



2016

Trimester 2

COURSE OUTLINE

BILD321

Sustainable Engineering Systems Design

GENERAL

Trimester Two; 15 points

ASSESSMENT

100% internal by assignment

CLASS TIMES AND LOCATIONS

LECTURES & TUTORIALS: Mondays and Thursdays 09.30 to 11.20

Rooms: VS 2.21 & VS 2.36 and VS 2.36a

COORDINATOR

Course Coordinator:

Name: Mike Donn

Email: Michael.donn@vuw.ac.nz

Teaching Fellow:

Name: Nilesh Bakshi

Phone: 04 463 6293

Office Hours: Immediately following the class sessions or by appointment

Email: nilesh.bakshi@vuw.ac.nz

In this course, the role of the Teaching Fellow will manage the day to day activities of the course, coordinating assignments, lectures and receipt of hand-ins. The Course Coordinator will ensure maintenance of Academic Standards and act as an arbiter of any issues with their delivery.

Tutor details will be provided at start of the course.

COMMUNICATION OF ADDITIONAL INFORMATION

Any changes or additions to this Course Outline will be discussed and agreed with the class, and conveyed through Blackboard or via email to all students enrolled in the course.

PRESCRIPTION

The interaction between buildings and the environment in the achievement of comfort, performance and sustainability, and the design of appropriate sustainable engineering systems at the building scale.

COURSE CONTENT

Following on from consideration of conventional environmental engineering systems (in BILD 231), this course will explore the interaction between buildings and the environment in the achievement of comfort, performance and sustainability; and the design of appropriate sustainable engineering systems at the building scale.

This course will cover the theory and practice of sustainable engineering system design and provide opportunities for problem solving at the building and urban scale.

Sustainable design issues will be reviewed at a technical and building system scale.

Particular emphasis will be placed on passive design, energy efficiency, and renewable energy, in relation to Net Zero Energy Building solutions.

Students will review current sustainable engineering systems and apply one or more of them in the course of a live project.

Topics to be covered include: passive design solutions such as thermal chimneys and advanced natural ventilation; efficiency options related to appliances and equipment such as HVAC and lighting systems; and renewable energy generation alternatives such as wind turbines and photovoltaic arrays.

COURSE LEARNING OBJECTIVES

1. Common methods, processes and assemblies of medium scale construction
2. The role of building technology, building science and innovation in the building industry
3. Detailing considerations in the context of the overall design objectives of an architectural project.

These 3 course learning objectives will be assess based on your ability to:

1. Obtain knowledge and comprehension of:
 - a. a range of basic sustainable engineering systems.
 - b. the philosophies and strategies of sustainable engineering systems design.
2. Develop the ability:
 - a. to understand and assess the design of complex sustainable engineering installations.
 - b. to apply their knowledge of sustainable engineering systems to the design of a medium-scale building in its broader context.
3. Produce detailed and supportable design proposals that encompass a refined ability:
 - a. to orally and graphically communicate their design of complex sustainable engineering installations.
 - b. to appropriately use representational media and communicate essential research findings and design outcomes.

GRADUATE SKILLS

Graduate Skills	Taught	Practised	Assessed
Knowledge			
• Information literacy	✓	✓	✓
Creative and Critical Thinking			
• Problem solving	✓	✓	✓
• Critical evaluation	✓	✓	✓
• Work autonomously		✓	✓
• Creativity and innovation		✓	✓
Communication			
• Effective communication (written)	✓	✓	✓
• Effective communication (oral)	✓	✓	✓
• Effective communication (graphic)	✓	✓	✓
• Work effectively in a team setting		✓	
Leadership			
• Ethical behaviour in social / professional / work environments		✓	
• Responsible, effective citizenship		✓	
• Commitment to responsibilities under the Treaty of Waitangi		✓	

Knowledge

By the end of the course you should be able to:

- Understand and describe the basic features of the main types of sustainable engineering systems.
- Understand the main strategies or approaches to the design of sustainable engineering systems.

Creative & Critical Thinking

By the end of the course, if you have passed, you will have learned to:

- Appraise the sustainable engineering installations of existing complex buildings.
- Understand the main issues, challenges and opportunities for the application of sustainable engineering systems in the built environment.

Communication

By the end of the course, students who have passed will have learned to:

- Write a concise description of a selected sustainable engineering system or systems, together with examples of their application in the built environment.
- Employ appropriate representational media and software applications to convey essential research findings and design outcomes in relation to the integration of sustainable engineering systems into the built environment.

Leadership

By the end of the course, students who have passed will have learned to:

- Conduct themselves appropriately and confidently while undertaking the design of the sustainable engineering systems for a medium-scale building and presenting their proposals to the client.

TEACHING FORMAT

Course delivery will be via lectures and seminars mainly, interspersed with tutorial sessions and class presentations.

The course has two 2-hour sessions per week.

The intention is to involve both in-house academics and external practitioners in the delivery of lectures/seminars focussing on their area of specialisation.

Students should anticipate spending a considerable amount of time working on their specific research and design tasks; and a significant amount of time in presentations and critiques.

The VUW Blackboard site will be used for course resources – files, announcements, project briefs, course information, project discussion boards and the like.

WORKLOAD

Attendance and participation is an important aspect of the learning process, and you are expected to attend all the lectures and tutorials.

If extraordinary circumstances arise that require you to be absent from some class sessions, you should discuss the situation with the Teaching Fellow in the first instance, as soon as possible.

You should expect to spend around 150 hours on this course, including both scheduled class time and independent study. Typically this involves around 10 hours per week during the 12 teaching weeks, with the balance during the mid-trimester break, study week and examination period

Please visit the link below for information on Studio Courses:

www.victoria.ac.nz/fad/faculty-administration/current-students#studioculturepolicy

Students with course timetable clashes are responsible for discussing these with the Teaching Fellow in the first instance. Students who then choose to remain enrolled in such courses must recognise that it is their sole responsibility to seek information from peers, Blackboard and other sources, and catch up on course material they may miss because of clashes.

ASSESSMENT

Two two-part assignments will be set for this course.

Assignment 1

<i>Project 1: S.E. Case Study -</i>	Weeks 28 to 31 (4 weeks): Due 8 August.	30%
<i>Project 2: Raw Modelling & QA -</i>	Weeks 32 to 36 (5 weeks): Due 8 September.	20%

Assignment 2

<i>Project 3: S.E. Design Project -</i>	Weeks 37 to 41 (5 weeks): Due 13 October.	30%
<i>Project 4: Course Presentations -</i>	Presentation 1 - Weeks 28 to 31 (4 weeks): Due 4 August.	20%
	Presentation 2 - Weeks 37 to 40 (3 weeks): Due 8 August.	

Total		100%
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Assignment 1 – Project 1 (which relates to all CLOs and assessed on 1a, 1b and 3b):

Course weight 30%

Project 1 is intended to develop and demonstrate your abilities to outline the principles and practice of a selected sustainable engineering system and to describe examples of its application in existing medium-scale buildings (based on descriptions in the published literature). You will select a sustainable engineering technology that is suitable for use in a large scale urban building. You will select two case study buildings that are not the same as any selected by your colleagues that utilize this technology or aspects of this technology.

Your analysis will have an in-depth description and demonstration of a calculation methodology for quantifying the environmental impacts/consumption of the system. This methodology will include a section on quality assurance – what can be done to prove your impact assessment is valid. This is intended to be a resource for all students in assignment 2 to help them when designing their own building.

A report of approximately nine A4 pages plus no more than eight power-point slides is anticipated. This will be assembled into a class resource and may form the basis for a textbook chapter. The report is evaluated on;

- a clear and unambiguous description of the underlying principles and components of the assigned system.
- a comprehensible design guidance for the system, appropriately referenced.
- a perceptive review of a set of relevant case studies.
- a strict conformity to the specified format, logical report structure, and fastidious referencing & for effective oral communication and thorough completion of further editing in response to comments.

Your report on your case study buildings must include a critique of the climate of the case study and how it differs compared to Wellington. Appendices may be added for completeness (from your point of view) or to support your findings, but these may not be read and will not be assessed

Due date 8th August.

Assignment 1 – Project 2 (which relates to all CLOs and assessed on 2a):

Course weight 20%

Project 2 is intended to develop and demonstrate your abilities to assess performance and measure sustainable engineering systems in a given medium- large scale building.

Your analysis will have an in-depth description of modelling assumptions and the quality assurance (QA) in the building performance simulation. A successful project submission will specifically incorporate careful modelling protocols and prove your simulation and assumptions are valid. A modelling report of approximately 4 A4 pages of writing (plus any graphical summaries) is anticipated. The project is evaluated on;

- a clear and unambiguous description of the underlying modelling assumptions made during the modelling process.
- Appropriate checks of the validity and/or sensitivity of your assumptions using modelling
- comprehensible application of expertise to assess performance.
- Results from a working EnergyPlus model of the building form -simulation and analysis to H1 modelling methodology
- strict conformity to the specified format, logical report structure, and fastidious referencing & thorough completion of further editing in response to comments.

Due date 8th September.

Assignment 2 - Project 3 (which relates to all CLOs and assessed on 2a, 2b and 3b):

Course weight 30%

Project 3 is intended to develop and demonstrate your understanding of sustainable engineering systems design and your abilities to apply such systems to a given medium- large scale building. You will work individually and re-design the given building using sustainable engineering systems to get as close to net-zero energy building performance as

possible. e.g. passive ventilation and daylighting, energy efficiency, renewable, water, materials etc. The outcomes will be a report of (at most) 10 A4 pages and a single A1 poster presentation. The project is evaluated on;

- Detailed design and environmental project goals. E.g. comfort criteria and a working definition of net-zero energy performance. This includes a review of existing standards and how their goals meet/exceed, why they were or were not chosen. You will determine which aspect of the building to focus on in depth e.g. energy, daylight. In all cases, you will use human comfort and usability as the primary measure of performance – energy use and resource use should be a secondary priority.
- A working EnergyPlus model of the re-designed building form -simulation and analysis to H1 modelling methodology.
- A working daylight model of the re-designed building -simulation and analysis proving building code compliance as a minimum goal

Assessment will be based solely on students' individual reports. Appendices may be added for completeness (from your point of view) or to support your findings, but these may not be read and will not be assessed

Due date 13th October.

Assignment 2 - Project 4 (which relates to all CLOs and assessed on 3a and 3b):

Course weight 20%

Project 4 is intended to develop your ability to orally and graphically communicate the design of complex sustainable engineering installations and to demonstrate the appropriate use of representational media and communicate essential research findings and design outcomes.

You will complete 2 presentations to a panel of reviewers for projects 1 and 3. These presentations will make up the full assessment for project four. This project will be graded for the quality and effectiveness of each presentation, ensuring that:

- The introduction is effective and informative.
- The presentation is well organised and easy to follow.
- The key points are clearly stated.
- The visual component, e.g., presentation slides, A1 posters, etc., are clear, effective, well referenced and used.
- The speaker's demeanor, volume, and manner of speaking are effective and clear.
- The ending draws things together well.
- The technical content is good, including clear and justifiable assumptions, methodology, relevant conclusions, etc.
- The questions are handled well
- And there is sound communication of understanding

For each presentation you will need to demonstrate critical thinking by identifying the main issues clearly, present both theoretical positions and empirical evidence and identify the strengths and weaknesses of these. The assumptions assessment methods for simulation methods must be adequately explained, postulating recommendations for further work in its area.

Due dates presentation 1: 4th August - presentation 2: 6th October.

BILD321 is internally assessed by the assignment work described above. Assignments are assessed and graded A+, A, A-, B+, B, B-, C+, C, C-, D, E, (where C- is a PASS). <http://www.victoria.ac.nz/students/study/progress/grades>

Grades only are issued to students. The final grade for the course is based on the aggregation of the percentage marks for each of the assignments, and a final grade of C- or better is required to pass the course.

NOTE: In order to ensure equity, hand-in dates cannot be modified. A hand-in date cannot be changed without permission from the Head of School.

Your work will be reviewed on the basis of the degree to which it meets the assessment criteria described in the Project Outlines. The School has a long tradition of providing *critical review* of student work as it progresses especially in design projects. For further information, please refer to the Website below.

Critical Review: www.victoria.ac.nz/fad/faculty-administration/current-students/faqs#criticalreview

Although visitors may be involved in some of the reviews, only the course coordinator and tutors will conduct the assessment. The course coordinator is finally responsible for the grades issued.

All grades posted during this course are only provisional results until confirmed by the School Examiners Committee which meets after the examination period.

SUBMISSION AND RETURN OF WORK

All work submitted for assessment must be accompanied by an Assessment Declaration Form.

You are responsible for ensuring your work is submitted on time and in the required format.

All project work must be submitted to the Hand-in folder on the R-Drive. This is a School of Architecture requirement to ensure that student work is appropriately archived.

Work submitted after the cut-off date late (usually one week after the Hand-in date) must be submitted directly to the Teaching Fellow.

Late submissions (i.e., those submitted after the Hand-in date) will be penalised as set out below, unless an extension is approved by the Teaching Fellow.

EXTENSIONS

In the event of illness or other extraordinary circumstances that prevent you from submitting and/or presenting a piece of work on time, or that you feel adversely affect the quality of the work you submit, it is important that you discuss your circumstances with the Teaching Fellow as soon as possible so that appropriate arrangements may be made. If possible, you should complete an Application for Extension form (available from the Faculty Office) for the Teaching Fellow to approve before the hand-in date. You will also need to provide suitable evidence of your illness or other circumstances. In an emergency, if you are unable to contact the Teaching Fellow and have then also attempted to contact the Course Coordinator, you should advise the Faculty Office of your situation.

PENALTIES

For work that arrives late without an approved extension, the following penalty will be applied: 5% immediately, then 5% for every subsequent 24 hours including weekends.

REQUIRED MATERIALS AND EQUIPMENT

Students will need to provide all materials and equipment as necessary for the completion of required work and be prepared to travel to local site visits. Please check the website link below for general requirements:

www.victoria.ac.nz/fad/faculty-administration/current-students/faqs#materialsandequipment

SET TEXTS

There are no Set Texts, but the following have been placed on Closed Reserve for the duration of the course:

Baird, G., *The architectural expression of environmental control systems*, Spon Press, London, 2001

Baird, G., *Sustainable Buildings in Practice – what the users think*, Routledge, Oxon, 2010

Duran, SC and Herrero, JF, *The sourcebook of contemporary green architecture*, Collins Design, New York, 2010

Insight Media, Strata SE1: *The wind turbines* - (VUW DVD 11283), The architects' channel, Insight Media, New York,

Yeang, K and Spector, A (Eds), *Green Design – from theory to practice*, Black Dog Publishing, London, 2011

RECOMMENDED READING

A full list of relevant books will be made available on Blackboard, many of which (other than those noted above) have been placed on three-day loan.

Donn, M R. (2001). Tools for Quality Control in Simulation. *Building and Environment*, 36, 6. (pp. 673-680).

Donn, M R. (2001). What does it look like? Quality Control in simulations of lighting appearance. *Proceedings of International Building Performance Simulation Association Biennial Conference*. (pp. 1041-1048). Rio de Janeiro, Brazil.

Duran, SC and Herrero, JF, *The sourcebook of contemporary green architecture*, Collins Design, New York, 2010

Insight Media, Strata SE1: *The wind turbines* - (VUW DVD 11283), The architects' channel, Insight Media, New York,

Lu, S., Amor, R., & Donn, M R. (2002). An Internet based Building Simulation Quality Assurance System. *Proceedings of the CIB W78 Conference on Distributing Knowledge in Buildings*. (pp. 225-232). Aarhus, Denmark

Twidell J and Weir, T, *Renewable Energy Resources*, Taylor and Francis, Abingdon, 2006 (2nd Edn)

Winkler, G., *Green Facilities: Industrial and Commercial LEED certification*, McGraw Hill, New York, 2011

Yeang, K and Spector, A (Eds), *Green Design – from theory to practice*, Black Dog Publishing, London, 2011

SCHEDULE OF SESSIONS

Week	Day	Date	Item	Location	Time	Comments
Month Week 28 July	M	11	Course Introduction & Project 1 Brief	VS2.21 VS2.26	09:30	
	TU	12				
	W	13				
	TH	14	Energy Lowering Solution Sets Project 1 Tutorials	VS2.21 VS2.26	09:30	
	F	15				
Week 29 July	M	18	Selected Case Studies Project 1 Tutorials	VS2.21 VS2.26	09:30	
	TU	19				
	W	20				
	TH	21	Project 1 Tutorials	VS2.21 VS2.26	09:30	
	F	22	Withdrawal refund			<i>This is the last date that you can withdraw from a Tri 2 course with a full fees refund</i>
Week 30 July	M	25	Building Performance Project 1 Tutorials	VS2.21 VS2.26	09:30	
	TU	26				
	W	27				
	TH	28	Zero Energy Design Project 1 Tutorials	VS2.21 VS2.26	09:30	
	F	29				
Week 31 August	M	1	Daylight modelling	VS2.21 VS2.26	09:30	
	TU	2				
	W	3				
	TH	4	Project 1 presentations <i>(Project 4 part 1)</i>	VS2.21 VS2.26	09:30	
	F	5				
Week 32 August	M	8	Project 2 Introduction Energy Plus Tutorial	VS2.21 VS2.26	09:30	HAND IN PROJECT 1 - 9:30am
	TU	9				
	W	10				
	TH	11	Lighting System Design Energy Plus Tutorial	VS2.21 VS2.26	09:30	
	F	12				
Week 33 August	M	15	Project 2 Energy Plus Tutorial			
	TU	16				
	W	17				
	TH	18	German Companies seminar series	VS2.21 VS2.26	09:30	
	F	19				
Week 34 August	M	22				Mid-trimester break
	TU	23				
	W	24				
	TH	25				
	F	26				
Week 35 August/ September	M	29				
	TU	30				
	W	31				
	TH	1				
	F	2				Mid-trimester break ends

Week 36 September	M	5	Energy Plus Q&A Session Project 2 Tutorials – Key Issues and Design Options	VS2.21 VS2.26	09:30	
	TU	6				
	W	7				
	TH	8	Project 2 final tutorials	VS2.21 VS2.26	09:30	HAND IN PROJECT 2 - 7:00pm
	F	9				
Week 37 September	M	12	Introduce Project 3	VS2.21 VS2.26	09:30	
	TU	13				
	W	14				
	TH	15	Embodied Energy	VS2.21 VS2.26	09:30	
	F	16				
Week 38 September	M	19	Green Star Building Design	VS2.21 VS2.26	09:30	
	TU	20				
	W	21				
	TH	22	Lessons from BEES Working Energy Plus model	VS2.21 VS2.26	09:30	
	F	23	Course withdrawals			<i>After this date the Associate Dean's approval is required for withdrawals from Tri 2 courses.</i>
Week 39 September	M	26	3DS Max Q&A Session Project 3 Tutorials – Key Issues and Design Options	VS2.21 VS2.26	09:30	
	TU	27				
	W	28				
	TH	29	Water resource Energy Plus Tutorial	VS2.21 VS2.26	09:30	
	F	30				
Week 40 October	M	3	3DS Max & Energy Plus Q&A Session Project 3 Tutorials – Key Issues and Design Options	VS2.21 VS2.26	09:30	
	TU	4				
	W	5				
	TH	6	Class session	VS2.21 VS2.26	09:30	
	F	7				
Week 41 October	M	10	Project 3 presentations (Project 4 part 2)	VS2.21 VS2.26	09:30	Project 3 Final presentations
	TU	11				
	W	12				
	TH	13	Class session	VS2.21 VS2.26	09:30	Hand-in Project 3 – 7:00pm
	F	14				
Week 42 October	M	17				Study/Examination Period
	TU	18				
	W	19				
	TH	20				
	F	21				Examination Period begins
Week 43 October	M	24				Labour Day – Public Holiday
	TU	25				
	W	26				
	TH	27				
	F	28				
Week 44 Oct/ Nov	M	31				
	TU	1				

	W	2				
	TH	3				
	F	4				
Week 45 November	M	7				
	TU	8				
	W	9				
	TH	10				
	F	11				
	S	12				Examination Period ends

CLASS REPRESENTATIVES

The Faculty of Architecture and Design operates a system of Class Representatives in 100-level courses, and Year Representatives in each of the professional disciplines. Student Representatives are elected during a class session in the first week of teaching. All Student Representatives will be listed on the STUDIÖ notice board in the Atrium, and the relevant Representatives are also listed on studio notice boards. Student Representatives have a role in liaising between staff and students to represent the interests of students to the academic staff, and also in providing students with a communication channel to STUDIÖ and the Student Representation organiser.

Class Rep name and contact details:

STUDENT FEEDBACK

This course has received very positive feedback from the students in the last student feedback survey; no issues have been pointed out. As a result, the course has kept the same structure and assignment. Student feedback on University courses may be found at www.cad.vuw.ac.nz/feedback/feedback_display.php.

OTHER IMPORTANT INFORMATION

The information above is specific to this course. There is other important information that students must familiarise themselves with, including:

- Aegrotats: www.victoria.ac.nz/home/about/avcadademic/publications2#aegrotats
- Academic Progress: www.victoria.ac.nz/home/study/academic-progress (including restrictions and non-engagement)
- Dates and deadlines: www.victoria.ac.nz/home/study/dates
- Faculty Current Students site: www.victoria.ac.nz/fad/faculty-administration/current-students
- Grades: www.victoria.ac.nz/home/study/exams-and-assessments/grades
- Resolving academic issues: www.victoria.ac.nz/home/about/avcadademic/publications2#grievances
- Special passes: www.victoria.ac.nz/home/about/avcadademic/publications2#specialpass
- Statutes and policies including the Student Conduct Statute: www.victoria.ac.nz/home/about/policy
- Student support: www.victoria.ac.nz/home/viclife/student-service
- Students with disabilities: www.victoria.ac.nz/st_services/disability
- Student Charter: www.victoria.ac.nz/home/viclife/student-charter
- Student Contract: www.victoria.ac.nz/home/admisenrol/enrol/studentcontract
- Turnitin: www.cad.vuw.ac.nz/wiki/index.php/Turnitin
- University structure: www.victoria.ac.nz/home/about
- VUWSA: www.vuwsa.org.nz

Work Submitted for Assessment

Declaration Form

Student's full name :

Course :

Assignment/project :
(*number and title*)

Date submitted :

Refer to the information on Academic Integrity, Plagiarism and Copyright on the back of this form.

I confirm that:

I have read and understood the University's information on academic integrity and plagiarism contained at [http: www.victoria.ac.nz/home/study/plagiarism](http://www.victoria.ac.nz/home/study/plagiarism) and outlined below:

- I have read and understood the general principles of copyright law as set out below:
- This project/assignment is entirely the result of my own work except where clearly acknowledged otherwise:
- Any use of material created by someone else is permitted by the copyright owner.

Signed:

Date:

Academic Integrity, Plagiarism and Copyright

ACADEMIC INTEGRITY

Academic integrity is important because it is the core value on which the University's learning, teaching and research activities are based. University staff and students are expected to treat academic, intellectual or creative work that has been done by other people with respect at all times. Victoria University's reputation for academic integrity adds value to your qualification.

Academic integrity is simply about being honest when you submit your academic work for assessment

- You must acknowledge any ideas and assistance you have had from other people.
- You must fully reference the source of those ideas and assistance.
- You must make clear which parts of the work you are submitting are based on other people's work.
- You must not lie about whose ideas you are submitting.
- When using work created by others either as a basis for your own work, or as an element within your own work, you must comply with copyright law

Summarised from information on the University's Integrity and Plagiarism website:

www.victoria.ac.nz/home/study/plagiarism

PLAGIARISM

The University defines plagiarism as presenting someone else's work as if it were your own, whether you mean to or not. 'Someone else's work' means anything that is not your own idea. Even if it is presented in your own style, you must acknowledge your sources fully and appropriately. This includes:

- Material from books, journals or any other printed source
- The work of other students or staff
- Information from the internet
- Software programs and other electronic material
- Designs and ideas
- The organisation or structuring of any such material

Find out more about plagiarism, how to avoid it and penalties, on the University's website:

www.victoria.ac.nz/home/study/plagiarism

COPYRIGHT

Copyright law regulates the use of the work of an author, artist, designer or other creator.

- Copyright applies to created work including designs, music, computer programs, artistic and literary work.
- The work can be in printed, digital, audio, video or other formats.
- Normally the author or creator of a work owns the copyright for their lifetime and for 50 years after their death, (although sometimes someone other than the creator of a work owns the copyright to the work, such as the creator's employer, or a person who commissions the creator's work).
- You must have permission from the copyright owner to copy, alter, display, distribute or otherwise use created work.
- If the creator has applied a Creative Commons licence to a work, this permits others to use the work but only in accordance with that licence.

Further information on copyright is available on the Victoria University website:

<http://library.victoria.ac.nz/library/about/policies/copyright.html>