



## Course and Examination Fact Sheet: Autumn Semester 2021

### 11,202: Digital Health

ECTS credits: 2

#### 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

[11,202,1.00 Digital Health](#) -- Englisch -- [Kowatsch Tobias](#)

#### Course information

#### Course prerequisites

Interest in the **multi-disciplinary** field of **Digital Health** at the intersection of **health economics, information systems research, computer science, and behavioral medicine**.

#### 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 health-care 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), **H1 2021 secured \$14.7B in digital health funding, already surpassing all of 2020's funding** (Rock Health, 2021)

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, management and treatment** of diseases. It covers topics such as digital health interventions, digital biomarker, digital coaches and healthcare chatbots, telemedicine, mobile and wearable computing, self-tracking, personalised medicine, connected health, smart homes or smart cars.

In the **20th century**, healthcare systems specialised in **acute care**. In the **21st century**, we now face the challenge of dealing with the specific characteristics of **chronic conditions**. 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 diseases 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. However, a lifestyle change is only implemented by a fraction of those affected, partly because of missing or inadequate interventions or health literacy, partly due to socio-cultural influences. Individual personal coaching of these individuals is neither scalable nor financially sustainable.

Against this background, the question arises on how to develop **evidence-based digital health interventions (DHIs)** 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, information systems research, computer science, and behavioural medicine**, 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 and assessment of DHIs**.



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

1. understand the importance of DHIs for the management of chronic conditions
2. understand the anatomy of DHIs
3. know frameworks for the design of DHIs
4. know evaluation criteria for DHIs
5. know technologies for DHIs
6. assess DHIs
7. discuss the advantages and disadvantages of DHIs

## Course content

To reach these learning objectives, the following topics are covered in the lecture and will be discussed based on concrete national and international examples including DHIs from the **Centre for Digital Health Interventions** ([www.c4dhi.org](http://www.c4dhi.org)), a joint initiative of the Department of Management, Technology and Economics at ETH Zurich and the Institute of Technology Management at the University of St.Gallen:

### 1. Motivation for Digital Health

- The rise of chronic diseases in developed countries
- The discrepancy of acute care and care of chronic diseases
- Lifestyle as medicine and prevention
- From excellence of care in healthcare institutions to excellence of care in the everyday life

### 2. Anatomy of Digital Health Interventions

- Just-in-time adaptive interventions
- Digital biomarker for predicting states of vulnerability
- Digital biomarker for predicting states of receptivity
- Digital coaching and healthcare chatbots

### 3. Design & Evaluation of Digital Health Interventions

- Overview of design frameworks
- Preparation of DHIs
- Optimisation of DHIs
- Evaluation of DHIs
- Implementation of DHIs

### 4. Digital Health Technologies

- Technologies for telemedicine
- Mobile medical devices
- Virtual, augmented and mixed reality applications incl. live demonstrations
- Privacy and regulatory considerations

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

The lecture is structured in **two parts** and follows the concept of a **blended treatment** consisting of **on-site sessions** and **complementary online lessons**. In the first part, students will **learn** and **discuss** the topics of the four learning modules in **weekly on-site sessions**. Complementary **learning material** (e.g., video and audio 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 critically assess DHIs. Each team will then **present and discuss the findings** of the assessment with their fellow students who will provide **peer-reviews**. Additional **on-site coaching sessions** are offered to support the teams with the **preparation** of their **presentations**.

## Course literature

1. Cohen AB Dorsey ER Mathews SC et al. (2020) **A digital health industry cohort across the health continuum**, npj Digital Medicine 3(68) 10.1038/s41746-020-0276-9



2. Collins LM (2018) **Optimization of Behavioral, Biobehavioral, and Biomedical Interventions: The Multiphase Optimization Strategy (MOST)** New York: Springer.
3. Coravos A Khozin S and KD Mandl (2019) **Developing and Adopting Safe and Effective Digital Biomarkers to Improve Patient Outcomes** Nature Digital Medicine 2(14), 10.1038/s41746-019-0090-4
4. Fleisch E Franz C Herrmann A **The Digital Pill: What Everyone Should Know about the Future of Our Healthcare System**, Emerald Publishing: Bingley,UK
5. Katz DL, EP Frates JP Bonnet SK Gupta E Vartiainen Carmona RH (2018) **Lifestyle as Medicine: The Case for a True Health Initiative** American Journal of Health Promotion 32(6), 1452-1458.
6. Kvedar JC Fogel AL Elenko E Zohar D (2016) **Digital medicine's march on chronic disease** Nature Biotechnology 34(3), 239-246, 10.1038/nbt.3495
7. Kowatsch T Otto L Harperink S Cotti A Schlieter H (2019) **A Design and Evaluation Framework for Digital Health Interventions** it - Information Technology 61(5-6), 253-263, 10.1515/itit-2019-0019
8. Kowatsch T Fleisch E (2021) **Digital Health Interventions**, in: Gassmann O Ferrandina F (eds): Connected Business: Creating Value in the Networked Economy, Springer: Berlin.
9. Kowatsch T Schachner T Harperink S et al (2021) **Conversational Agents as Mediating Social Actors in Chronic Disease Management Involving Health Care Professionals, Patients, and Family Members: Multisite Single-Arm Feasibility Study**, Journal of Medical Internet Research (JMIR) 23(2):e25060 10.2196/25060
10. Kowatsch T Lohse KM Erb V et al (2021) **Hybrid Ubiquitous Coaching With a Novel Combination of Mobile and Holographic Conversational Agents Targeting Adherence to Home Exercises: 4 Design and Evaluation Studies**, Journal of Medical Internet Research (JMIR) 23(2):e23612, 10.2196/23612
11. Nahum-Shani I Smith SN Spring BJ Collins LM Witkiewitz K Tewari A Murphy SA (2018) **Just-in-Time Adaptive Interventions (JITAI) in Mobile Health: Key Components and Design Principles for Ongoing Health Behavior Support** Annals of Behavioral Medicine 52 (6), 446-462, 10.1007/s12160-016-9830-8
12. Sim, I. (2019) **Mobile Devices and Health** The New England Journal of Medicine, 381(10), 956-968, 10.1056/NEJMra1806949

#### Mandatory Material

The mandatory material will be provided via the online learning platform no later than November 19, 2021.

### Additional course information

In the case of the President's Board having to implement new directives due to the SARS-CoV-2 pandemic in AS2021, the course information listed above will be changed as follows:

- The on-site sessions and coaching sessions will be conducted online via Zoom.
- The recordings of the course will be made permanently available.
- The lecturer informs via Canvas on the changed implementation modalities of the course.
- Course content such as live demonstrations or on-site guest lectures will likely be cancelled.

The examination information listed below would be changed as follows:

- Planned on-site group presentations will be cancelled and the group work will be assessed based on online presentations (in groups - all given the same grades, 85%).
- Further details about the group work and examination will be communicated via Canvas.

### 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 and peer-review via Canvas

## Examination-aid rule

Term papers

Written work must be written without outside help according to the known citation standards, and a declaration of authorship must be attached, which is available as a template on the StudentWeb.

Documentation (quotations, bibliography, etc.) must be carried out universally and consistently according to the requirements of the chosen/specified citation standard such as e.g. APA or MLA.

The legal standard is recommended for legal work (cf. by way of example: FORSTMOSER, P., OGOREK R., SCHINDLER B., Juristisches Arbeiten: Eine Anleitung für Studierende (the latest edition in each case), or according to the recommendations of the Law School).

The reference sources of information (paraphrases, quotations, etc.) that has been taken over literally or in the sense of the original text must be integrated into the text in accordance with the requirements of the citation standard used. Informative and bibliographical notes must be included as footnotes (recommendations and standards e.g. in METZGER, C., Lern- und Arbeitsstrategien (latest edition)).

For all written work at the University of St.Gallen, the indication of page numbers is mandatory, regardless of the standard chosen. Where page numbers are missing in sources, the precise designation must be made differently: chapter or section title, section number, article, etc.

## Supplementary aids

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## 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

Presentations

In presentations, aids for visual presentation can be used. These aids can be specified or restricted by the lecturers.

### Supplementary aids

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### Examination languages

Question language: English  
Answer language: English

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## Examination content

1. Motivation for Digital Health
2. Anatomy of Digital Health Interventions
3. Design & Evaluation of Digital Health Interventions
4. Digital Health Technologies

## Examination relevant literature



## Mandatory Material

The mandatory material will be provided via the online learning platform Canvas no later than November 19, 2021.

### 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 (CW51) at the latest. In the case of centrally organised mid-term examinations, the documents and materials up to CW 42 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 34 (Thursday, 26 August 2021);
- Examination information (regulations on aids, examination contents, examination literature) for decentralised examinations: in CW 42 (Monday, 18 October 2021);
- Examination information (regulations on aids, examination contents, examination literature) for centrally organised mid-term examinations: in CW 42 (Monday, 18 October 2021);

Examination information (regulations on aids, examination contents, examination literature) for centrally organised examinations: two weeks before the end of the registration period in CW 45 (Monday, 8 November 2021).