISBN-13: 978-0596000509, ISBN-10: 0596000502, 2016.
2. https://www.cisco.com/en/US/products/hw/modules/ps2033/prod_technical_reference09186a00800afeb7.html#wp16220, accessed 2018.

3. Performance Tradeoffs in Static and Dynamic Load Balancing Strategies, NASA March 1986, <http://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/19860014876.pdf>.
4. Varieties of Spanning Tree Protocols, <http://www.ciscopress.com/articles/article.asp?p=2832407&seqNum=5>, 2018.
5. MMOG Server-Side Architecture. Front-End Servers and Client-Side Random Load Balancing, <http://ithare.com/chapter-vib-server-side-architecture-front-end-servers-and-client-side-random-load-balancing/>

Additional literature:

1. Introduction to The Hot Standby Router Protocol (HSRP) <http://www.pearsonitcertification.com/articles/article.aspx?p=2141270>, 2019.
2. Virtual Router Redundancy Protocol (VRRP) **and** Gateway Load Balancing Protocol (GLBP), <https://www.networkstraining.com/hsrp-vrrp-glbp-comparison/>, 2019.
3. Richard Froom, Erum Frahim, Implementing EtherChannel in a Switched Network, <http://www.ciscopress.com/articles/article.asp?p=2348266&seqNum=3>, 2019.

14. Assessment methods and criteria: The final assessment is based on the points obtained during the semester, the correspondence between the number of points and the six-point assessment is presented in Table 1. On the announced date for completion of the final grade, the students develop one or two questions of the discipline in writing and solve a case study in a practical assignment.

Table 1.

Number of points	Assessment According to the 6-point Scale System
0 – 39	Fail 2 (F)
40 – 45	Satisfactory 3.00 (E)
46 – 56	Satisfactory 3.00 (D)
61 – 74	Good 4.00 (C)
75 – 88	Very good (5B)
89 - 100	Excellent 6.00 (A)

15. Language of instruction: Bulgarian/English