COURSE PROFILE

Course Number : EE 476	**Course Title : Wireless Communication**
Required / Elective : Elective	**Pre-requisite :** Consent of Instructor
Catalog Description: Introduction to RF and wireless technology. Basic concepts in RF design, noise in RF circuits. Cellular radio and telephony systems, cellular system design fundamentals: frequency planning, interference, trunking, cell splitting, sectoring. Mobile radio propagation models: large scale propagation models, link budget design using path loss models, small scale or fading models. Multiple access techniques: FDMA, TDMA, spread spectrum multiple access, frequency hoped multiple access, direct sequence multiple access-CDMA, space division multiple access. Capacity of cellular systems. Wireless mobile systems and standards, GSM, DECT, AMPS, PDC, CDMA.	**Textbook / Required Material :** Theodore Rappaport. *Wireless Communications - Principles and Practice, 2nd Ed*, Prentice Hall 2002.
Course Structure / Schedule : (3+0+0) 3 / 6 ECTS	
Extended Description: This course is intended to provide an upper-undergraduate level treatment of wireless communication system principles. Previous knowledge of communication principles and digital modulation techniques is assumed. The objectives of the course are • To provide an overview of wireless systems and standards, • To describe the characteristics of wireless channels, such as path loss and fading, and ways to handle them in system design. • To give the essentials of cellular system design. • To explore capacity limits of wireless networks • To introduce advanced techniques such as multicarrier modulation and spread spectrum.to combat the challenges in wireless channels. • To present several multiuser communication techniques, and corresponding challenges.	
Design content : Usage of system level design techniques for cellular systems, performed based on the basis of design problems.	**Computer usage:** Use of MATLAB to model the wireless channel, and to numerically solve design problems for wireless networks
Course Outcomes: a. Ability to mathematically model physical characteristics of wireless channels, [2,6] Relevant Content: Mobile radio propagation models: large scale propagation models, small scale fading models. Interference.	

b. Ability to analyze, and perform a system level design of, state-of-the art wireless communication systems; [2,6,7]

   Relevant Content: Cellular radio and telephony systems, cellular system design fundamentals: frequency planning, interference, trunking, cell splitting, sectoring. Link budget design using path loss models. Multiple access techniques: FDMA, TDMA, CDMA, SDMA. Direct sequence and frequency hopping spread spectrum.

c. Ability to appreciate the scarcity of resources such as bandwidth and power, and to employ methods that allow their efficient use [2,3,6,7]

   Relevant Content: Cell planning and frequency reuse. Multiple access techniques: FDMA, TDMA, CDMA, SDMA.

d. Ability to obtain an engineering point of view, which shall enable the students to proceed with more advanced courses and specialize on specific aspects in wireless communications [Outcome 3,6,7,10]

   Relevant Content: Mathematical modeling of path loss and multipath effects. Cellular system design. Capacity of cellular systems. Wireless mobile systems and standards, AMPS, GSM, WIMAX, 3G and beyond.

e. Ability to perform independent research, and simple simulations on state of the art wireless technologies. [3,10]

   Relevant Content: Term project, which involves research on wireless standards and applications, from databases such as IEEExplore, and simulations in the form of verification of reported results from recent literature.

The contribution of this course to the program outcomes can be rated as follows:

Outcomes 2,6,7: SIGNIFICANT

Outcomes 3,11: MODERATE

Outcomes 10: SOME

Recommended reading:

Andrea Goldsmith. *Wireless Communications*. Cambridge University Press, 2005.

David Tse and Pramod Viswanath. *Fundamentals of Wireless Communication*. Cambridge University Press, 2005

Teaching Methods:

Pre-readings, lectures and discussion sessions, individual exercises and projects.

Assessment Methods:

- Exams (written and oral) [a, b, c, d].
- Portfolios (homework, programming and survey projects,) [a,b,c,d,e].

- Class surveys, exit surveys [b,d,e]

Student Workload:

Preparatory reading	30 hrs
Lectures,workshop, discussions	42 hrs
Homeworks	36 hrs
Presentations	3 hrs
Projects	36 hrs
Final Exam	3 hrs
TOTAL ……	**150 hrs to match 25 x 6 ECTS**

Prepared by : Onur Kaya	Revision Date : 03/02/2010