Course Syllabus

Instructor: Riaz Esmailzadeh  
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Room:  
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Time: Fridays, 8:30-11:20 am

Place: TBD

Review Session: TBD

Pre-Requisite: 95-705 – Telecommunications Management

Course Description

Provision of hi-speed data communications and internet connectivity from the home and small business is a very recent development. A decade or so ago the best connection speeds were in the order of tens of kilobits per second (kbps), and used ordinary telephone lines and dial-up modem technologies. The introduction of Digital Subscriber Links (DSL) technologies just before the turn of the century has facilitated megabit/sec (Mbps) connectivity. This has been followed by further development in xDSL technologies, novel topologies using a combination of DSL and Optical Fiber technologies. In the same period, great advances have been made in the field of wireless broadband; culminating in standards such as Super 3G, WiMAX and LTE.

This course is designed to provide students with a deep understanding of the key technologies which enable the delivery of broadband communications. The course will build on basic telecom theories to enable students to gain insight into what technologies are used to enable such services and why. We will also discuss the challenges in delivering these services from the business and policy points of view. Discussion of technology will be set in the context of present and future applications. Topics covered will include basic concepts of wireless telecommunication technology, and mobile Internet.

Learning Objectives

The course will have a technical focus. We will cover in depth how the technology works in order to enable future managers to understand the technology, and appreciate how it is evolving as they plan and manage broadband communications systems. The syllabus is designed so students will learn:

- Details of fixed broadband technologies: xDSL and transmission technologies for fixed media; hybrid topologies: DSL and Fiber
- Details of broadband wireless technologies: Super 3G, LTE, WiMAX
- Wide area coverage technologies: satellite broadband
- Transmission rates and coverage issues
- Voice over IP, Peer-to-Peer and sensor networking
- Antenna technologies: MIMO and adaptive arrays
- Network design, costs and policy issues
Student Expectations

As befits a post-graduate course student, a high level of individual student motivation and initiative will be expected. Students will need to use extensive online resources on telecommunications technology and be well prepared to discuss issues in class. Assignment questions, while based on lecture material and issues discussed in class, still require a certain degree of self-guided research. Answers to some questions may not be readily apparent by just looking at lecture material. Furthermore, student team project will require extensive individual and team research, and is an important component of the course. Furthermore, I would like you to share your finding with the class using the discussion forum on the Blackboard.

All lecture notes, assignments, review questions and reading materials will be posted on the Blackboard: I expect the students to refer to the class Blackboard regularly.

Required Readings

There are no text books. Lecture notes and case studies on telecommunications are required readings for classroom discussion. The case studies are available from the bookshop. Some further material will be made available on Blackboard. It is your responsibility to regularly check Blackboard for course handouts and other course-related messages.

A number of on-line resources provide up-to-date news on mobile commerce: one such site: Total Telecom provides the latest development in the field and you should subscribe to their daily newsletter.

Agenda

An agenda for each class is posted on the Blackboard. Here a list of topics to be discussed as well as an approximate length for their discussion is provided. Furthermore, the agenda list “things to be done”, such as articles to read or activities to do; both to prepare for the lecture, as well as where to find further information on the topics covered. Reminders are given for due assignments.

Individual Paper

Instead of a final exam you will submit a paper in which you explore a telecom technology or business. Your final report will be a mini case study on what the technology/business is, why it is important and how you see its role playing out in the coming years. Your analysis details and critical thinking ability in studying and reporting your topic will be assessed. The final paper submission is expected to be less than 10 pages.

The individual paper can be on one of the following:

- Analysis of a current telecom business, showing the technologies, the market and the benefits of the business.
- Analysis of different telecom technologies and a comparison on their value to the end-user/operator/policy entity.
- Analysis of a telecom system and the contributing technologies.

Team Project

The team project further enables you to investigate a topic in telecoms with a group of fellow students. You are expected to produce a paper of double the length as the individual project. You will also need to present your findings to the whole class. The team project will be evaluated based on the quality of the final product and presentation. Peer evaluation is carried out and is taken into account when marking individual team members.

Assignments

There will be two assignments (21% each) spread throughout the mini.
**Blackboard and Class Participation**
The class Blackboard provides a great opportunity to have virtual conversations. To facilitate this, please post more than just a URL. You need to add your opinions and/or analysis of the article. Your grade for the class Blackboard contribution will be based on the quantity and quality of your postings. A follow-up on an existing posting will carry more weight than starting a new discussion thread. A minimum of 5 postings, spread evenly throughout the mini semester, (including at least 3 postings that are follow-ups on existing postings) can earn you 70% of the maximum 5 points. The quality of the postings will earn you the remaining 30%. Deadline for submissions is the last Friday before the exam week, at 11:59 pm.

Please note that attendance counts since your participation during lectures and case discussion matters. I further expect you to be punctual in your attendance.

**Course Performance Evaluation**
Participant performance will be evaluated based on assignments, team project, and class and Blackboard contribution, as follows:

- Individual Paper 30%
- Team Project 21%
- Assignments (2 x 21%) 42%
- Class and Blackboard Participation 7%

**Important Dates**
- Details of important dates will be posted on the Blackboard.

**Policy Regarding the Usage of Laptop in Class**
In general there will be a closed laptop policy in class. However I am open to your using of a laptop if you use it only for following and taking lecture notes.

**Other Policies**
- All group work is subject to peer review to prevent free riding. Each team member will evaluate other members at the end of the project.
- I will determine your class participation marks, and the quality of your Blackboard postings. Just attending the class is not enough. You should also contribute to our discussion in the classroom. One factor contributing to your participation mark is your punctuality.
- Assignments must be submitted to the Digital Dropbox on the Blackboard. Your file should be named yourname_assignment_x, where “x” is the assignment number (1 or 2).
- Team deliverables must be zipped in one folder and named yourteamname_x, where “x” is the deliverable number (1 or 2).
- Late home-works and group reports are subject to penalty. The deadline is 11:59 pm on the submission date for all submissions. You will automatically lose 30% of the assignment credit if you are late by up to one day. No credit will be given for a later submission.
- Punctual attendance at the lectures, and active participation, is important for successful completion of the course. I expect full class presence unless you have a very good reason.

**Re-Grade Requests**
- Must be submitted within one week of the date the marked assignment is returned.
- Must be in writing and include the original.
I re-grade entire assignment and as a result your grade can go up or down.

Class and Blackboard participation grades are not subject to appeal.

**Grades**

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<thead>
<tr>
<th>Percentage Range</th>
<th>Grade</th>
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<tbody>
<tr>
<td>97%-100%</td>
<td>A+</td>
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<tr>
<td>93%-96.99%</td>
<td>A</td>
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<tr>
<td>90%-92.99%</td>
<td>A-</td>
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<tr>
<td>87%-89.99%</td>
<td>B+</td>
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<tr>
<td>83%-86.99%</td>
<td>B</td>
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<td>70%-72.99%</td>
<td>C-</td>
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<td>Less than 70%</td>
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**Ethical Standards**

Students at Carnegie Mellon are engaged in preparation for professional activity of the highest standards. Each profession constrains its members with both ethical responsibilities and disciplinary limits. To assure the validity of the learning experience Carnegie Mellon establishes clear standards for student work. You are required to be familiar with related university policies on this subject. An extract of these policies is reproduced here:

In any presentation, creative, artistic, or research, it is the ethical responsibility of each student to identify the conceptual sources of the work submitted. Failure to do so is dishonest and is the basis for a charge of cheating or plagiarism, which is subject to disciplinary action.

Cheating includes but is not necessarily limited to:

- Plagiarism, explained below.
- Submission of work that is not the student's own for papers, assignments or exams.
- Submission or use of falsified data.
- Theft of or unauthorized access to an exam.
- Use of an alternate, stand-in or proxy during an examination.
- Use of unauthorized material including textbooks, notes or computer programs in the preparation of an assignment or during an examination.
- Supplying or communicating in any way unauthorized information to another student for the preparation of an assignment or during an examination.
- Collaboration in the preparation of an assignment. Unless specifically permitted or required by the instructor, collaboration will usually be viewed by the university as cheating. Each student, therefore, is responsible for understanding the policies of the department offering any course as they refer to the amount of help and collaboration permitted in preparation of assignments.
- Submission of the same work for credit in two courses without obtaining the permission of the instructors beforehand.

Plagiarism includes, but is not limited to, failure to indicate the source with quotation marks or footnotes where appropriate if any of the following are reproduced in the work submitted by a student:

- A phrase, written or musical.
- A graphic element.
- A proof.
- Specific language.
- An idea derived from the work, published or unpublished, of another person.

As a matter of policy I will not tolerate cheating or plagiarism. If you are caught: you will automatically lose all marks for that exam/assignment. I will decide whether further disciplinary action should also be taken.
Course Schedule

The following is an approximate plan for the topics covered in this course, and a time-line for course activities. Changes may occur because of unforeseen events.

Session 1:
- A review of telecommunications technologies
  - Principles of information technology
  - Data communications technologies
  - Characteristics of transmission media
  - Modulation and coding

Session 2:
- Multiple access technologies CDMA and OFDM
- WiMAX and evolution
- 3G evolution and LTE
- Antenna technologies
- Capacity Calculations

Session 3:
- Broadband Telecoms
  - Fixed broadband (xDSL, Fttx, Cable)
  - Wireless Broadband (Fixed wireless, mobile wireless)
- Importance of broadband to a local economy
- Case Study on Broadband Provision: Indosat and Broadband Penetration

Session 4:
- Mid-semester team project progress report
- Broadband business and policy
  - Costs of broadband rollout
  - Infrastructure ownership
  - Competition

Session 5:
- Network architecture
- Wireless network design and network planning
- Sensor networking
- RFID
- Near-field communications
- Case Study on Applications: OnStar

Session 6:
- Mobile IP
- Peer-to-Peer networking
- Voice over IP standards and technologies
- TBD

Session 7:
- Final team project report