



UNIVERSITÀ DI PISA  
**DIPARTIMENTO DI INGEGNERIA DELL'INFORMAZIONE**  
**Dottorato di Ricerca in Ingegneria dell'Informazione**

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Doctoral Course

**“Advanced Biomedical Instrumentation: Design and Practice”**

Prof. Mannan Mridha

Division of Patient Safety-Technology and Health, Royal Institute of Technology (KTH, Sweden)

**Short Abstract:** The objective of the course is to introduce the design principles of biomedical electronics and impart practical knowledge on construction and signal acquisition. The course is divided in 5 sessions. Each session consists of 2 hours of lecture and 3 hours of practical.

**Course Contents in brief:**

- Lecture 1: Introduction: Medical instrumentation systems, Sensors, transducers and other sensors, Measurement constraints, Signal acquisition, Bio amplifiers (instrumentation amplifiers) and Bio filters.
- Lab 1) Measurement of Pacemaker signals and design of a signal generator
- Lecture 2: Biostatistics, Signals and noise, Measurement of Temperature. Standards and norms of reference:
- Lab 2) Compare different Thermal sensors and design of Thermistor to measure breathing rate
- Lecture 3: Piezoelectric sensor, Measurement of Blood Pressure: Measurement of Blood Pressure and heart sound and Blood flow. Direct measurement, Dynamic properties of pressure measurement systems Analogous electric systems, Heart sounds and Electrical model of the heart
- Lab 3) Design and Test Piezoelectric sensor to record arterial pulse rate
- Lecture 4: Measurement of physiological fluids in motion and flow rate:
- Lab 4) Design and Test ECG recorder
- Lecture 5: Optosensors:
- Measurement of blood values, blood gases and glucose,... Spectrophotometry,
- Lab 5) Design and Test Optosensors sensor to record capillary blood flow.

**Total # of hours of lecture: 25**

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## CV of the Teacher

Dr. Mannan Mridha, has a Ph.D. and M.Sc. Engineering degree in Biomedical Engineering. Dr Mridha has also a M.Ed. degree. He has more than 30 years of experiences from teaching at the Engineering Universities in Sweden, and more than 10 other colleges and Universities in different countries, including Sweden, UK, India, Bangladesh, Indonesia, Philippines, Vietnam, Palau, Kenya, Italy and Japan. He has supervised more than 100 students in their B.Sc. and M.Sc. Engineering degrees. Mridha has been work for the past 12 years with R& D projects connecting rural health workers in India and Bangladesh with medical experts to improve diagnosis, treatment and disease prevention. Currently, working with EU project H2020 with innovative medical devices for low resources settings.

During 1967-74, studied at a British system academic institution, Cadet College in Bangladesh and passed with distinctions to obtain government merit scholarship for higher studies in Europe. He acquired M.Sc. Eng. degree from Warsaw Technical University. Later, with Swedish Institute's merit scholarship, **obtained Ph.D. and M.Ed. degree from Linkoping University in Sweden.** Mridha has working experience with teaching and research in Biomedical engineering at the University of Linkoping, Mälardalen University and Royal Institute of Technology in Sweden; University of Oxford and London in UK; Indian Institute of technology, IIT Bombay and New Delhi in India; Gono-University in Bangladesh and Tokyo University in Japan. He worked as WHO consultant with planning and management of Medical Equipment in many developing countries such as, Bangladesh, India, Vietnam, Fiji and Palau. Swedish Institute funded for post doc study to University of Southern California, LA, University of Washington in Seattle, USA. He was awarded fellowships from the Royal Swedish Academy, Royal Society for Science and Engineering in the UK, and by the Japan Society for Promotion of Science. Currently, his teaching and research interest include biomedical engineering courses and application of ICT in education, health and environment.

## Room and Schedule

Room: *A27 Aula Riunioni del Dipartimento di Ingegneria dell'Informazione, Largo Lazzarino and Aula ex B26 (ADII 3) Polo B.*

Schedule:

- 14/01/2019 ore 9:30 - 11:30- Aula Riunioni Piano 6, Largo Lazzarino
- 14/01/2019 ore14:00 - 17:00 - Aula ex B26 (ADII 3), Polo B
- 15/01/2019 ore 9:30 - 11:30 - Aula Riunioni Piano 6, Largo Lazzarino
- 15/01/2019 ore14:00 - 17:00 - Aula ex B26 (ADII 3), Polo B
- 16/01/2019 ore 9:30 - 11:30 - Aula Riunioni Piano 6, Largo Lazzarino
- 16/01/2019 ore14:00 - 17:00 - Aula ex B26 (ADII 3), Polo B
- 17/01/2019 ore 9:30 - 11:30 - Aula Riunioni Piano 6, Largo Lazzarino
- 17/01/2019 ore14:00 - 17:00 - Aula ex B26 (ADII 3), Polo B
- 18/01/2019 ore 9:30 - 11:30 - Aula Riunioni Piano 6, Largo Lazzarino
- 18/01/2019 ore14:00 - 17:00 - Aula ex B26 (ADII 3), Polo B