



# **Máster en Ingeniería de Sistemas y Servicios Accesibles para la Sociedad de la Información**

EUIT Telecomunicación

Curso 2010-2011

Seminar

**Coding**



## **Professor**

Prof. Dr.-Ing. Volker Kühn (University of Rostock, Germany)

Dr. Kühn received the diploma degree in electrical and electronics engineering from the University of Paderborn in 1993. From 1994 to 1998 he was with the Department of Communications Engineering at the University of Paderborn. After receiving the Ph.D. degree in 1998, he joined the Department of Communications Engineering at the University of Bremen where he wrote his postdoctoral thesis. From 2005 to 2006, he was with Qualcomm CDMA Technologies GmbH in Nuremberg, Germany. In 2006, he became a Professor for Communications Engineering at the University of Rostock, Germany.

Dr. Kühn is author/co-author of three text books and numerous conference and journal contributions. His main field of interest is mobile radio communications, especially the topics error correcting codes, multiple antenna systems, iterative detection and distributed coding strategies in relay and sensor networks.

## **Dates:**

27<sup>th</sup> September – 29<sup>th</sup> September 2010

**Room: 3004**

## **Contents:**

### **Lecture 1, (Monday 27th at 15:30h)**

#### **Introduction to Error Correcting Codes**

The first lesson will give an introduction to the principle structure of a communication system. By comparing the error rate performance for AWGN and fading channels it is illustrated why error correcting codes are required to achieve a reliable communication. Next, different coding principles are introduced and the basics of error correcting codes are explained. Finally, examples of some simple block codes and - if time permits - convolutional codes are presented.

### **Lecture 2, (Tuesday 28th at 15:30h)**

#### **One Lesson of Information Theory**

In order to discover the ultimate limits in communications, a look at information theory is unavoidable. Definitions of entropy, mutual information and the channel coding theorem of Shannon are explained. Furthermore, the capacity of different channels are compared.

### **Lecture 3, (Wednesday 28th at 16:30h)**

#### **State-of-the-art channel coding**

In the last lesson, we illuminate the basic coding strategies to approach the capacity limits. The definition of log-likelihood ratios and soft bits are introduced and the turbo decoding principle for concatenated codes is explained. Examples will illustrate how state-of-the-art error correcting codes work.