WIRELESS COMMUNICATION FOR BODY IMPLANTED DEVICE
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Description:

This course provides an inclusive coverage on the subject of implanted medical wireless communication systems. It is expected that ever sophisticated medical devices will be implanted inside the human body for medical telemetry and telemedicine. To set up effective and efficient wireless links for implanted devices, it is essential to give special attention to the antenna design and channel modeling. Therefore, deep knowledge of the RF field and biological tissues will be required.

Course Contents:

1. Background and Overview of Body Implanted Device
2. Implant Device Communication Methods
3. Medical Implant Communication Standards
4. Medical Implant communication Design Requirements
5. Wave Propagation in the Biological Materials
6. RF Radiation Safety and Thermal Effects
7. Antenna
8. Channel Modeling for Body Implanted Devices

Conduction:

Mandatory Lectures (20%), Class work (20%), and Written Exam (60%)

Students need to attend the course, to be eligible for the exam.

Lectures:

Mon: 8:30-10:00, 10:30-12:00
Tue: 8:30-10:00, 10:30-12:00, 13:00-13:45 (Questions and Problems)

Final Exam:

Wed: 9:00-12:00.

The amount of credits is yet to be confirmed.

Literature:

Books:

[1] H. B. Li, K. Yekeh Yazdandoost, B. Zhen, "*Wireless Body Area Network*", River Publishers, 2010.

[2] F. S. Barnes and B. Greenebaum, "*Handbook of Biological Effects of Electromagnetic Fields, Bioengineering and Biophysical Aspects of Electromagnetic Fields*", Taylor & Francis, 2007.

[3] O. P. Gandhi, "*Biological Effects and Medical Applications of Electromagnetic Energy*", Prentice Hall, 1990.

[4] D. Prutchi, M. Norris, "*Design and Development of Medical Electronic Instrumentation: A Practical Perspective of the Design, Construction, and Test of Medical Devices*", Wiley, 2004.

Articles:

[1] K. Yekeh Yazdandoost, R. Kohno, "*Body Implanted Medical Device Communications*", IEICE Transaction on Communication E92-B, pp. 410-417, 2009.

[2] K. Sayrafian-Pour, W-B. Yang, J. Hagedorn, J. Terrill, K. Yekeh Yazdandoost and K. Hamaguchi, "*Channel Models for Medical Implant Communication*", Springer, International Journal of Wireless Information Networks, 2010.

[3] L. C. Chirwa, P. A. Hammond, S. Roy, and D. R. S. Cumming, "*Electromagnetic Radiation from Ingested Sources in the Human Intestine between 150 MHz and 1.2 GHz*", IEEE Transaction on Biomedical Engineering, Vol. 50, 4, pp. 484-492, 2003.

[4] W. G. Scanlon, J. B. Burns & N. E. Evans, "*Radio Wave Propagation from a Tissue-implanted Source at 418 MHz and 916.5 MHz*", IEEE Trans. Biomedical Engineering, vol. 47, 4, pp. 527–534, 2000.

[5] Q. Tang, N. Tummala, S. Kumar S. Gupta, and L. Schwiebert, "*Communication Scheduling to Minimize Thermal Effects of Implanted Biosensor Networks in Homogeneous Tissue*", IEEE Trans. on Biomedical Eng., vol. 52, 7, pp. 1285-1294, July 2005.

[6] N. Kuster and Q. Balzano, "*Energy Absorption Mechanism by Biological Bodies in the Near Field of Dipole Antennas above 300 MHz*", IEEE Transactions on Vehicular Technology, vol. 41, 1992, pp. 17 23.

[7] T. Houzen, M. Takahashi, and Koichi Ito, "*Implanted Antenna for an Artificial Cardiac Pacemaker System"*, Progress In Electromagnetics Research Symposium, 2007.

[8] FCC, Medical implant communications, January 2003, http://wireless.fcc.gov/services/index.htm?job=service_home&id=medical_implant

[9] ERC Recommendation 70-03 relating to the use of Short Range Device (SRD), European Conference of Postal and Telecommunications Administrations, CEPT/ERC 70-03, Tromsø, Norway, 1997.

[10] IEEE standard for safety levels with respect to human exposure to radio frequency electromagnetic field, 3 KHz to 300 GHz, IEEE Std C95.1, 1999.