



## Course and Examination Fact Sheet: Spring Semester 2023

### 11,803: Digital Therapeutics Project

ECTS credits: 3

#### Overview examination/s

(binding regulations see below)

Decentral - examination paper written at home (individual) (15%)

Examination time: term time

Decentral - Presentation (in groups - all given the same grades) (85%)

Examination time: term time

#### Attached courses

Timetable -- Language -- Lecturer

[11,803.1.00 Digital Therapeutics Project](#) -- Englisch -- [Kowatsch Tobias](#)

#### Course information

#### Course prerequisites

Students should be interested in the **multi-disciplinary** field of **Digital Health** at the intersection of **health economics, behavioral medicine, information systems research, and computer science**. Programming skills may be **helpful** but are **not required**. That is, students will design and implement a mobile health intervention with the help of easy-to-follow **video tutorials**. Finally, a **computer with a 13-inch display** (15-inch or larger recommended) and a **smartphone** with either iOS 12 (or higher) or Android Version 8 (or higher) **are required** to test the mobile health intervention.

#### Learning objectives

**Can medical Alexas make us more healthy?** (The New York Times, April 2021), **Wearables as a tool for measuring therapeutic adherence in behavioral health** (npj Digital Medicine, May 2021), **Improving community healthcare screenings with smartphone-based AI technologies** (The Lancet Digital Health, May 2021), **Predictive analytics and tailored interventions improve clinical outcomes** (npj Digital Medicine, June 2021), **Q1 2022 Digital Health funding reaches 6B across 186 deals** (Rock Health, 2022)

What are the **implications** and **rationale** behind the recent developments in the field of **digital health**?

**Digital Health** is the use of **information and communication technology** for the **prevention** and **treatment** of diseases in the **everyday life** of individuals. It is thus linked to topics such as digital health interventions, digital biomarkers, digital coaches and healthcare chatbots, telemedicine, mobile and wearable computing, self-tracking, personalized medicine, connected health, smart homes, or smart cars.

In the 20th century, healthcare systems specialized in acute care. In the 21st century, we now face the challenge of dealing with the specific characteristics of **non-communicable diseases**. These are now responsible for around 70% of all deaths worldwide and 85% of all deaths in Europe and are associated with an estimated **economic loss of \$7 trillion between 2011 and 2025**. Chronic and mental diseases are characterized in particular by the fact that they require an intervention paradigm that focuses on prevention and lifestyle change. Lifestyle (e.g., diet, physical activity, tobacco, or alcohol consumption) can reduce the risk of suffering from a chronic condition or, if already present, can reduce its burden. A corresponding change in lifestyle is, however, only implemented by a fraction of those affected, partly because of missing or inadequate interventions or health literacy, partly due to sociocultural influences. Individual personal coaching of these individuals is neither scalable nor financially sustainable.

To this end, the question arises of how to develop evidence-based **digital therapeutics (DTx)** that allow **medical doctors** and other **caregivers** to **scale** and **tailor long-term treatments** to **individuals** in need at **sustainable costs**. At the intersection of **health economics, behavioral medicine, information systems research, and computer science**, this lecture has the objective to help students and upcoming healthcare executives interested in the multi-disciplinary field of digital health to better understand



the **need, design, implementation, and assessment** of DTx.

After the course, students will be able to...

1. understand the importance of DTx for the management of chronic and mental conditions
2. discuss the opportunities and challenges related to DTx
3. better understand the design, implementation and evaluation of **smartphone-based** and **chatbot-delivered** DTx

## Course content

To reach the learning objectives, students will work on the following topics:

### 1. Motivation for Digital Health

- The rise of chronic diseases in developed countries
- Lifestyle as medicine and prevention of chronic diseases

### 2. Design of a Digital Therapeutics (DTx)

- Overview of design frameworks for health interventions
- Development of a conceptual model for a DTx
- Implementation of a smartphone-based and chatbot-delivered DTx

### 3. Evaluation of DTx

- Overview of evaluation methods and evaluation criteria for DTx
- Evaluation of a smartphone-based and chatbot-delivered DTx

## Course structure and indications of the learning and teaching design

The course is structured in **two parts** and follows the concept of a blended treatment consisting of **on-site live sessions** and **complementary online self-service lessons**. In on-site live sessions, students will **learn** and **discuss** the topics of the three learning modules. Complementary **learning material** (e.g., video clips), **multiple-choice questions**, and **exercises** are provided online via Canvas.

In the second part, **students work in teams** and will use their knowledge from the first part of the lecture to **develop** a **smartphone-based** and **chatbot-delivered** health intervention with **MobileCoach** ([www.mobile-coach.eu](http://www.mobile-coach.eu)), an open-source **software platform** for the development of digital biomarker and digital health interventions. Each team will then **present and discuss** the resulting **digital health intervention and evaluation results** with their fellow students who will provide **peer reviews**. Additional **live coaching sessions** are offered to support the teams with the **design and evaluation of their digital health intervention**, and with the **preparation** of their **presentations**.

## Course literature

1. Collins, L. M. (2018) **Optimization of Behavioral, Biobehavioral, and Biomedical Interventions: The Multiphase Optimization Strategy (MOST)** New York: Springer.
2. Corneta, V. P., and R. J. Holden (2018) **Systematic Review of Smartphone-Based Passive Sensing for Health and Wellbeing** Journal of Biomedical Informatics (77:January), 120-132.
3. Coravos, A., S. Khozin and K. D. Mandl (2019) **Developing and Adopting Safe and Effective Digital Biomarkers to Improve Patient Outcomes** Nature Digital Medicine 2 Paper 14.
4. Katz, D. L., E. P. Frates, J. P. Bonnet, S. K. Gupta, E. Vartiainen and R. H. Carmona (2018) **Lifestyle as Medicine: The Case for a True Health Initiative** American Journal of Health Promotion 32 (6), 1452-1458.
5. Kowatsch, T., L. Otto, S. Harperink, A. Cotti and H. Schlieter (2019) **A Design and Evaluation Framework for Digital Health Interventions** it-Information Technology 61(5-6), 253-263.
6. Kvedar, J. C., A. L. Fogel, E. Elenko and D. Zohar (2016) **Digital medicine's march on chronic disease** Nature Biotechnology 34 (3), 239-246.
7. Michie, S., L. Yardley, R. West, K. Patrick and F. Greaves (2017) **Developing an Evaluating Digital Interventions to Promote Behaviour Change in Health and Health Care: Recommendations Resulting From an International Workshop** Journal of Medical Internet Research 19(6):e232.
8. Nahum-Shani, I., S. N. Smith, B. J. Spring, L. M. Collins, K. Witkiewitz, A. Tewari and S. A. Murphy (2018) **Just-in-Time Adaptive Interventions (JITAs) in Mobile Health: Key Components and Design Principles for Ongoing Health**



**Behavior Support** Annals of Behavioral Medicine 52 (6), 446-462.

## Mandatory material

The mandatory material will be provided via the online learning platform Canvas.

## Additional course information

If you have any **further questions** regarding this lecture, then please contact **Robert Jakob** (rjakob@ethz.ch).

## Examination information

### Examination sub part/s

#### 1. Examination sub part (1/2)

##### Examination time and form

Decentral - examination paper written at home (individual) (15%)

Examination time: term time

##### Remark

Online exercises in Canvas

##### Examination-aid rule

Free aids provision

Basically, students are free to choose aids. Any restrictions are defined by the faculty members in charge of the examination under supplementary aids.

##### Supplementary aids

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##### Nature of examination

analog

##### Examination languages

Question language: English

Answer language: English

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#### 2. Examination sub part (2/2)

##### Examination time and form

Decentral - Presentation (in groups - all given the same grades) (85%)

Examination time: term time

##### Remark

Presentation of team project

##### Examination-aid rule

Free aids provision

Basically, students are free to choose aids. Any restrictions are defined by the faculty members in charge of the examination under supplementary aids.

##### Supplementary aids

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##### Nature of examination

analog



## Examination languages

Question language: English

Answer language: English

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## Examination content

The examination content will cover the three building blocks of the lecture:

1. Motivation for Digital Health
2. Design of Digital Health Interventions
3. Evaluation of Digital Health Interventions

## Examination relevant literature

### Mandatory material

The mandatory material will be provided via the online learning platform Canvas.

### Please note

Please note that only this fact sheet and the examination schedule published at the time of bidding are binding and takes precedence over other information, such as information on StudyNet (Canvas), on lecturers' websites and information in lectures etc.

Any references and links to third-party content within the fact sheet are only of a supplementary, informative nature and lie outside the area of responsibility of the University of St.Gallen.

Documents and materials are only relevant for central examinations if they are available by the end of the lecture period (CW21) at the latest. In the case of centrally organised mid-term examinations, the documents and materials up to CW 12 are relevant for testing.

Binding nature of the fact sheets:

- Course information as well as examination date (organised centrally/decentrally) and form of examination: from bidding start in CW 04 (Thursday, 26 January 2023);
- Examination information (regulations on aids, examination contents, examination literature) for decentralised examinations: in CW 12 (Monday, 20 March 2023);
- Examination information (regulations on aids, examination contents, examination literature) for centrally organised mid-term examinations: in CW 12 (Monday, 20 March 2023);
- Examination information (regulations on aids, examination contents, examination literature) for centrally organised examinations: two weeks before the end of the de-registration period in CW 15 (Monday, 10 April 2023).