# AsTeRICS Academy

# Module Description

# Vienna Summer School
for Assistive Technology

## 2016

University of Applied Sciences
FH TECHNIKUM WIEN

AsTeRICS academy

MA23
Wirtschaft, Arbeit · Statistik

StaDt·Wien

# Table of Content

# 1. Course Overview

The AsTeRICS Academy Summer School for Assistive Technology offers a versatile compilation of courses and lectures, taught by a group of internationally renowned experts in the fields of AT, web accessibility and Augmentative & Alternative Communication. Each day of the summer school program is dedicated to a specific topic and during the last 3 days, people can apply the collected knowledge from the course modules in hands-on workshops and small group projects.

| | 07.11.16 Mon | 07.12.16 Tue | 07.13.16 Wed | 07.14.16 Thu | 07.15.16 Fri | 07.16.16 Sat | 07.17.16 Son | 07.18.16 Mon | 07.19.16 Tue | 07.20.16 Wed |
|---|---|---|---|---|---|---|---|---|---|---|
| **Morning 9:00-12:00** | **Academy Team** Opening and Lab Tour | **Shadi Abou Zahra** Web accessibility: Basics and evaluation | **Therese Willkomm** Assistive Technology in Minutes | **Benjamin Aigner** Arduino-based affordable AT-solutions | **Nina Fröhlich** AAC and iPad | | | **Samantha Sibanda** AT for people in Zimbabwe **Project Groupwork** | **Doug Taylor** ShonaQuip/Uhambo Foundation South Africa **Project Groupwork** | **Project Groupwork** |
| **Afternoon 13:00-17:00** | **Veronika David & Martin Deinhofer** Assistive Technology overview | **Martin Deinhofer** AsTeRICS: Model-based Assistive Technology | **Therese Willkomm** Assistive Technology in Minutes | **Chris Veigl** EMG, ECG, EEG: Bioelectric signals for AT | **Project Groupwork** Selection of topics | | | **Project Groupwork** **Gerhard Nussbaum** Innovative AT solutions | **Project Groupwork** | **Project presentations** **Closing and Farewell** |

The total ECTS points quoted for the Summer School courses is **3.0 ECTS** (for a description of the European Credit Transfer System ECTS please refer to http://ec.europa.eu/education/ects/ects_en.htm). Please note that a learning effort of 25 hours is calculated per ECTS point (49 out of 75 hours are covered in lectures/workshops with physical presence at the UAS Technikum Wien, the remaining 26 hours are dedicated to preparation at home). If you are studying outside Europe please contact the legal department of your university for information how to transfer ECTS to your local crediting system.

# 2. Course Details

## 2.1. Assistive Technology Overview

| Course Title | **Assistive Technology Overview** |
|---|---|
| ECTS | 0.25 |
| Lecturer | Veronika David / Martin Deinhofer |
| Course Methods | Lecture |
| Course Description | In this lecture, the students will learn to outline different types of disabilities including typical impairments. The lecture gives a good overview on Assistive Technology devices in general, with a special focus on ICT-enabled devices and solutions for people with special needs. |
| Infos / Links | |

## 2.2. Web Accessibility Module

| Course Title | **Web Accessibility: Basics and Evaluation** |
|---|---|
| ECTS | 0.25 |
| Lecturer | Shadi Abou Zahra |
| Course Methods | Lecture, hands-on demonstration |
| Course Description | Introduction to web accessibility for people with disabilities, and its usability benefits for everyone. In this course you will learn the basic principles of web accessibility and how to apply and check these principles in practice. After this course you will be able to answer these questions:<br>• How do people with disabilities use the Web?<br>• What is web accessibility and why is it important?<br>• Who is affected and what is the business case?<br>• What other benefits does web accessibility have?<br>• How can I check how accessible my website is?<br>• How can I make my website more accessible?<br>• What is the role of different W3C/WAI standards?<br>Where can I find resources and tools to help me? |
| Infos / Links | W3C Web Accessibility Iniative (WAI):<br>http://www.w3.org/WAI/ |

# 2.3. AsTeRICS Module

| Course Title | **AsTeRICS: Model-based Assistive Technology** |
|---|---|
| ECTS | 0.25 |
| Lecturer | Martin Deinhofer |
| Course Methods | Lecture, hands-on demonstration |
| Course Description | AsTeRICS is a free and Open-Source graphical construction set for assistive technologies (AT). It allows the creation of flexible solutions for people with disabilities using a large set of sensors and actuators.<br><br>Possible applications are<br><ul><li>Computer input (mouse, keyboard, joystick)</li><li>Environmental Control (KNX, FS20, IR, EnOcean, openHAB)</li><li>Toys and Games (Playstation 3, computer games, RC-toys ...)</li><li>Brain/Neural computer interfaces (Enobio, OpenVIBE, OpenEEG)</li><li>Android Phone support (SMS, calls)</li><li>and many more!</li></ul><br>In this lecture you will get an overview about AsTeRICS and potential use cases. In a hands-on session you will learn how to create your own Camera Mouse solution. |
| Infos / Links | http://www.asterics.eu |

# 2.4. Affordable Assistive Technology Construction Module

| Course Title | **Assistive Technology in Minutes** |
| --- | --- |
| ECTS | 0.5 |
| Lecturer | Therese Willkomm |
| Course Methods | Workshop |
| Course Description | This interactive workshop will explore over 50 everyday items, tools, and materials for creating hundreds of AT solutions in five minutes or less and for $5 or less and without the need for power tools. Learn how to become a spontaneous problem solver by looking at and using everyday items in extraordinary way.<br><br>• Amazing uses for ordinary items<br><br>• Re-purpose and recycle materials and items into incredible A.T. solutions<br><br>• Creating A.T. solutions by looking at the challenge differently<br><br>• Using materials like Instamorph, Dual Lock, PVC pipes, Uglu, Loc-Lift RG, Koffler soft pebble tape, Hold-It, Velcro Brand products like Veltex, Stickyback and much more to create creative AT-solutions<br><br>• Discover the top 10 "must have" basic hand tools and the multiple uses for these tools.<br><br>Each participant will fabricate three different assistive technology solutions using everyday materials. |
| Infos / Links | |

## 2.5. Bioelectric Signal Processing Module

| Course Title | Arduino-based affordable AT-solutions |
| --- | --- |
| ECTS | 0.25 |
| Lecturer | Benjamin Aigner |
| Course Methods | Lecture, hands-on demonstration |
| Course Description | This lecture introduces the famous Arduino development environment and shows examples of firmware programming including:<br><br>• Serial communication<br><br>• Interfacing switches, controlling leds / actuators<br><br>• Using USB HID device functions (Mouse / Keyboard)<br><br>• Using the OpenEEG P2 firmware for sending analoge values to the AsTeRICS framework<br><br>As a hands-on example, the Flexible Assistive Button Interface (FABI) will be used together with the low-cost switches manufactures in the low cost AT-construction sessions by Therese Willkomm. |
| Infos / Links | Arduino IDE, Teensy microcontroller, Fritzing, Switch interface, HID device, AsTeRICS, FABI |

| Course Title | EMG, ECG, EEG: Bioelectric Signals for AT |
|---|---|
| ECTS | 0.25 |
| Lecturer | Chris Veigl |
| Course Methods | Lecture, hands-on demonstration |
| Course Description | In this course, the basics of bioelectric signal processing will be presented. The covered topics include:<br><br>• Physiological foundations of bioelectric signals: nerve cells and action potentials<br><br>• Analog amplification and signal conditioning<br><br>• ADC-conversion and sampling<br><br>• Digital filters, feature extraction and classification methods<br><br>• Brain Computer Interfaces (μ-rhythm, P300, ..)<br><br>In an hands-on part which builds upon the module by Benjamin Aigner, an EMG / ECG measurement will be performed in small groups, using the AsTeRICS framework for signal processing. |
| Infos / Links / references | Arduino, Olimex ECG/EMG shield, AsTeRICS, BrainBay, OpenVibe |

## 2.6. Augmentative & Alternative Communication Module

| Course Title | AAC and iPad |
|---|---|
| ECTS | 0.25 |
| Lecturer | Nina Fröhlich |
| Course Methods | Lecture, hands-on demonstration |
| Course Description | Augmentative and Alternative Communication (AAC) and and it's relation to Assistive Technology (AT) are the priorities of this course. In recent years, the iPad became the most relevant tool for AAC – a large number of quality apps are available. Nina Fröhlich will give an overview and show live demonstrations. In a hands-on workshop, participant can work with the "Go Talk Now" app and desing onwn communication grids. |
| Infos / Links | http://die-uk-kiste.jimdo.com/ (in german) |

## 2.7. Assistive Technology Examples

| Course Title | AT examples and best practise models |
|---|---|
| ECTS | 0.25 |
| Lecturers | Samantha Sibanda<br>Gerhard Nussbaum<br>Doug Taylor |
| Course Methods | Lecture |
| Course Description | Samantha Sibanda (Signs of Hope Trust, Zimbabwe), Gehrhard Nussbaum (KI-I Linz) and Doug Taylor (Shonaquip South Africa) will present different approaches and best practice models for innovative AT-solutions and for bringing Assistive Technology to the people. |
| Infos / Links / references | http://www.ki-i.at<br>https://www.facebook.com/Signs-of-Hope-284529185037280/<br>http://shonaquip.co.za/ |

# 2.8. Project Groupwork

| Course Title | Project Groupwork |
|---|---|
| ECTS | 0.75 |
| Lecturer | Chris Veigl / Benjamin Aigner / Veronika David / Martin Deinhofer |
| Course Methods | Workshops in small groups |
| Course Description | The project development phase of the AsTeRICS Academy Summer School program allows the participants to choose from a number of suggested projects and use cases and to implement complex assistive solutions in small groups. All covered materials and methods explored in the previous days of the summer school can be used. The offered topics include:<br><br>• Accessible gaming using switches or special input devices<br><br>• Building and applying the FLipMouse kit<br><br>• Environmental control solutions (infrared, KNX, etc.)<br><br>• Speech based systems (recognition / synthesis)<br><br>• AAC solutions / scanning and special On-Screen Interfaces<br><br>• Camera-based systems / computer vision<br><br>• Biosignal based input methods<br><br>• Biofeedback / audio-visual representation<br><br>The project development phase will be concluded with the final group presentations. |
| Infos / Links | http://www.asterics.eu |

# 3. Introducing the Lecturers

International Guests:

## 3.1. Nina Fröhlich

Nina Fröhlich studied special education for mentally disabled people and people with speech disorders. She works at the "Schule am Winterrain", a school for mentally challenged children in Ispringen (Germany) and lives in Karlsruhe. Nina acts as a consultant for Alternative and Augmentative Communication (AAC) and she plans and leads group trainings for primary, secondary and graduation classes. She applies multimedia in special education and is an expert in AAC-applications for the iPad.

## 3.2. Gerhard Nussbaum

Gerhard Nussbaum is project manager and technical engineer at the KI-I. He studied computer science at the Johannes Kepler University Linz and graduated with distinction in 2003. During his work at the KI-I he is and was involved in numerous national and international founded projects in the area of e-inclusion. He was speaker at various international conferences (e.g. AAATE, ICCHP, ICOST, etc.) and is member of the scientific committees of the international conferences ICCHP, ICTA and DSAI. His current research work is related to the use of ICT to enable the integration of people with disabilities that concerns the field of Assistive Technology as well as accessibility and usability of modern ICT including the Internet. His special fields of research are smart environments, environmental control and mobile computing.

## 3.3. Samantha Sibanda

Samantha Sibanda initiated the "Signs-of-Hope Trust" Zimbabwe, where she acts as an advocate and networking person to implement rights of persons with disabilities in the Harare and Bulawayo regions. Signs of Hope Trust will be training persons with disabilities for free, in using technology to access computers, tablets or cell phones. The primary target groups for the support are people with visual impairment, muscular dystrophy, or stroke. Samantha also engages in other Zimbabwean NGOs that help people with special needs, including the Miracle Mission Foundation and the Jairos Jiri Association (Vocational Training Centers and Community-Based Rehabilitation).

## 3.4. Doug Taylor

Doug Taylor represents Shonaquip and the Uhambo Foundation, two South African initiatives committed to improving the quality of life of individuals living with moderate to severe disabilities. Shonquip designs, manufactures and supplies posture support wheelchairs, mobility equipment and other positioning devices, and provides client focussed support services that include assessment, customized fittings, follow-ups and training. Uhambo is working in communities to promote and support the rights of people with disabilities. The foundation creates opportunities and assists in the development of people with disabilities in order to positively impact their quality of life.

## 3.5. Therese Willkomm

Therese Willkomm, PhD, is the Director of New Hampshire's State Assistive Technology Program with the Institute on Disability at the University of New Hampshire (UNH) and is an associate professor in the Department of Occupational Therapy.Dr. Willkomm is known nationally and internationally as "The MacGyver" of Assistive Technology and has designed and fabricated thousands of solutions for individuals with disabilities including her patented "A.T. Pad Stand", a multiuse assistive technology mounting device.  She is also known throughout the county for her trainings on awesome iPAD apps and adaptations. She has presented her work in 42 states, seven foreign countries and three U.S. Territories; has written 22 assistive technology related publications including her new book titled:   "Assistive Technology Solutions in Minutes – Book 2"

## 3.6. Shadi Abou Zahra

Shadi Abou-Zahra works with the W3C Web Accessibility Initiative (WAI) as Activity Lead of the WAI International Program Office, which includes groups that are responsible for education and outreach, coordination with research, general discussion on web accessibility, coordination with the WAI Technical Activity, and WAI liaisons with other organizations including standards organizations and disability groups. Shadi coordinates WAI outreach in Europe, accessibility evaluation techniques, and international standards promotion and harmonization activities. He is the scientific coordinator of the WAI-DEV Project (IST 611612), chairs the Evaluation and Repair Tools Working Group (ERT WG), is the staff contact of the Research and Development Working Group (RDWG), and is a participant and editor for the Education and Outreach Working Group (EOWG).

# 3.7. Benjamin Aigner

Benjamin Aigner started his studies in the bachelor program „Electronic Engineering" at the UAS Technikum Wien in 2010 and continued with the master program „Embedded Systems" from 2012 to 2014. In August 2012 he started working as employee within the AC-Centrope II project. His employment continued with the modulAAR project from January 2013 until August 2013. Since September 2013 he is employed within the „AsTeRICS Academy" and the „ViTAL" project. In addition to project related research, he is holding courses covering different aspects of electronic/electrical engineering, embedded systems and Assistive Technologies.

# 3.8. Veronika David

Veronika David studied Biomedical Engineering at the UAS Technikum Wien. After the Bachelor Degree she graduated in the master program Healthcare and Rehabilitation Technology in 2012. The main focus during her studies lied on Rehabilitation Technology and Ambient Assisted Living. In October 2012 she joined the Department of Biomedical Engineering at the UAS Technikum Wien where her major activities are research and development in the area of Rehabilitation Technology, Ambient Assisted Living and Gait Analyses. Since September 2013 she is part of the AsTeRICS-Academy team working in the area of Assistive Technologies in the Department of Embedded Systems. She is doing her PhD in course of the research project MISTRAAL (Mobile instrumented stroke rehabilitation in AAL) at the Medical University of Vienna.

# 3.9. Martin Deinhofer

After graduation at the HTL St. Pölten (Department of Informatics) 1997, he worked in several companies as a software developer (Java, Linux) for network management systems and traffic control systems. He started his studies in Sports Equipment Technology at UAS Technikum Wien in the year of 2007. Afterwards he graduated in the master program Healthcare and Rehabilitation Technology. During his studies Martin Deinhofer focused on several projects using sensors (IMU, WiiMote, Kinect,...), pattern recognition (HMM, LDA,...) and functional electrical stimulation (FES). Since September 2013 he is part of the AsTeRICS-Acedamy team and working on projects in the area of assistive technologies. He is one of the contributors to the AsTeRICS framework and has held several workshops in Prague and Kyzylorda, Kasachstan.

## 3.10.    Chris Veigl

Chris Veigl holds a master degree from the Technical University of Vienna where he studied Information Engineering and Medical Informatics. He joined the Technikum Wien Department of Embedded Systems in Sept. 2007, were he established the Assistive Technology and Smart Home focus. Starting with the AsTeRICS EU project, where Chris Veigl was responsible for the technical management, several follow-up projects in the AT and AAL sector could be successfully accomplished. Chris presented and applied AT-solutions in various workshops around the world, including countries like Nepal, Buthan and Zimbabwe and the US. His expertise includes software and firmware development, system architecture design, as well as implementation of hardware/software solutions and interfaces using various technologies.

In his teaching activity, Chris Veigl holds courses for microcontroller programming, operating systems and selected AT-related topics as well as workshops for building interactive art sculptures and biofeedback-based art installations.