Schedule

Monday, 9th of February 2015: Introduction to project management

Hour	Topic	Lecturer
9:00-9:15	Course presentation	Anja Skrivervik
9:15-11:00	Introduction to Project management	Catherine Monnin
11:00-11:30	Coffee Break	
11:30- 13:00	Introduction to Project Management	Catherine Monnin
13:00-14:30	Lunch	
14:30-16:00	Distribution of Assignements, first discussions	A. Skrivervik
16:00-16:30	Coffee Break	
16:30-18:00	Work on assignements	Anja Skrivervik

Tuesday, 10th of February 2015: Antenna Aspects

Hour	Topic	Lecturer
9:00-10:45	Antennas I : antenna families	Marta Martinez
10:45-11:15	Coffee break	
11:15-13:00	Antennas II : scenarios	Marta Martinez
13:00-14:30	Lunch	
14:30-16:00	Group work on assignments	Anja Skrivervik
16:00-16:30	Coffee Break	
16:30-18:00	Group work on assignments	Anja Skrivervik

Wednesday, 11th of February 2015: Telecommunication aspects

Hour	Topic	Lecturer
9:00-10:45	Introduction to telecommunication theory I	Marina Mondin
10:45-11:15	Coffee break	
11:15-13:00	Introduction to telecommunication theory II	Marina Mondin
13:00-14:30	Lunch	
14:30-16:00	Group work on assignments	Anja Skrivervik
16:00-16:30	Coffee Break	
16:30-18:00	Group work on assignments	Anja Skrivervik

Thursday, 12th of February 2015: Industrial aspects

Hour	Topic	Lecturer
9:00-10:45	introduction to antenna projects and their management	Silvia Raffaelli
10:45-11:15	Coffee break	
11:15-13:00	examples of industrial antenna projects	Silvia Raffaelli
13:00-14:30	Lunch	
14:30-16:00	Group work on assignments	Anja Skrivervik
16:00-16:30	Coffee Break	
16:30-18:00	Group work on assignments	Anja Skrivervik

Friday, 13th of February 2015: Presentations, Discussions and Wrap up

Hour	Topic	Lecturer
9:00-10:45	Planning aspects	Anja Skrivervik
10:45-11:15	Coffee break	
11:15-13:00	Presentations of group work, grading of projects	Anja Skrivervik
13:00-14:30	Lunch	
14:30-16:00	Final discussions and course assessments	Anja Skrivervik
16:00-16:30	Coffee Break	

Course description and aim

The aim of this course is to provide the students with the required background to efficiently cope with the technical management of an antenna project. The technical key steps of a project, starting from a customer's needs, to the final antenna design and testing will be approached. The students will learn how to clarify the requirements of a customer, make trade offs, look for additional information like standards, propagation channels, telecommunication theory and link budgets to establish the antenna specifications, and finally propose the best antenna system to fulfill those requirements; all this, of course keeping an eye on the budget and the timeframe of the project. Topics treated include a review of antennas and systems and their characteristics, but also a review of the relevant telecommunication theory and an introduction to project management, from the industrial point of view.

The course is aimed to PhD students and Postdocs, but is open to whoever is interested. It will have two legs : a theoretical approach in the mornings, were topics essential to the efficient lead of an antenna project are approached, and practical guided group work in the afternoons, were the students will go through all the phases of a project. In these practical session, each group will be given an industrial antenna problem, linked for instance to wireless application in the automotive sector, or to future telecommunication platforms. The initial requirement will be quite general, and the groups will during the week refine these requirements to come up with specifications and potential solutions.

Day 1: **Introduction to antenna project and their management.**

Project Management is the discipline of planning, organizing, and managing resources to bring about the successful completion of specific project goals and objectives. But project management is also about team building and human intercourse with potential clients. These aspects will be treated in this first part of the course, with practical exercises to illustrate the different aspects.

Day 2: **Antenna scenarios**

This part of the course should cover the main antenna families and their advantages and draw backs. We will start from elementary antenna families, like dipoles, loops, patches, horns, waveguide, slots, and the go to more complex antennas like arrays (of the aforementioned) or reflector antennas. We will then continue to the analysis of different antenna scenarios, covering areas like polarization, single beam/multi-beam, single band/multi-band, frequency domain, mobile/fixed scenarios, and their implication on the antenna selection

Day 3: **Telecommunication**

We will start with a symbolic model of a communication system, discuss the spectral efficiency versus Eb/N0 performance of the various modulation schemes, and derive the bandwidth and SNR requirements of the system. Then we will discuss the channel models, attenuation models, and finish with a link budget. The impact of reconfigurability on antenna specification may also be discussed.

Day 4: **Industrial aspects of antenna project:**
This day will be devoted to the study of examples of antenna projects from industry.

Day 5: **Planning aspects and final wrap up**
The first part of the day will be devoted to planning aspects, including the planning of test campaigns. The student will then finish their group work, and each group will then present its project and the options taken to their fellow students. The options will be assessed in a general discussion

Example of practical work description

On the first day, the students will be distributed into groups, ideally 3-4 to a group. Each group will then receive the first outline of real project, comprising an antenna design. An example could be:

High Altitude Platforms (HAP) are currently considered as candidates to provide voice and data links in the following situations:

- relief and rescue in catastrophe situations, when the terrestrial communication infrastructure has collapse (Katrina in New Orleans, for instance)
- Environmental survey (forest monitoring, early detecting of fires, etc.)
- Internet access in remote developing areas

The regulation authorities have allotted a frequency band around 30 GHz for this type of services.

We want to develop a HAP borne system as a base station for voice service. The HAP is at an altitude of 21 km.

1. Develop the link scenario
2. Establish the specifications for the airborne antenna
3. Propose an antenna solution (for instance, consider a multibeam lens antenna)
4. Estimate the manpower required for the project and the skills requested
5. Establish the time frame of the project, with the relevant milestones
6. Make the test plan for the antenna.

The other proposed projects could cover links in the automotive area, a project in the cell phone area, and so on.

The student will work together and with the help of the teachers and research assistants. They will have access to EM simulation tools, an extensive library, basic software like matlab, etc. They will also have the opportunity to discuss with antenna measurement specialists and to mechanics in workshops.