

# Boston University

## MET CS 685: Network Management and Performance

### Course Overview

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This course will cover theories, techniques and architectures for network management with a focus on contemporary integrated network management based on FCAPS (Fault, Configuration, Administration, Performance, and Security management) model and the eTOM business process framework. The main management protocols will be covered: SNMP, RMON, COPS and COPS-PR, CLI, SYSLOG, NETCONF/YANG, Netflow/IPFIX, Web Services, IRP, WBEM and Agent Extensibility Protocol (AgentX) . Example of domain specific management will be provided with a particular focus and emphasis on Broadband Network Management, Wireless Management and VoIP Management.

### Prerequisites

- MET CS535 - Data Communications and Computer Networks (mandatory) or MET CS625 – Business Data Communications (mandatory)
- Network Access - either through BU or work and BU Telecom Lab Net;
- Familiarity with computer programming concepts.

### Learning Objectives

At the end of the course, you will be able to understand Network Management basics and modern concepts of network management such as services (Voice over IP services, Peer-to-Peer Management, Cloud computing, SOA, etc). You will be able to understand role of Network Management and inter-dependencies of various network technologies and services.

### Textbooks

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#### Mandatory

- Custom book: information will be sent by email

#### Optional

- Subramanian Mani, *Network Management: Principles and Practice*, Addison-Wesley, 2000
- Jianguo Ding, *Advances in network Management*, CRC Press Auerbach Publications
- Alexander Clemm, *Network Management Fundamentals*, Cisco Press
- Adrian Farrel, *Network management Know it All*, Morgan Kaufman
- Adeel Ahmed, *VoIP Performance Management and Optimization*, Cisco Press
- Additional papers and articles will be provided in the class

### Methods of Instructions

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The class sessions will be conducted in the lecture format once a week (see below). The mandatory components of the course work include class attendance, submitting homework on time and taking the midterm and final exams.

## Evaluation and Grading

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This course is a "learn by doing" course. You will have to do homework assignments to help you master the material. You will also have to read the textbook in advance to prepare for each lecture and to be ready to discuss the issues related to the current class topic.

Any grading event not met and not covered by the above two points will receive a grade of 0

Grades will be based on

- Homework assignments and Participation (20%),
- Mid-term examination (30%)
- Labs (20%), and
- Final examination (30%).

Grading criteria for the homework and the exams include your ability to understand course concepts and their relationships correctly.

Grade ranges are as follows:

A	94 - 100%
A-	90 - 93%
B+	87 - 89%
B	84 - 86%
B-	80 - 83%
C+	77 - 79%
C	74 - 76%
C-	70 - 73%
D	60 - 69%
F	< 60%

## Homework

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Homework assignments are mandatory. Their timely and satisfactory completion is an absolute requirement for receiving any credit for this course. Homework assignments must be uploaded into the course Blackboard Dropbox.

Homeworks are worth 20% of the final grade.

Homeworks and projects you will submit in Microsoft Word format. The file name must be in the following format:

LastName\_FirstName\_HomeworkNumber.doc for example, Doe\_John\_HW2.doc

or

LastName\_FirstName\_ProjectTitle.doc for example, Doe\_John\_Lab1.doc

All assignments will be posted to the "Assignments" page of this web, along with a due date. Assignments will not be accepted after the start of the class on the night that homework is due.

### Mid-Term and Final Examinations

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There will be two exams. The first exam (Mid-Term) will cover Network Management definitions of terms and concepts, and brief discussions of course concepts and their relationships. The second exam (Final) will cover the whole course. It will be in the multiple-choice and fill-in-the-blanks format. Both exams are closed book, and no electronic and paper documents will be permitted.

If either the mid-term or final will be missed it will be the responsibility of the student to arrange with the professor a mutually agreeable schedule for completion of work.

Mid-Term and Final Exam are each worth 30% of the final grade.

If any work is to be completed beyond the scheduled dates of this course the student must negotiate a Boston University "Contract for an Incomplete Grade" with the professor.

### Labs

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The Labs are worth 20% of the Final Grade.

### Software

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Recommended NMS tools are PRTG and Net-SNMP.

Wireshark will be used for troubleshooting and packet analysis.

Neo4j will be used as graph database to model management information

YANG validator: pyang

### Schedule

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Week	Date	Content	Homeworks
1	Mon, Sep 14	Introduction to the course  Overview of Data Communications  Overview of Networking Models	
2	Mon, Sep 21	Theories, Techniques and Architectures for Network Management  <ul style="list-style-type: none"><li>• Network management architectures: manager/agent, Telecommunications Management Network(TMN), service management ...</li><li>• FCAPS (fault, configuration, accounting, performance, security)</li><li>• Enhanced Telecom Operations Map (eTOM)</li></ul>	HW1 assigned

3	Mon, Sep 28	Theories, Techniques and Architectures for Network Management <ul style="list-style-type: none"> <li>• Policy-based management</li> <li>• Artificial Intelligence techniques for network management</li> <li>• Web-based network management</li> <li>• Cloud management</li> <li>• Autonomic Networking</li> </ul>	HW1 due, HW2 assigned
4	Mon, Oct 5	Management Protocols: <ul style="list-style-type: none"> <li>• SNMP</li> <li>• Agent Extensibility Protocol (AgentX)</li> </ul>	HW2 due, HW3 assigned
5	Mon, Oct 12	NO CLASS – Columbus Day	
6	Mon, Oct 19	Management Protocols: NETCONF/YANG	HW3 due, HW4 assigned
7	Mon, Oct 26	Management Protocols: <ul style="list-style-type: none"> <li>• CLI</li> <li>• SYSLOG</li> <li>• Netflow/IPFIX</li> <li>• RMON</li> <li>• COPS and COPS-PR</li> </ul>	HW4 due, HW5 assigned
8	Mon, Nov 2	Mid-Term	
9	Mon, Nov 9	Management Protocols: <ul style="list-style-type: none"> <li>• Web Services (WS-M, WinRM)</li> <li>• WBEM (CIM/WMI)</li> </ul>	HW5 due, HW6 assigned
10	Mon, Nov 16	Domain Specific Management: Wireless	
11	Mon, Nov 23	Domain Specific Management: VoIP	
12	Mon, Nov 30	Domain Specific Management: IP & MPLS	HW6 due
13	Mon, Dec 7	Domain Specific Management: Optical Networks Management and GMPLS	
		Catch-up, Open Discussion, Class Presentations, Course Overview	
14	Mon,	Final Exam	

### **Academic Honesty**

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The course is governed by the Academic Conduct Committee policies regarding plagiarism (any attempt to represent the work of another person as one's own). This includes copying (even with modifications) of a program or segment of code. You can discuss general ideas with other people, but the work you submit must be your own. Collaboration is not permitted.

Copying answers off the Internet is not permitted. Copying answers off Solutions is not permitted.

Any violation of the Academic Code of Conduct will be enforced to the full extent with no exceptions.

### **Instructor Information**

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Instructor: Said Soulhi (Dr. Eng)

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Class Room: FLR 267, 808 Commonwealth Ave, first floor

**For additional information please visit <http://csmet.bu.edu>  
Computer Science Department at Boston University Metropolitan College**

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