

Finnish Chairmanship of the Nordic Council of Ministers Theme Seminar  
 Developing Joint Programmes and Degrees in Nordic and Baltic Countries  
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## *European Virtual Campus for Biomedical Engineering EVICAB*

Jaakko Malmivuo and Juha Nousiainen  
 Ragnar Granit Institute  
 Tampere University of Technology  
 Tampere, Finland

## EVICAB

### Introduction

#### Biomedical Engineering

- is multidisciplinary
- has large number of sub-specialities
- is developing fast

It is difficult for any university, especially for the new and/or small ones, to produce high quality and up-to-date education material.

## EVICAB

#### Globalization

- encourages the students to mobility

#### BIOMEDEA project

- facilitates mobility by
- harmonizing the study programs

#### Internet

- is more and more used in education

## EVICAB

# Idea of EVICAB

## EVICAB

*EVICAB is a:*

- high quality
- free access

*BME Curriculum on the Internet*

*EVICAB is not a university*

## EVICAB

**EVICAB Partners**  
[www.evicab.eu](http://www.evicab.eu)

## EVICAB



Each partner university has their own Biomedical Engineering program

The students are "normal" students:

- degree students
- exchange students
- visiting students
- international program students
- ...

## Idea of EVICAB



The partner universities have their own BME programs

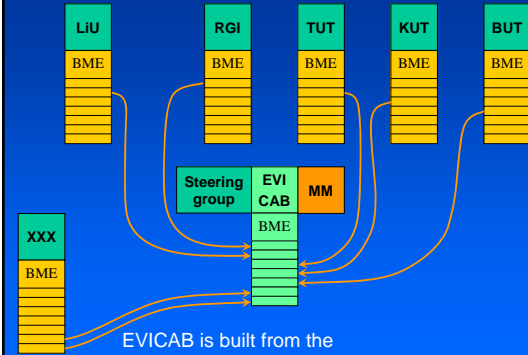
## EVICAB



EVICAB provides a Virtual University Platform for a Biomedical Engineering Program

The partner universities offer BME courses to EVICAB  
The courses are accepted to EVICAB by the Steering Group  
Courses may also be provided by co-operating universities outside the consortium  
The courses must be accepted by some university to be used in Bachelor/Master/PhD -studies

## Idea of EVICAB



EVICAB is built from the BME Programs of the partner universities

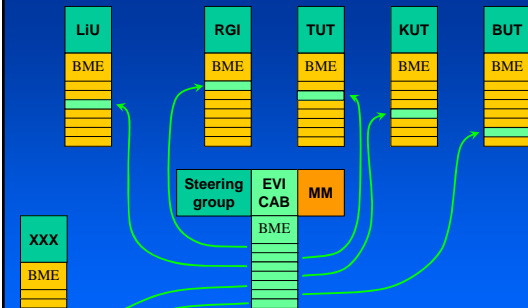
## EVICAB



Partner universities take courses from EVICAB to their own Biomedical Engineering program

Courses may also be taken by co-operating universities outside the consortium

## Idea of EVICAB



Partner Universities take BME Courses from the EVICAB to their programs

## EVICAB



The EVICAB project concentrates on creating the Virtual Campus on Biomedical Engineering

The educational material on Biomedical Engineering on the Web must be produced with other funds.

## Build-up of the BME Curriculum

- EVICAB creates a platform for a BME curriculum on the Internet
- Universities may propose a course to EVICAB
- The Steering Group decides what courses are accepted to EVICAB
- EVICAB will get the courses free of charge
- The courses are updated and maintained by those universities which produced them

## Why to give a free course to EVICAB?

- EVICAB will become the internationally recognized standard in Internet education
- If a course is accepted to EVICAB, that demonstrates the high quality of the education in that university
- It will attract international students and increase the reputation of that university/institute
- The international assessment and ranking of universities has come more popular and universities compete for their position on the lists
- EVICAB will offer in BME a platform to demonstrate the excellence

## EVICAB



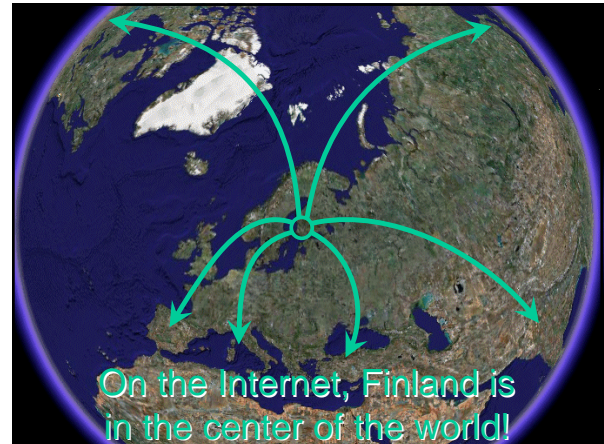
## Why Internet?



Finland is far from the USA



Finland is far from Japan



**EVICAB**

Biomedical Engineering Curriculum  
Master of Science Education

| BIOELECTROMAGNETISM  |        |      |       |        |
|--|--------|------|-------|--------|
| Teacher  | Course | Book | Video | Slides |
| Jaakko Malmivuo: Bioelectromagnetism                           |        |      |       |        |
| Frank Sachse: Computational Modelling of Cardiovascular System |        |      |       |        |

| OPTICS                    |        |      |       |        |
|---------------------------|--------|------|-------|--------|
| Teacher                   | Course | Book | Video | Slides |
| Göran Salerud: Bio-optics |        |      |       |        |

| SIGNAL ANALYSIS                                   |        |      |       |        |
|---|--------|------|-------|--------|
| Teacher   | Course | Book | Video | Slides |
| Rangaraj M. Rangayyan: Biomedical Signal Analysis |        |      |       |        |

Internet Examination  
Internet Education tool in Evicab Moodle  
[moodle](http://www.moodle.org)  
[www.evicab.eu](http://www.evicab.eu)

**EVICAB**

Lecture Videos

Jaakko Malmivuo: Video lectures on Bioelectromagnetism, Recorded at the Ragnar Granit Institute, Autumn 2006.

- You must have the version 10.5 of **RealPlayer**. Apparently the most new version of Real Player (11 Beta) does not provide the Cantataze Plugin and therefore it does not work.
- RealPlayer also needs a Plugin for Cantataze. Open "RealPlayer". Click "About RealPlayer". Click "Check for Updates". RealPlayer will connect to the net. Choose from the Multimedia Plugins: "Cantataze Plugin". Click "Install".

**Lecture 1**

1.1-1.2 Bioelectromagnetism, Main topics, Textbook, Interdisciplinary sciences  
1.3 Bioelectromagnetism, Subdivisions of bioelectromagnetism.  
1.4 Bioelectric phenomena, Generation of bioelectric signals, importance of bioelectromagnetism, Funny example  
1.4.1 History of bioelectromagnetism, William Gilbert, Jan Swammerdam, Luigi Galvani, Electroweather  
1.4.2 Hans Christian Ørsted, Hans Berger, EEG, Magnetoencephalogram, Hermann Helmholtz, Helmholtz equation  
**Lecture 2**

2.1 Anatomical basis of bioelectromagnetism, nerve and muscle cell, Cell membrane, Mitochondrion  
2.2 Synapse, Striated muscle, Bioelectric function, Response of the membrane potential, Conduction of nerve impulses  
2.3 Subcellular membrane phenomena, Helmholtz equation, Electric potential and field, Helmholtz-Platz equation, Biostriction  
2.4 The origin of resting voltage, Electric circuit of membrane, Goldman-Hodgkin-Katz equation, Reversal voltage, Transmembrane voltage

**The heart**

**ELECTROMECHANICAL MOTOR**

- electronically controlled
- two chambers with turbo
- maintenance free
- lifetime about 75 years, while it makes 3,000,000,000 cycles

www.rgi.tut.fi/moodle

Video lectures on the Internet 2006  
Jaakko Malmivuo  
Bioelectromagnetism, 44 h

www.rgi.tut.fi/moodle

Video lectures on the Internet 2007  
Frank Sachse  
Modeling Cardiac Electric Fields 24 h

**Internet Examination 2005 - Arranged from abroad**

Exam monitored in real time from MINNEAPOLIS

Course in TALLINN

Exam in HELSINKI

Exam in TALLINN

Exam in TARTU

130.000 visits since 2002

Research Base Aboa of Finland

|  | MICROSOFT<br>HITS PER<br>COUNTRY | HITS<br>PER<br>COUNTRY | HITS PER<br>CONTINENT |
|--|----------------------------------|------------------------|-----------------------|
| North-America                          | (25.8%)                          | 34019                  | (26.8%)               |
| International                          | (2.1%)                           | 2300                   | (1.8%)                |
| Australia and the Paci                 | (1.9%)                           | 2655                   | (2.1%)                |
| Europe                                 | (43.6%)                          | 56068                  | (44.1%)               |
| Africa                                 | (0.7%)                           | 797                    | (0.6%)                |
| Middle East                            | (2.3%)                           | 2670                   | (2.1%)                |
| Asia                                   | (9.7%)                           | 11722                  | (9.2%)                |
| South America                          | (4.1%)                           | 4709                   | (3.7%)                |
| Antarctica                             | 0                                | 0                      | 0                     |
| Central America/Caribbean              | 109                              | (0.1%)                 | 180                   |
| Russia and the Former Soviet Republics | 1054                             | (1.4%)                 | 1714                  |
| Other                                  | 1490                             | (1.9%)                 | 2868                  |

**ANTIGUA AND BARBUDA**  
The beach is just the beginning...

Christopher Columbus landed on his second voyage in 1493 and gave the island the name Antigua

Statistics for counter: BemBook Download  
209-59-70-210.candw.ag Antigua and Barbuda Sat, 27 Jan 17:55:29 MSIE 7 Windows XP

Statistics for counter: BemBook Video  
209-59-70-210.candw.ag Antigua and Barbuda Sat, 27 Jan 18:34:12 Netscape 5 Windows XP  
209-59-70-210.candw.ag Antigua and Barbuda Sun, 28 Jan 13:21:52 MSIE 7 Windows XP  
209-59-70-210.candw.ag Antigua and Barbuda Sun, 28 Jan 14:55:36 MSIE 7 Windows XP

UNIVERSITAT DE BARCELONA

[ COURSE | SCHEDULE | INFO ]

**Bioelectromagnetism**

MASTER'S COURSE

Barcelona, 4.12. - 15.12. 2006

Organized by the Faculty of Physics, Institute of Electronics

University of Barcelona

Lecturer of the Course: Professor Jaakko Malmivuo

Ragnar Granit Institute  
Tampere University of Technology  
Tampere, Finland

The course is based on the book:  
Jaakko Malmivuo and Robert Plonsey:  
Biopotentials and Applications of Bioelectric and Biomagnetic Fields  
Oxford University Press, New York, 1995  
Contents of the book:  
The course is lectured in English.  
The book is also available on the Internet  
Download the book as a ZIP file

**RAGNAR GRANIT INSTITUTE**  
TAMPERE UNIVERSITY OF TECHNOLOGY

**RGI Support to EVICAB**

**Biomedical Engineering education**

- Biomedical Engineering Program 1979
- All education in English 1990
- International Master's Degree Program 2006
- International Graduate School in BME & MP 2007

**EVICAB**

*EVICAB welcomes all interested universities to join to the consortium as associate partners.*

*Thank you!*