



ECTS: 6

SUBJECT: Complements to Telecommunication Engineering MASTER DEGREE: Master in Space Engineering

| | | | ikee: master in space engineering | | | | ECIS: 6 | I | |
|---------------------------------|--------------------------------------|---------------------------------|---|--|---------------------------|---|---------------------------------------|--|--------------------------------------|
| | - | | WEEKLY | | NING | | | | |
| W E | E S | s | | TEAC HING | Continuous Assessments | | WEEKLY PROGRAMMING FOR STUDENT | | |
| E K U M B E R | S I O N U M B E | E S I O N I D | DESCRIPTION | (MAR L E C T U R E S | Assessments | SPECIAL ROOM FOR SESSION (Computer room, audiovisual room) | DESCRIPTION | CLASS HOURS (1.66 h = 50 min + 50 min) | HOMEWORK HOURS (max. est. 3,25 h) |
| | | | Course Introduction | | | | | | |
| 0 | 1 | | Contents, teachers, schedule, etc. | x | | | | 1,66 | 3,25 |
| | | | Introduction to Telecommunication Engineering | ~ | | | | 2,00 | 5,25 |
| 0 | 2 | | Definition and types of telecommunication systems. Overview of fundamentals of communication systems. | x | | | | 1,66 | 3,25 |
| | | - | Signals and systems. Time and Frequency domains. | ^ | | | | 1,00 | |
| 0 | 3 | 51 | Definition and taxonomy of signals. Examples of signals, and basic operations. Definition of a system. Examples, and properties of systems. Characterization of deterministic signals. Characterization and properties of linear time invariant systems. | x | | | | 1,66 | 3,25 |
| | | 1 1 | Signals and systems. Time and Frequency domains. | Ê | | | | 1,00 | |
| 0 | 4 | 52 | Representation of signals by their harmonic components, with some examples. Fourier series to represent periodic signals: definition, properties and examples. Fourier transform to represent aperiodic signals: definition, properties and examples. Definition of the frequency response of a linear time invariant system, and methods to calculate this response. | x | Quiz | | | 1,66 | 3,25 |
| | | | Signals and Systems. Filtering, sampling, and quantification of signals | | | | | | |
| | | | Definition of filtering and types of filters: shaping filters and frequency selective filters. Sampling of continuous time signals: The Nyquist sampling theorem, and effect of sampling in the frequency domain. Definition and effects of the spectral overlapping. Relationships between frequency responses of the continuous time and the discrete time signals. Reconstruction of sampled signals: interpolation and low pass filtering. Quantification of sampled signals for analog to digital conversion: resolution and quantization error. | | | | | | 225 |
| 1 | 5 | 53 | Signals and Systems (LABORATORY) | x | Quiz | | Preparation of the lab | 1,66 | 3,25 |
| | | | | | | | session, reading of the lab | | |
| 1 | 6 | 54 54 | Illustration of concepts presented in Sessions S1-S3. The Electromagnetic Model. | | Quiz | X | script | 1,66 | 3,25 |
| | | | - Maxwell's Equations. Vector fields and material/media parameters. Electrostatic, | | | | | | |
| 1 | 7 | E1 | magnetostatic, electrodynamics. Power, energy and Poynting vector. Wave equation. Introduction to communication systems. Noisy channel modeling. | X | Quiz | | | 1,66 | 3,25 |
| 1 | 8 | 55 | Classification of communication systems: analog vs digital communication systems. Analog communication systems: amplitud, phase and frequency modulations. Statistical model of noise in communication systems: additive white and Gaussian noise. Definition of the signal to noise ratio in communication systems. | x | Quiz | | | 1,66 | 3,25 |
| | | | Digital communication systems. Baseband and bandpass | | | | | , | |
| | | | modulations. Baseband modulations: Pulse amplitude modulation: constellations, shaping filters, and bandwidth. Bandpass modulations: phase and frequency shift modulations. Overview of advanced modulation | | | | | | |
| 2 | 9 | S6 | techniques. | x | Quiz | | | 1,66 | 3,25 |
| | | | EM Waves. Free space propagation I. | | | | | | |
| | | | Propagation fundamentals: Phase velocity, wavelength, TEM wave, Power flow, | x | 0 | | | 1.00 | 2.25 |
| 2 | 10 | E2 | Perpendicularity of E and H. Polarization. EM Waves. Free space propagation II. | × | Quiz | | | 1,66 | 3,25 |
| | | | | | | | | | |
| , | 11 | E3 | Reflection: reflection coefficient, standing wave. Refraction: Snell's Laws. Diffraction. Scattering. | x | Quiz | | | 1,66 | 3,25 |
| | | | Digital communication systems. | | | | | | |
| 2 | 12 | 57 | Design of digital receivers in noisy channels, and computation of the probability of error. | x | Quiz | | | 1,66 | 3,25 |
| | | | Digital communication systems I (LABORATORY) | | | | Preparation of the lab | | |
| 3 | 13 | 58 | Illustration of concepts presented in Sessions S5-S7 | x | Quiz | × | session, reading of the lab script | 1,66 | 3,25 |
| | | | EM Waves. Free space propagation (LABORATORY) | | | | Preparation of the lab | | |
| 3 | 14 | E4 | Illustration of Sessions E2 and E3. | x | Quiz | x | session, reading of the lab script | 1,66 | 3,25 |

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| Local area networks. The IEEE 802.3 standards. Supported transmission | |
| Local area networks. The IEEE 802.3 standards. Supported transmission | |
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| Introduction to TCP/IP | |
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| IETF standards. IP header format and addressing. Routing algorithms. | 2.25 |
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| Communication networks (LABORATORY) Preparation of the lab session, reading of the lab | |
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| 6 24 T4 Illustration of Sessions T1-T3 Quiz x script 1,66 Subtotal 1 42 | 81 |
| | 01 |
| Total 1 (Hours of class plus student homework) 123 | |
| Tutorials, handing in, etc., 1,8 | |
| Assessment The exam will take place on the 4 | 4 |
| Subtotal 2 6 | |
| Total 2 (Hours of class plus student homework) 10 | 4 |
| | 4 |
| Total (around 160h) 133 | 4 |