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# CS-E4160 - Laboratory Works in Networking and Security, 08.01.2020-30.03.2020

## Course Arrangements



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# Course Personnel

## Responsible Teacher

- Antti Ylä-Jääski

## Assistants

- Esa Vikberg
- Dancun Omondi Ogenda
- Antton Kortelainen
- Ahmed Massoud



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# Course information, contact information

All course materials in MyCourses

- <https://mycourses.aalto.fi/course/view.php?id=24347>

For general discussion about assignments

- [Slack](#)
- MyCourses General Discussion forum

Personal matters to course personnel mailing list

- [cs-e4160@aalto.fi](mailto:cs-e4160@aalto.fi)

**Please do not contact course staff directly!**



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# Course Contents and Motivation

**Get to try all the things you have learned!**

**Hands on learning of the basics of:**

- **Configuring, monitoring and diagnosing different services and computer networks**
- **Configuring and inspecting some computer and network security related stuff**
- **Linux administration and networking tools**

**Course material will provide you with the base information**

- **Learn to search for information and instructions yourself!**



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# Prerequisites

## Recommended prerequisites:

- A course on computer networks or similar

## Useful skills

- Basics of Unix-based systems administration (we will be using Ubuntu in the course)
- Command line

We will have a brief lecture on Linux/Unix basics to help you get started

- During the course you should be able to do things in Unix-based machines



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# Assignments

## Path A

- Network tools
- Email server
- IPv6
- Encrypted filesystems
- Firewall
- Extra: SDN

## Path B

- Network tools
- Web server
- DNS
- Network filesystems
- VPN
- Extra: Containers



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# Course Environment

**You will install your own Virtual Machines (VMs)**

- **VirtualBox as the Hypervisor**
- **Three virtual Ubuntu servers**
- **Virtual networks**
- **Installation instructions in MyCourses**
- **You will have to bring your own laptop to the sessions**



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# Schedule

Week	Event	Path A	Path B
2	This Lecture		
3	Linux Crash Course		
4	Round 1 demos	Networking tools	Networking tools
6	Round 2 demos	Email server	Web server
9	Round 3 demos	Ipv6	DNS
11	Round 4 demos	Encrypted Filesystems	Network Filesystems
13	Round 5 demos	Firewall	VPN
14	Extra Round demos	SDN	Containers

**Before demo week of an assignment, there is a reception where you can ask for help.**





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# Passing the course

## You can get 5 or 10 ECTS from this course

- Path A or Path B: 5 ECTS, intro(n/w tools) + 4 mandatory assignments (+ 1 extra)
- Path A+B: 10 ECTS, intro (n/w tools) + 8 mandatory assignments (+ 1 extra)
- You have to demonstrate each assignment to an assistant to be graded
- Points for each task shown in the assignment
- First assignments is shared between paths

## Extra assignments

- Can be used to replace missed mandatory assignment
- Can be used to increase your total score

**Detailed grading information is available in MyCourses**

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# Reception sessions

## During reception week you can ask questions about your assignments

- Either in a reception session or in the forums(Slack and Mycourses)
- Assistants will answer your questions the best they can
- But they will **not do** the assignments for you

## Reception sessions

- Not mandatory!
- No reservation, first-come-first-serve
- Reception Week Tuesdays (14:00 onwards)
  - Unless otherwise announced



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# Demo sessions

## Reserve your personal slot in MyCourses

- 30 minutes per assignment
- You can reserve 30min + 30min, if doing both paths

## Demonstrate your solution for the assignment face-to-face

- Assistants will ask questions, you answer to your best knowledge
- Your responsibility is to prepare your answers to questions so that you can demonstrate the whole assignment in reserved times

## Demos are **MANDATORY SESSIONS**

- Will be held in room C111



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# FAQs

## **Can I bring paper notes? Or can I use electronic notes?**

- Yes, but you should leave all material you brought to course personnel

## **Can I work with a pair?**

- Yes, but you will have to demo with your own virtual machines without your pair!

## **Can I reuse the work of some other student?**

- Zero tolerance; plagiarism will lead to failing of the whole course
- The course personnel asks you additional questions to see you understand what you were doing and why

## **Can I use my own work from previous years? Do I have to demo those?**

- Contact the course personnel!



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# Assignments



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# First assignment: Network tools

## **Common for both paths!**

- Setup your VMs, learn to find information

## **Basic Unix-tools for networking**

- ip, netstat, dig, ping, traceroute

## **Configuring network interfaces**

## **Client-server communication with netcat and telnet**



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# Path A



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## A2: Email server

Setup an email server

- Configure postfix
- Learn to filter spam with procmail and spamassassin
- Learn to filter non-spam with procmail
- DNS and Email

## A3: IPv6

- Build a small network with IPv6
- Routing in IPv6
- Connect to global IPv6 using Teredo
- Security issues in Ipv4/Ipv6 mixed networks

## A4: Encrypted filesystems

- Simulation of encryption of an external memory (such as an USB memory stick)
- Two different schemes:
  - Encrypted loopback device with dm\_crypt
  - Encryption layer for an existing filesystem with encFS
- Truecrypt also used to create a hidden volume inside another encrypted volume.

## A5: Firewall

- Firewall basics
- Packet filtering with netfilter/iptables
- Squid as web proxy to control traffic





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# Path B



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## B2: Web server

- Configuring Apache
- A basic Node.js application
- Encryption using SSL / HTTPS
- Using nginx as a reverse proxy

## B3: DNS

- Create caching-only name server
- Create a DNS domain
- Configure subdomains
- Secure the server with DNSSEC

## B4: Network filesystems

Setup and compare network filesystems

- NFS
- Samba
- sshfs
- WebDAV

## B5: VPN

- Introduction to VPN concepts
- OpenVPN used to establish a host-to-net VPN scenario



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## Extra A: SDN

### Openflow basics

- Build custom topologies with mininet
- Control switches using POX
- Create a layer-2 firewall with Pyretic

## Extra B : Containers

### Docker and Kubernetes basics

- Deploy services with Docker
- Scale services with Kubernetes



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Questions?