



BUSINESS SCHOOL
Te Kura Pakihi

COURSE OUTLINE

Pervasive Computing and Interactive Technologies
(Advanced Human-Computer Interaction and
Interactive Systems)
INFO305

Semester One, 2021

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Paper Description and Aims

Advanced human-computer interaction and interactive systems are important topics in Information science and Computer science. Interactive systems encompass concepts and technologies from within Pervasive or Ubiquitous computing. Pervasive or Ubiquitous computing describes the concept of computers and sensors which are used everywhere and anytime moving away from traditional desktop computers. Computers are part of cars, mobile phones, wearables devices such as fitness trackers or smart watches, but computers and sensors are also integrated into our fridge, washing machine, car parks to only name a few. Pervasive and ubiquitous computing touches many disciplines including mobile computing, human-computer interaction, distributed computing, and visual computing. In this course we will touch some of the core topics of Pervasive and Ubiquitous computing including mobile technology, sensors but also new interfaces for pervasive computing. As part of the course we will use the Microsoft Mixed Reality Toolkit and Unity to develop new wearable computing applications.

The lab sessions are used for working on the projects but also providing team to receive feedback and get project-related questions answered but do not rely on a fixed lab book. Instead, the students work on an open project within the scope of pervasive computing with fixed milestones. The project is organised in three (3) milestones with individual and group assignments. The project starts with (1) an evaluation of selected sensors commonly used to develop pervasive and ubiquitous computing applications. (2) Continues with building prototypes of context aware systems using noisy sensor values. Finally, (3) using vision-based sensors and combining them with the prior prototypes the final project milestones aims to prototypical implement a relevant application demonstrating concepts of pervasive and ubiquitous computing (pedestrian navigation).

Learning Outcomes

Students will gain proficiency in the foundations of Human-Computer Interaction. At the end of the course an INFO305 student is expected to:

- Design, implement and criticize pervasive and mobile computing systems.
- Understand the concepts of pervasive and ubiquitous computing, mobile and wearable computing as well as user interfaces for these technologies going beyond WIMP interfaces
- Understand the basic technologies for interactive systems and mobile technologies, including communication, sensing, output and displays for interactive systems.

- Understand the risks and opportunities in interactive systems including privacy, security and ethical considerations.
- Understand key application areas and future trends in interactive systems.
- Explain the implications of context awareness in ubiquitous computing systems.

Additionally, this course will expect that an INFO305 student is improving on important soft skills such as problem-solving and critical thinking, but also personal skills such as self-awareness and interpersonal skills.

Teaching Staff

Paper Coordinator and Lecturer

Name: Assoc. Prof Tobias Langlotz
Office: CO 7.13
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Lecturer

Name: Prof Holger Regenbrecht
Office: CO 9.07
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Lecturer and Lab tutor

Name: Dr Alexander Plopski
Office: CO7.14
Email: alexander.plopski@otago.ac.nz

You should contact Dr Tobias Langlotz with any administrative enquiries about the paper or requests for late submission of assignments.

Course Delivery

We strongly recommend that all students should plan to attend all of the lectures and labs and be prepared for the lecture sessions by reading and watching the assigned material for that session.

Lectures

Lectures present the key conceptual material through discussion and interaction between teaching staff and students.

Labs/Tutorials

Labs/Tutorials are interactive, collaborative sessions in which students attempt to cement concepts presented at lectures by working on the project and sometimes smaller lab tasks. We will initially provide detailed information on how to work towards the project and lab tasks.

Students should continuously work on the project while having the opportunity to receive help from the lab staff. Note: Labs start on time and usually start with a discussion of topics relevant to the lab/project. It is therefore strongly recommended that students are not late.

Material covered in labs may go beyond that covered in lectures and is examinable.

There are two lectures each week:

Day	Time	Venue
Tuesday	12:00-12:50 am	TBA
Thursday	10:00-10:50 am	TBA

Each student will be streamed into a single two-hour laboratory/tutorial session to be held each week. The lab timetable is given below.

Day	Time	Venue
Thursday	3:00- 4:50 pm	CO327

Streaming information will be available from Blackboard. Students should come to their assigned stream. Note: The labs streams are close to capacity. Priority will be given to those students who are coming to their assigned stream. If the lab is full, and you are in a different stream then you may be asked to leave.

Blackboard Discussion

There will be various discussion threads on Blackboard. We encourage students to take part in these discussions by posting questions that they might have with regard to topics covered in the lectures, labs or the project. The posted questions may be answered by other students or staff. Staff will be monitoring the discussions. We encourage you to post answers to the questions posted on Blackboard. Teaching staff may tell you to post a question to the discussions boards if they feel that the question and answer will benefit the entire class rather than answer the question directly.

Anonymous posting to the discussion boards is allowed.

Course Overview and Assessment

Module 1 (4 weeks)

The problem is introduced. The concepts of Pervasive and Ubiquitous computing are introduced. HoloLens as a platform for ubiquitous computing is introduced together with first sensors available.

Deliverables: The students work in small groups writing a first application for the HoloLens that allows to evaluate the accuracy and precision of integrated sensors (tracking the device pose, and fiducial targets). The results of their evaluation are submitted via their group blog and Bitbucket.

Module 2 (4 weeks)

This module continues on introducing sensing capabilities while also introducing filtering techniques to improve the raw sensor values. The tutorial/lab allows to make practical experience with data collection and classification techniques to compute context information.

Deliverables: The students continue to work in small groups using their results from the first module to further develop their sensor readings into contextual information using filtering and classification.

The results of the development will be demonstrated and submitted via their group blog and Bitbucket.

Module 3 (5 weeks)

The final module covers in particular the topics of natural user interfaces and application of pervasive and ubiquitous computing. Based on the results from Module 1 and Module 2 the small groups continue to develop a small example application demonstrating concepts of Pervasive and Ubiquitous computing.

Deliverables: The final application prototype is implemented. Documentation is submitted regularly via the blog. The final result is submitted through Bitbucket. This documentation should include justifications of design decisions and results. Each team member should submit a report describing his/her contribution to the project work. The final presentation will give the students the chance to summarise their achievements of the course and to demonstrate their prototype.

Assessment

All material presented is examinable (except where stated otherwise) by assignments and the final examination. All-important assessment information such as due dates and times, content, guidelines and so on will be discussed at lectures and, where appropriate, detailed on Blackboard. *Students are responsible for ensuring that they are aware of this information, keeping track of their own progress, and catching up on any missed classes.*

Note that, although for some assessments you will be working in groups, *each group member will ultimately receive their own mark for the assignment*, which will reflect their contribution and understanding of the assignment. By default, this mark will be consistent throughout the group, although it may be altered on a student-by-student basis based upon observations from staff and other appropriate evidence.

The final mark for each student will be determined as follows (refer also to the course requirements section):

Assessment	% of final grade
Project work Milestone #1	10
Project work Milestone #2	25
Project work Milestone #3	15
Final examination	50

Grading System

The grading scheme used at Otago is:

A+	90-100	C+	60-64
A	85-89	C	55-59
A-	80-84	C-	50-54
B+	75-79	D	40-49
B	70-74	E	<40

Course Requirements (The Hurdle and Terms Requirements)

In order to pass this paper, in addition to obtaining a minimum grade of 50 out of 100, the students must achieve at least 40% in the final exam (50 marks).

Additionally, INFO305 has no terms requirements.

Requests for Extensions and Special Consideration

In cases of sickness or other special circumstances, we may offer individual students extensions to assignment deadlines or alternative forms of assessment to replace tests that have been missed. To be eligible for this, an affected student should inform the coordinator (Dr. Tobias Langlotz) as soon as possible and before the deadline has passed. We require a doctor's note to confirm a medical problem. Extensions to assignments can be granted but only with a penalty of 10% for delayed submissions submitted within the first 10h after the deadline and further 1% for every hour after that, unless there are exceptional circumstances. Note: Asking for an extension for the course project because you were sick for the last few days before the deadline is not considered to be an exceptional circumstance. You will have at least two weeks to work on each assignment deliverable, so plan ahead, and don't leave it until it is too late.

If there is any way in which we can help students with disabilities please let us know. We are happy to offer whatever assistance we can, but need to know in advance of any potential difficulties that might arise.

Academic Integrity and Academic Misconduct (Plagiarism)

Students should ensure that all submitted work is their own. Plagiarism is a form of academic misconduct (cheating). It is defined as copying or paraphrasing another's work and presenting it as one's own. Any student found responsible for academic misconduct in any piece of work submitted for assessment shall be subject to the University's dishonest practice regulations, which may result in serious penalties, including forfeiture of marks for the piece of work submitted, a zero grade for the paper, or in extreme cases, exclusion from the University. The University of Otago reserves the right to use plagiarism detection tools.

Students are advised to inform themselves about University policies concerning dishonest practice and take up opportunities to improve their academic and information literacy. If necessary, seek advice from academic staff, or the Student Learning Centre. The guideline for students is available at this link: <http://www.otago.ac.nz/study/academicintegrity/index.html>

Quality Assurance

At the Otago Business School we monitor the quality of student learning and your learning experience. Your assessed work may be used for assurance of learning processes, such as evaluating the level of achievement of learning outcomes, with the aim of improving the quality of our programmes. All material used for quality assurance purposes will be treated as confidential and the outcome will not affect your grades.

Expectations and Workload

The teaching team (see 'Staff') are committed to creating the best possible environment to facilitate student learning. However, learning is a joint activity that requires active participation from the learner. Students are therefore expected to attend and participate in all facets of the course. This includes activities such as revising material, completing assigned work, spending extra time researching difficult concepts, in addition to participating in lectures, labs, and assessments.

INFO 305 is worth 18 points, which equates to spending 12 hours per week on the course (in accordance with University guidelines). This calculation includes the mandatory contact hours of lectures and labs (see 'Course Schedule') totaling up to 4 hours per week. The remaining 8 hours should be used for reading (assigned and personal research), lab preparation and completion, the project work, and course revision including exam preparation.

Course Calendar

INFO305 – Pervasive Computing and Interactive Technologies (Advanced Human-Computer Interaction and Interactive Systems)

Course Schedule

(as of 1st of March 2021, subject to change)

Week of	Lecture	Lecture Topic	Recommended Papers	Lecturer	Project milestones / deadlines
1 st of March	1	Interactive Systems Foundations I Introduction, History		TL	
	2	Interactive Systems Foundations II Definitions and concepts (Ubiquitous Computing, Pervasive Computing, Ambient Intelligence,...)		TL	
8 th of March	3	Interactive Systems: Applications and Devices I Tangible Computing, Physical Interfaces, Wearable Computing, Context Awareness, Augmented Reality		TL	
	4	Interactive Systems: Applications and Devices II Tangible Computing, Physical Interfaces, Wearable Computing, Context Awareness		TL	
15 th of March	5	Programming Interactive Systems I Unity and the Mixed Reality Toolkit		AP	
	6	Programming Interactive Systems II Unity and the Mixed Reality Toolkit		AP	
22 nd of March	7	Programming Interactive Systems III Unity and the Mixed Reality Toolkit		AP	
	8	Interactive Systems: Sensors I Sensing location and orientation (GPS, WiFi/Bluetooth based sensing, vision, proximity, RFID,...)		TL	Submission Project Milestone #1
29 th of March	9	Interactive Systems: Sensors II Sensing orientation (Magnetometer, accelerometer, gyros, vision)		TL	
	10	Interactive Systems: Sensors III Sensors beyond location (light/lux sensors, heat, medical sensors etc.)		TL	

Mid-Semester Break: 2 – 11 April

Week of	Lecture	Lecture Topic	Recommended Papers	Lecturer	Project milestones / deadlines
12 th of April	11	Interactive Systems: Dead Reckoning and Sensor Fusion		TL	
	12	Interactive Systems: Interactions for Interactive Systems I Interactions beyond WIMP, natural user interfaces		TL	
19 th of April	13	Interactive Systems: Interactions for Interactive Systems II Interactions beyond WIMP, natural user interfaces		TL	
	14	Interactive Systems: Interactions for Interactive Systems III Tangible Computing and Physical Computing		TL	
26 th of April	15	Interactive Systems: Interactions for Interactive Systems IV Tangible Computing and Physical Computing		TL	
	16	Interactive Systems: Augmented Reality I		AP	Submission Project Milestone #2
3 rd of May	17	Interactive Systems: Augmented Reality II		AP	
	18	Interactive Systems: Augmented Reality III		AP	
10 th of May	19	Interactive Systems: Augmented Reality IV		AP	
	20	Interactive Systems: Context Awareness and Adaptation I		TL	
17 th of May	21	Interactive Systems: Context Awareness and Adaptation II		TL	
	22	Interactive Systems: Applications I		TL	
24 th of May	23	Interactive Systems: Applications II		TL	
	24	Interactive Systems: Applications III		TL	
31 st of May	25	Interactive Systems: Privacy and security		TL	
	26	Wrap-up		TL	Submission Project Milestone #3

Mid-Year Examinations: 9 - 23 June

Course Learning Resources

There is no prescribed reading material but we will hand out academic publications during the course which is recommended for reading.

Blackboard

Blackboard <https://blackboard.otago.ac.nz/> provides you with access to course materials, class notices, and resources. Blackboard is used to email the whole class so it is important that you check your student email and *Blackboard* regularly.

Student Webmail

IMPORTANT - DO THIS NOW:

Forward your University email address to an email address that you use regularly as follows:

1. [Log into your StudentMail account](#) using your student username and password
2. Click **Cog button (top right corner) > Options**
3. Under **Account**, select the **Forward your email** shortcut under the **Short Cuts** menu on the right side of the screen.
4. Under the Forwarding heading, type in the email address you want your email to be forwarded to. You can also choose to have a copy of these emails kept on your StudentMail account, so please check the box if you would like this.
5. Click the **Start forwarding** button.

Student Learning Support and Information

Student Charter

<http://www.otago.ac.nz/about/otago005275.html>

Guidelines for Learning at Otago

<http://hedc.otago.ac.nz/hedc/wp-content/uploads/2012/12/Guidelines-for-Learning.pdf>

<http://hedc.otago.ac.nz/hedc/learning/>

Student Learning Centre

The Student Learning Centre, which is part of the Higher Education Development Centre, provides learning support, free of charge, to ALL enrolled students. Their services include:

- a workshop programme designed to help students to improve their learning strategies and their generic skills;
- individual assistance with learning issues;
- on-line study skills advice;
- a student leadership programme
- a student-led peer support programme for students of all ages and backgrounds.
- conversational English groups for students from a non-English speaking background

The Centre also provides two very helpful study guides, "Guidelines for Writing and Editing" and "Writing University Assignments" and these are available on the SLC website.

<http://slc.otago.ac.nz/>

Kaiāwhina – Māori Student Support

Ko Te Atua o Taiehu te Mauka, Ko Ōtākou te Tai, Ko Ōtākou te Marae, Ko Kai Tahu , Taranaki ka iwi. Ko Taikawa Brett Taiaroa Karetai Tamati-Elliffe ahau.

Papaki kau ana ngā tai o mihi, ko Taikawa ahau. He wheako ōku kia poipoi, akiaki ia koutou nga taurira o Te Kura Pākihi.

Taikawa Tamati-Elliffe (Kai Tahu, Taranaki) is the Kaiāwhina Māori (Māori student support) for Te Kura Pākihi (Business School). He can help with questions about your academic studies as well as providing information on scholarships, pastoral, financial and other campus services. Taikawa also offers support to those studying away from their whanau, hapū and iwi, to feel safe and supported.

Tel: 03 479 5342

Email: kaiarahi.obs@otago.ac.nz | taikawa.tamati-elliffe@otago.ac.nz

OBS Pacific Student Support Facilitator (Part-time)

Mary Jane's role is to **liaise with** Academic Departments and Student Services relating to Pacific students and their course of study. Mary Jane is based in the Pacifica room on the **OBS Ground Floor**. As she works part time, it is best to email her to make an appointment.

Email: mary-jane.kivalu@otago.ac.nz

Library Support

The Library website <http://www.otago.ac.nz/library> provides access to resources and services, including group room bookings, library hours and locations, past exam papers, subject guides, article databases and more.

If you need assistance either check out the self-help guides <http://otago.libguides.com/selfhelp>, or ask Library staff at the ground floor service desks, or email ask.library@otago.ac.nz

Disability Information and Support

Students are encouraged to seek support if they are having difficulty with their studies due to disability, temporary or permanent impairment, injury or chronic illness. It is important to seek help early, through one of the contacts below:

Website: <http://www.otago.ac.nz/disabilities>

65 Albany St, West Lane, ISB, Student Services

Tel: +64 3 479 8235 Email: disabilities@otago.ac.nz

Student Feedback

We encourage your feedback. This can be in the form of contacting staff, participating in course evaluation surveys and communicating with class representatives. INFO 203 is a new paper for 2017, so some fine tuning of the course may be required. Continual improvements will be made to this course based in part on student feedback.

Class Representatives

The class (or student) representative system is an avenue for encouraging communication and consultation between staff and students. It provides you with a vehicle for communicating your views on the teaching and delivery of the paper and provides staff with an opportunity to communicate information and gain constructive feedback from students. It contributes to the development of a sense of community within a department and it adds a further dimension to the range of support services offered to students.

Volunteers for the role of class representatives will be called early in the semester. The OUSA invites all class representatives to a training session, conducted by OUSA, about what it means to be a class representative and some of the possible procedures for dealing with issues that arise. They also provide information on the services that OUSA offers and the role OUSA can play in solving problems that may occur. The OUSA provides support to class representatives during the semester. Departmental staff will also meet with class representatives during the semester to discuss general issues or matters they wish to have considered.

Your class representative's name and contact details will be posted on Blackboard early in the semester.

Concerns about the Course

We hope you will feel comfortable coming to talk to us if you have a concern about the course. The Course Co-ordinator will be happy to discuss any concerns you may have. Alternatively, you can report your concerns to the Class Representative who will follow up with departmental staff. If, after making approaches via these channels, you do not feel that your concerns have been addressed, there are University channels that may aid resolution. For further advice or more information on these, contact the departmental administrator or head of department.

Disclaimer

While every effort is made to ensure that the information contained in this document is accurate, it is subject to change. Changes will be notified in class and via Blackboard. Students are encouraged to check Blackboard regularly. It is the student's responsibility to be informed.