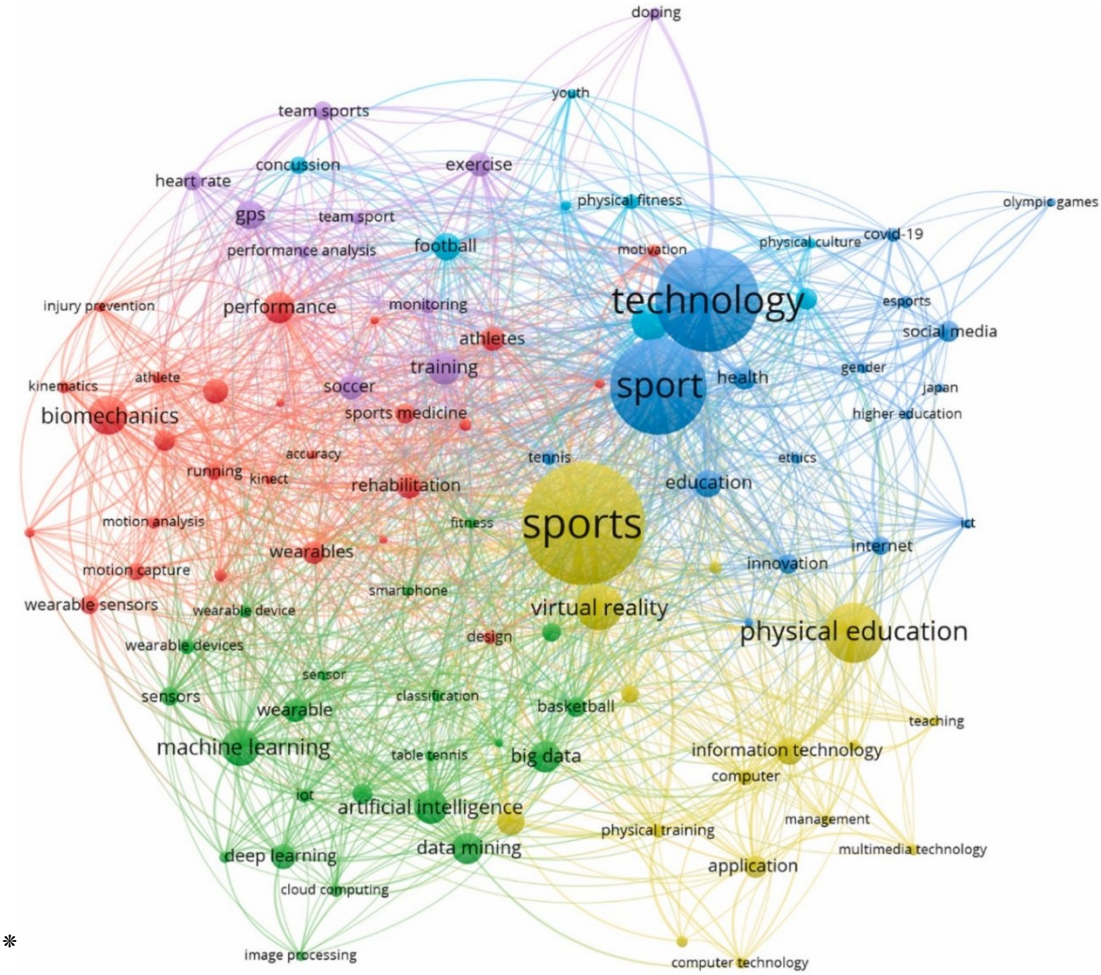
SPEX 311: Sports Technology



Technology is fundamentally changing the nature of sport and exercise. In this paper you will learn about how to appraise the historical impact of sport and exercise technologies in the past, present and potential future. Students will be expected to critically appraise how technology has changed the ways that sport and exercise are participated, watched, and promoted. In particular, SPEX311 focusses on the technologies underpinning how human movement is recorded and analysed. As part of the course you will debate the ethics/fairness of the role of technology in modern sport. Some key skills you will develop include a range of effective communication and presentation skills (e.g., verbal, written, individual and group presentations). Furthermore, you will develop independent learning skills and demonstrate creative problem-solving. Students who are interested in technology and the role it plays in our lives will find value in taking this paper. Those students that challenge themselves to engage with the material and learning approaches offered will do well in this paper.

I hope you enjoy taking SPEX311 Sports Technology!

Professor Chris Button

[*] Bibliographic co-occurrence map for author keywords. Image from Frevel et al (2022). https://doi.org/10.1016/j.techfore.2022.121838

1. General information

a) Administrative information

Contact person (first point of contact)

Paper Coordinator: Chris Button
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Email: chris.button@otago.ac.nz
Phone: 479 9122
Office hours: Wednesday 11am-4pm, all other times by prior appointment.

Teaching Assistant: Connor Eastwood (connor.eastwood@otago.ac.nz)

Technical Support: Chris Harvey (chris.harvey@otago.ac.nz; Room 2.11, Tel: 03 479 9125)

b) Prerequisite: SPEX202 and/or equivalent approved experience.

c) Use of Blackboard learning platform

Blackboard is a web-based learning platform (https://blackboard.otago.ac.nz/) that we will use regularly to help manage teaching and learning in the course. On Blackboard you will find resource material, details of lectures, practical activities and tutorials, a discussion site, and your own personal grade sheet. Let the Paper Coordinator know if you have difficulty accessing the SPEX311 Blackboard page.

2. Introduction to SPEX 311: Sports Technology

This paper considers how various applications of technology have influenced the way that sport and exercise are participated in the past, today and possibly in the future. We will consider new and emerging ways in which athletic behaviour can be measured, modified and enhanced. Students will be required to critique the relationship of modern sport and technology from both interdisciplinary and sociocultural critical perspectives.

3. Intended learning outcomes

On completion of this paper you are expected to:

1. Provide historical overviews of disruptive sport technologies and predict some likely directions for the future
2. Critical analyse how technology can impact upon sports performance, exercise and physical activity
3. Apply an interdisciplinary approach and debate the ethics/fairness of the role of technology in sport and exercise
4. Identify some of the main challenges for the field of sport technology in collecting, analysing and interpreting physical activity data
5. Demonstrate a range of effective communication and presentation skills (e.g., verbal, written, digital)
6. Display initiative and advanced learning skills (e.g., curiosity, time-management, problem-solving, filtering and evaluating information, critical analysis, leadership, group-work)

4. Paper content and structure

Date	Topic	Activity	Time / Location
15 July (Tues) 16 July (Wed) 18 July (Fri)	1. Quantifying the impact of sports technology	• Lecture (Chris Button) • Tutorial: How to get the most out of SPEX311 • Lab 1 (Connor Eastwood): Validity and reliability of physical activity tracking devices	Lecture: 3-4pm, 2.13/14 PE School Tutorials: 2-3pm, Arts building C411 4-5pm, Arts building C411 Lab streams: 11am-1pm, 2-4pm, G5/6, PE School
22 July (Tues) 23 July (Wed) 25 July (Fri)	2. Fairness, sport & technology	• Lecture (Guest: Mark Falcous) • Tutorial: The controversy of sports technology: What is fair? • Lab 2 (CE): Small group planning and pilot work	Lecture: 3-4pm, 2.13/14 PE School Tutorials: 2-3pm, Arts building C411 4-5pm, Arts building C411 Lab streams: 11am-1pm, 2-4pm, G5/6, PE School
29 July (Tues) 30 July (Wed) 1 Aug (Fri)	3. The regulation of sport technologies: Performance enhancing drugs	• Lecture (Chris Button) • Tutorial: PEDs, supplements and testing (CB 10-11am, CE 4-5pm) • Lab 3: Data collection	Lecture: 3-4pm, 2.13/14 PE School Tutorials: 2-3pm, Arts building C411 4-5pm, Arts building C411 Lab streams: 11am-1pm, 2-4pm, G5/6, PE School
5 Aug (Tues) 6 Aug (Wed) 8 Aug (Fri)	4. Materials and production technology: Sport equipment	• Lecture (Chris Button) • Tutorial: Equipment R&D workshop • Lab 4: Data collection (cont'd)	Lecture: 3-4pm, 2.13/14 PE School Tutorials: 2-3pm, Arts building C411 4-5pm, Arts building C411 Lab streams: 11am-1pm, 2-4pm, G5/6, PE School
12 Aug (Tues) 13 Aug (Wed) 15 Aug (Fri)	5. 'Smart' technologies: Physical activity tracking and AI	• Lecture (Chris Button) • Tutorial: The world of 'wearables' – where next? • Lab 5: Final data collection and/or data analysis	Lecture: 3-4pm, 2.13/14 PE School Tutorials: 2-3pm, Arts building C411 4-5pm, Arts building C411 Lab streams: 11am-1pm, 2-4pm, G5/6, PE School
19 Aug (Tues) 20 Aug (Wed) 22 Aug (Fri)	6. Medical technologies and rehabilitation	• Lecture (Chris Button) • Tutorial: Inclusivity vs unfair advantage: How to regulate body technologies • Lab 6: Interpreting and presenting results. Report tips	Lecture: 3-4pm, 2.13/14 PE School Tutorials: 2-3pm, Arts building C411 4-5pm, Arts building C411 Lab streams: 11am-1pm, 2-4pm, G5/6, PE School
26 Aug (Tues) 27 Aug (Wed) 29 Aug (Fri)	7. Crossed the line?: Officiating & media technologies	• Lecture (Chris Button) • Tutorial: Is VAR killing the spirit of sport? **No lab on 29 August**	Lecture: 3-4pm, 2.13/14 PE School Tutorials: 2-3pm, Arts building C411 4-5pm, Arts building C411

Mid-Semester Break			
9 Sept (Tues) 10 Sept (Wed) 12 Sept (Fri)	8. Practice-enhancing technologies	• Lecture: (Chris Button) • Seminar/demo: Will virtual reality revolutionise practice? • IP Workshop 1: Individual projects – Impact, mechanism and evaluating the quality of evidence	Lecture: 3-4pm, 2.13/14 PE School Tutorials: 2-3pm, Arts building C411 4-5pm, Arts building C411 IP streams: 11am-1pm, 2-4pm, G5/6, PE School
16 Sept (Tues) 17 Sept (Wed) 19 Sept (Fri)	9. Wellness technologies and the environment	• Lecture: (Chris Button) • Tutorial: Does technology connect us or disconnect us from the environment? • IP Workshop 2: Individual projects – Handouts and visual aids	Lecture: 3-4pm, 2.13/14 PE School Tutorials: 2-3pm, Arts building C411 4-5pm, Arts building C411 IP streams: 11am-1pm, 2-4pm, G5/6, PE School
23 Sept (Tues) 24 Sept (Wed) 26 Sept (Fri)	10. Powering a greener game: Sustainability and sport	• Lecture (Chris Button) • Tutorial: What can I do to promote sustainability in my sport? • IP Workshop 3: Project presentation practice tips and work-ons	Lecture: 3-4pm, 2.13/14 PE School Tutorials: 2-3pm, Arts building C411 4-5pm, Arts building C411 IP streams: 11am-1pm, 2-4pm, G5/6, PE School
30 Sept (Tue) 1 Oct (Wed) 3 Oct (Fri)	11. The business of Sport Tech & future innovations	• Lecture (Guest: Tim Horton) • Tutorial: The future of sport and exercise • IP Workshop 4: Project presentation final practice	Lecture: 3-4pm, 2.13/14 PE School Tutorials: 2-3pm, Arts building C411 4-5pm, Arts building C411 IP streams: 11am-1pm, 2-4pm, G5/6, PE School
7 Oct (Tues) 8 Oct (Wed) 10 Oct (Fri)	12. Individual Project Presentations	**No lecture on 7 Oct** • Tutorial: Student presentations • Lab: Student presentations	**Note: Presentation file and handout to be submitted by 12pm 10 Oct** Tutorials: 2-3pm, Arts building C411 4-5pm, Arts building C411 IP streams: 11am-1pm, 2-4pm, G5/6, PE School
14 Oct (Tues) 15 Oct (Wed) 17 Oct (Fri)	13. Course review and exam preparation	• Lecture (Chris Button) • Tutorial: 'Formative Test' • Final lab: Revision & evaluation	Lecture: 3-4pm, 2.13/14 PE School Tutorials: 2-3pm, Arts building C411 4-5pm, Arts building C411 **Note: Formative test on 15 Oct worth up to 10% final grade** IP streams: 11am-1pm, 2-4pm, G5/6, PE School

5. Teaching / learning approaches

A combination of stimulus lectures, tutorials, and laboratories will be used in this paper. All lectures will be video-recorded and made available for one week at least 24 hours later via Echo360 accessed through the SPEX311 Blackboard page. Although your attendance and participation in lectures is not compulsory it is **strongly recommended** as the extent of your engagement will impact upon your learning. If you have to be absent due to illness, please contact the paper coordinator by email preferably before the session/s you cannot attend.

Attendance at tutorial sessions is compulsory and will be monitored. Please note that most tutorials will involve some review, in-class discussion, questions and feedback. You will also find your learning in this course is supported if you read the relevant materials associated with each stimulus lecture. It is an effective learning strategy to form study groups throughout the paper where you can regularly discuss the ideas and concepts with others. Discussion helps understanding and application of the course material in different situations and from a range of perspectives. Please note that at times in the course we will engage in small group debates so it may be helpful to practice this skill in your own time.

Attendance at laboratory sessions is compulsory due to logistical constraints. If you are forced to be absent from a laboratory (i.e., due to illness) please provide written evidence justifying your absence. Please come to laboratory sessions appropriately attired, i.e., ready to participate in light/moderate physical exercise if required. You should also bring a laptop, and maybe a notebook and pen to each laboratory to record important information.

6. Learning Resources

a) Recommended readings / websites

These readings are important, they will be discussed in Tutorials and include important exam material, so please make sure you read them each week.

Week 1

Haake, S.J. (2009). The impact of technology on sporting performance in Olympic sports, *Journal of Sport Sciences, 27*, 1421–1431.

Week 2

Dyer, B. The controversy of sports technology: a systematic review. *SpringerPlus 4,* 524 (2015). https://doi.org/10.1186/s40064-015-1331-x (should be read prior to week 2 tutorial)

Week 3

Khan, R. (2017). Doping in sports – Cheating or leveling of the playing field? Downloaded on 20/06/2019 from: https://www.forbes.com/sites/roomykhan/2017/12/31/doping-in-sports-cheating-or-leveling-of-the-playing-field/#c1ae2675ecf9

Week 4

Caine, M., Blair, K. & Vasquez, M. (2012). Materials and technology in sport. *Nature Materials, 11*, 655–658. https://doi.org/10.1038/nmat3382

Week 5

Shei, R. J., Holder, I. G., Oumsang, A. S., Paris, B. A., & Paris, H. L. (2022). Wearable activity

trackers–advanced technology or advanced marketing? European Journal of Applied Physiology, 122(9), 1975-1990.

Week 6

Varillas-Delgado, D., Del Coso, J., Gutiérrez-Hellín, J. et al. (2022). Genetics and sports performance: the present and future in the identification of talent for sports based on DNA testing. European Journal of Applied Physiology 122, 1811–1830.

Week 7

Spitz, J., Wagemans, J., Memmert, D., Williams, A. M., & Helsen, W. F. (2021). Video assistant referees (VAR): The impact of technology on decision making in association football referees. *Journal of Sports Sciences, 39*(2), 147-153.

Week 8

Farrow, D. (2013). Practice-enhancing technology: a review of perceptual training applications in sport. *Sports Technology, 6*(4), 170-176.

Week 9

Becker, P. & Loynes, C. (2019). The Mediation of Experiences by Technology in the Outdoors Opening or Losing Connections with the World. Selection of papers for the 17th conference of the European Institute for Outdoor Adventure Education and Experiential Learning (EOE). pp 1-7 (Becker), 8-14 (Loynes). pdf on Blackboard.

Week 10

TBD

Week 11

Frevel, N., Beiderbeck, D., & Schmidt, S. L. (2022). The impact of technology on sports – A prospective study. *Technological Forecasting and Social Change, 182*, 121838.

Week 13

https://sportnz.org.nz/resources/ensuring-the-sector-is-fit-for-the-future/

General background learning resources

Fuss, F. (2014). *Routledge Handbook of Sports Technology and Engineering.* Routledge: Abingdon, Oxon, New York. (UO Central Library GV745.R69)

Sport Technology @ Otago private Facebook group – email chris.button@otago.ac.nz to join

https://www.geekwire.com/sports

The Science of Sport by Ross Tucker & Jonathan Dugas: https://sportsscientists.com/sports-science

Schmidt, S. L. (Ed.). (2020). *21st Century Sports: How Technologies Will Change Sports in the Digital Age.* Springer Nature.

Note: Other resources will be regularly posted on the SPEX311 2025 Blackboard page throughout the Semester, keep checking this site regularly.

7. Expected workload

In total there is approximately 50 hours of contact time and up to 130 hours of independent study time required for this paper. Most weeks you will be expected to spend 2 hours in lectures and tutorials and 2 hours in laboratories or workshops. Every week at least an additional **3-5 hours of independent study time** should be devoted to self-directed activities such as reading, researching, analysing data, small group meetings, making summary notes, assessment preparation, etc.

8. Assessment

*Laboratory report……..…….....***30%**
Students will undertake a small group project testing the ability of a wearable device to track physical activity accurately and/or reliably. The project should be written up as an **independent** laboratory report using standard APA guidelines (Note that single or 1.5 line spacing is acceptable). The length of the report is limited to **2,500 words** (excluding title page and references). Laboratory reports to be submitted electronically by **5pm Friday, 29 August.**

Students are allowed the use of generative AI software to assist with the construction of the Introduction section of the lab report. Students are strongly discouraged from directly copying and pasting text from genAI into their Introduction and instead should critically improve the output to enhance the presentation of their report. For all other sections of the report (i.e., Methods, Results, Discussion) students SHOULD NOT use genAI and instead compose these sections themselves. Any unauthorized or unacknowledged use of genAI to write this laboratory report will be treated as suspected plagiarism and processed with standard processes (for more details, see: http://www.otago.ac.nz/administration/policies/otago116838.html).

Although you are encouraged to collaborate with other students in your lab group, it is important that you write your own lab report. The submission of suspiciously similar Laboratory reports by two or more people will be investigated as potential plagiarism.

*Individual Project presentation and handout ….…….....***30%**
Students are required to conduct an individual project within the sport or physical activity of their choice. Students should analyse the impact that a technology has had on the chosen sport or physical activity from an interdisciplinary perspective. Dissemination of the project will take the form of a 10 minute presentation delivered to the class (**during tutorial and lab times**) and an information handout (no more than 2 sides of A4). Students are required to present the findings from their project using visual aids and props if appropriate and respond to questions from staff and other students.

Formative Test (Practice Exam)………**10%**
For those students that have engaged appropriately throughout the Semester an online, knowledge test is offered to help summarise the paper content, identify areas of strengths and weaknesses, and also to direct you towards revision strategies for the final exam. The formative test will be composed of a mixture of question types, including MCQs, fill in the gap, mix & match and short answers. Answers and feedback will be discussed in the final laboratory to further aid your revision. The test (30 mins duration) will be completed during the tutorial streams on **15 Oct, 2025.**

Please note that the formative test will NOT be available to students that do not engage or attend regularly.

Final Examination.....**30%**
The exam will be composed of a combination of short answer questions, a debate question, and a brief essay. The short answer questions will assess general knowledge relating to past, current and potential future applications of sports technology. For the debate question you should consider a contentious statement provided and then write a statement either in favour of, or against the statement. The brief essay will be a choice of one from a selection of questions pertinent to the paper.

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Note that the grading scheme used at Otago is:

A+	90-100	B-	65-69
A	85-89	C+	60-64
A-	80-84	C	55-59
B+	75-79	C-	50-54
B	70-72	D	40-49
		E	<40

Please note that assignments submitted later than the deadlines advertised above will be subject to the standard University of Otago penalty. The standard penalty shall be 5% of the maximum mark per day late or part thereof. For example, if submitted up to 24 hours late, reduce available marks by 5%; 24-48 hours late, reduce available marks by 10% etc. For further details see: *Guidelines for the Assessment of Student Performance*
(https://www.otago.ac.nz/administration/policies/otago078920.html).

9. Attendance

Attendance at all sessions (i.e., lectures, tutorials, laboratories) is strongly recommended. Due to logistical factors attendance at tutorials and laboratories is **compulsory.** It is your responsibility to ensure you attend all tutorials and laboratories. If you have to miss any session for legitimate reasons you should either request advance permission from the paper coordinator or submit evidence explaining why your absence was unavoidable. Informal monitoring of attendance will be taken at all sessions.

10. Referencing style

The course uses the APA (American Psychological Association) referencing style. You are recommended to obtain the tutorial booklet *Using the APA Referencing Style* from the Student Learning Centre in the ISB Building. You will also find information about different referencing styles at: http://www.library.otago.ac.nz/research/citation.html

11. Plagiarism/dishonest practice

Academic Integrity and Academic Misconduct

Academic integrity means being honest in your studying and assessments. It is the basis for ethical decision-making and behaviour in an academic context. Academic integrity is informed by the values of honesty, trust, responsibility, fairness, respect and courage. Students are expected to be aware of, and act in accordance with, the University's Academic Integrity Policy.

Academic Misconduct, such as plagiarism or cheating, is a breach of Academic Integrity and is taken very seriously by the University. Types of misconduct include plagiarism, copying, unauthorised

collaboration, submitting work written by someone else (including from a file sharing website, text generation (artificial intelligence) software, or purchased work) taking unauthorised material into a test or exam, impersonation, and assisting someone else's misconduct. A more extensive list of the types of academic misconduct and associated processes and penalties is available in the University's Student Academic Misconduct Procedures.

In accordance with the University of Otago's guidelines on GenAI use and academic integrity, it is the student's responsibility to:

- use Gen-AIs tools in accordance with any guidelines on the use of Gen-AIs for specific papers and in a way that is consistent with the Academic Integrity Policy.
- become aware that Gen-AIs have different capacities and limitations and that their responses may be biased and that responses may be fabricated.
- check any output from Gen-AIs against reliable sources of information and understand that they will be responsible for any errors or omissions in material generated by Gen-AIs.
- be aware of the acceptable use of Gen-AIs for assessment and to be aware that Gen-AIs may not be acceptable or permitted for all assessments.
- be aware that the unacceptable or unauthorised use of Gen-AIs constitutes academic misconduct.

Artificial Intelligence Use School Policy

The purpose of course assessments is to evaluate your understanding, skills, and achievement of learning outcomes. These assessments are designed to measure your ability to analyse, create, and apply knowledge in ways that demonstrate your learning and prepare you for future careers. When considering the use of AI tools, it is essential to ensure that their use supports rather than undermines these educational goals.

AI Use Guidelines for This Paper

Please review the selected policy option below, which indicates the permitted level of AI use in this course. If you have any questions about the policy or specific applications, please consult teaching staff.

☐ **No AI Use**
AI assistance is not permitted in this course. This restriction exists because the course objectives require demonstration of specific individual skills and capabilities. Any use of AI tools for coursework, including but not limited to grammar and writing style assistance, falls under the University's Academic Integrity Policy and may result in academic penalties.

☒ **Disclosed AI Use**
AI tools may be used for specific aspects of coursework, but all use must be explicitly disclosed. Your lecturer will provide detailed guidelines on permitted applications of AI tools for different assignments. When submitting work, you must include a statement describing any AI assistance used, including the specific tools, extent of use, and your role in reviewing and refining AI-generated content. Failure to disclose AI use falls under the Academic Integrity Policy.

☐ **Open AI Use**
AI tools may be used freely as learning and productivity aids in this paper without specific disclosure requirements. Your lecturer will provide

guidance on appropriate and effective use of AI tools to support your learning objectives. While disclosure is not required, you are encouraged to think critically about the quality and relevance of information output from any AI tools being used.

Use of course materials and copyright: Lecturers hold the copyright (permission to use) all course materials (including but not limited to: lecture and tutorial slides, assignments, exams, recordings). Lectures **may not** be recorded by students unless they are given specific permission by the lecturer. Course materials **may not** be shared on note-sharing websites. Students engaging in any of these practices could face disciplinary action by the University. See this link for details, particularly the section "Take care with materials provided to you by your lecturers".
https://www.otago.ac.nz/administration/copyright/otago016316.html

It is your responsibility to be aware of and use acceptable academic practices when completing your assessments. To access the information in the Academic Integrity Policy and learn more, please visit the University's Academic Integrity website at www.otago.ac.nz/study/academicintegrity, or ask at the Student Learning Centre (HEDC) or the Library, or seek advice from your paper co-ordinator.

For further information:
Academic Integrity Policy
http://www.otago.ac.nz/administration/policies/otago116838.html
Student Academic Misconduct Procedures
http://www.otago.ac.nz/administration/policies/otago116850.html

Turnitin on Blackboard
Turnitin is a text-matching software tool which reports matches between sections of student work submitted to it, and other material to which Turnitin has access (i.e. material available via the internet, and content of other student assignments which have previously been submitted to Turnitin). Turnitin is also often referred to as a plagiarism detection tool. All assignments submitted electronically through Blackboard are uploaded via Turnitin, and the report is available to the marker. You are able to check your draft assignment via Turnitin before you submit your final assignment. Full instructions and guidance for the use of Turnitin can be found at:

https://help.otago.ac.nz/blackboard/assessing-your-students/turnitin/turnitin-for-students/Academic Integrity and Academic Misconduct

12. Impairment

The School encourages students to seek support if they find they are having difficulty with their studies owing to disability, temporary or permanent impairment, injury, chronic illness or deafness. If you are suffering from anything that is likely to impair your study in this course, please let the paper coordinator know as soon as possible. If you let us know of any problems we can make arrangements for appropriate support.

Contact either:

School of Physical Education, Sport and Exercise Science Disabilities Officer
Ms. Marguerita Lazar
Tel 479 5263
e-mail: pe.undergrad@otago.ac.nz

or

Disability Information and Support
Tel 479 8235
e-mail: disabilities@otago.ac.nz
website: http://www.otago.ac.nz/disabilities

Puāwaitanga – individual counselling for all students

The University is pleased to announce that we have partnered with Puāwaitanga, a free telehealth counselling service available to all enrolled students, across all campuses. They can support students with feelings of anxiety, low mood, relationships, grief, addictions, low self-esteem, or low confidence. Appointments can be held anytime between 9am – 9pm, 7 days a week.

Students can call 0800 782 999 or visit their website to arrange an appointment.

13. What do you do if you have concerns about the course?

We hope you will feel comfortable coming to talk to teaching staff if you have a concern about the course. The paper coordinator will be happy to discuss any concerns. If you do not feel that your concerns have been addressed, there are university channels that may aid resolution. For further advice and more information on these channels, contact either the Administrators in the Reception office (physical-education@otago.ac.nz) or Associate Dean Curriculum (peter.lamb@otago.ac.nz).