

Life Science & Technology

Study Guide 2007 - 2008

Master of Science

www.leidendelft.nl

Disclaimer

Every effort has been made by the faculty in putting together this guide. However, further details about a number of subjects will only be available after the guide has been printed. For that reason, the information published by the faculty in this handbook is subject to change. Amendments, further details, and a more extensive description of the subjects can be found on Blackboard: <http://blackboard.tudelft.nl> and in the digital study guide <http://studyguide.tudelft.nl>

Contents

2	>	Disclaimer
4	>	Personal Data
5	>	Dear student
6	>	1 Programme overview
6	>	1.1 Aims & objectives
6	>	1.2 The structure of the MSc programme
10	>	2 List of course modules
10	>	2.1 Compulsory track courses cell factory
10	>	2.2 Compulsory track course cell diagnostics
11	>	2.3 Compulsory track course functional genomics
11	>	2.4 Compulsory track courses living matter
11	>	2.5 LM3901 Masters thesis project
11	>	2.6 General compulsory modules
11	>	2.7 Electives: 12-17 ECTS
12	>	2.8 Science based business modules
16	>	Timetables
17	>	Contacts
24	>	Addresses Leiden University
30	>	Course descriptions
54	>	Map of TU Delft campus
56	>	Map of Leiden University

Personal Data

name _____

address _____

postcode/city or town _____

date of birth _____

home phone _____ mobile _____

work phone _____ work fax _____

e-mail _____

student number _____

giro account no. _____ bank account no. _____

passport no. _____ valid thru _____

driving license _____ valid thru _____

social-fiscal no. _____

family doctor _____

medications: _____

allergic to medications: _____

blood type _____ RH factor _____ donor card: yes/no _____

IN EMERGENCIES PLEASE CONTACT

naam _____

address _____

postcode/town or city _____

home phone _____ mobile _____

If found, please return this student guide or contact the owner.

Dear student,

In this booklet, you will find the outline of the Life Science & Technology Master's programme. In addition to your own motivation and scientific curiosity, one of the most important aspects of passing your Master's programme successfully is the planning of the various parts of the programme over the two years in which you should be able to complete it. The initiative for this mainly comes from you, which means that you have to think about how to organise your studies at an early stage. Moreover, besides thinking, consultation with track coordinators, lecturers, the internship coordinator and others at the education office is also necessary in order to get the information you need to be able to make appropriate choices.

Below, you will find an outline of the whole programme, followed by a separate description of each part, and a schedule in which the track modules, the Ethics & Engineering module, and the Design project are detailed. Finally, there is information about the lecturers involved.

We hope that this guide will help you to graduate successfully and, above all, to enjoy your studies.

On behalf of the LS&T MSc programme,

Prof. Mathieu Noteborn
Director of Education

Programme

1. PROGRAMME OVERVIEW

1.1 AIMS & OBJECTIVES

Aim of the Programme

The programme aims:

- To instil scientific knowledge, insight, as well as methodical, technological and communicational skills that correspond to the specialised field of the programme;
- To gain an academic attitude with a critical, scientific and creative way of thinking, based on awareness of the ethical and social aspects relating to one's own research, and insight into the professional situation and into the consequences of one's actions on others;
- To prepare for a scientific career and further education, especially for a doctoral education (PhD);
- To prepare for a career in society. The graduate will be able to pursue an independent profession and may be admitted to PhD education programmes. The programme complies with the requirements of the "Leiden University Register of Programmes" in terms of its structure, final attainment levels and other quality features.

1.2 THE STRUCTURE OF THE MSc PROGRAMME

The MSc programme takes two years (120 ECTS). During that time, you will attend lectures, complete practical assignments, and participate in internships and projects. You will have to choose one of four tracks: Cell Factory, Cell Diagnostics, Functional Genomics, or Living Matter. The lectures and practical work for the first two tracks take place mainly in Delft; those of the latter two take place mainly in Leiden.

1.2.1 DESCRIPTION OF THE TRACKS:

Cell Factory, track co-ordinator: Prof. Jack T. Pronk.

Cell Factory is the most process-oriented track in the MSc programme. As the name implies, it is about cells operating as factories as well as in factories. The student focuses on gaining all the information and skills necessary for the industrial application of (parts of) living organisms in the production of valuable components. This means that this educational programme has a strong focus on technological aspects such as fermentation technology, as well as the purification and formulation aspects of a biotechnological product on its way to the end consumer, in addition to modern molecular biology with its basis in genomics and physiology.

Cell Diagnostics, track co-ordinator: Prof. Simon de Vries

This track focuses on the development and implementation of methods, techniques and instruments in order to discover maximum information about living cells. This applies to all levels, from molecule through to subcellular structure, to the whole cell in vitro and in situ. In addition to acquiring new fundamental knowledge, the development of new medicines is one of the most important applications of this work. Cell diagnostics is definitely a bio-instrumentational track where 'Biorecognition' - the detailed specificity of binding, interaction and biocatalysis through biomolecules - is central. A well-grounded knowledge of biological systems is essential both in protein chemistry and protein technology, cell biology, immunobiology, and bio-organic and bio-anorganic chemistry. In addition, the student is introduced to new developments in physics, spectroscopy, electron microscopy, (micro) electronics, micro array techniques, image processing and interpretation, as well as in bio-informatics.

Functional Genomics, track co-ordinator: Prof. Jaap Brouwer

This track is characterised by the in-depth study of molecular genetics and cell biology, with an emphasis on those processes that play a role in the regulation of information transport in the cell. In addition, the student gains insight and skills in modern analysis (genomics, proteomics, single cell/single molecule spectroscopy) and recombinant DNA/PCR technologies. A thorough understanding of bioinformatics is essential in view of the complexity and enormity of the data sets that are generated.

Living Matter, track co-ordinator: Dr Edgar M. Blokhuis

Researching cell structure and function. The identification of molecular structures and mechanisms, and research of the physical principles underlying cellular organisation. This is the most fundamental track, literally focused on the 'Science of Life'. Understanding living processes in terms of models, rules, laws and theories. Currently, a fundamental, theoretical description of the majority of biological processes is unknown. In order to arrive at a meaningful understanding of nature, it is important to discover regularities or laws in nature. This approach is evident in Systems Biology, where biological processes are described in model form without knowledge of the underlying theory. Graduates of the Living Matter track will have accumulated in-depth knowledge stretching from physics and chemistry, through mathematics and informatics, to molecular biology. Whilst mathematical skills are important for a quantitative description, the emphasis in these modules lies more on the application of mathematical rules rather than on their precise definition. The interdisciplinary nature of the Living Matter track means that both theoretical and experimental internship positions are possible in both the University of Leiden and TU Delft within a large number of research groups, particularly in chemistry, biochemistry, biophysics, theoretical biology, mathematics and informatics.

1.2.2 THE COMPONENTS OF THE PROGRAMME ARE:

I. For the chosen track:

- A. Compulsory track courses (24 ECTS)
- B. Master's Thesis research project (45 ECTS)

II. For all LS&T MSc students:

- A. Compulsory general modules: Design project (11 ECTS), Industrial Internship (13 – 18 ECTS), Ethics & Technology (6 ECTS), Literature course (4 ECTS)
- B. Electives (12 – 17 ECTS)

I.A: These courses are the core of the track programme. In most tracks, there is a limited choice.

I.B: This Master's Thesis project is the main part (32 weeks) of the programme in your track. In addition to practical work, it includes a requirement to complete reports (written and oral) on the practical work. You can make

a choice from the different research groups according to the chosen track in Leiden or Delft (or outside these universities). This choice must be discussed with your track co-coordinator.

II.A: These modules are for all LS&T MSc students. The Design project and the Ethics & Technology module are provided by TU Delft. The Literature course concludes with an oral report and takes place under the supervision of one of the teaching professors. Information about the Industrial Internship (2 – 3 months) can be obtained from the internship co-coordinator.

II.B: Electives can be chosen from courses in other tracks, but in principle, all kinds of Master's courses are allowed with the agreement of your track co-coordinator. For further information about the different courses, modules and projects see the more detailed descriptions in this booklet.

The design of the timetable makes it possible for you to take all your trackcourses, the Design project, the Ethics & Technology course, and most of your electives in the first year of the MSc programme. The Internship, Research project, and Literature course can be completed in the second year.

1.2.3 EXCEPTIONS & MODIFICATIONS TO THE PROGRAMME:

1: If Dutch students want to follow some parts of the programme in other Dutch universities or abroad, please contact the relevant track co-coordinator to discuss the possibilities.

2: In addition to one of the above-mentioned tracks, it is also possible to take special course modules from the Science Based Business (SBB) programme. These modules are provided by the faculty of Natural Science & Mathematics at Leiden University and prepare students for a career in science-related business and administration, and for innovation and enterprise from an LS&T perspective. There are two options:

- a. SBB Fundamentals (17 ECTS). You can take this module instead of your electives (17 ECTS).
- b. SBB Fundamentals (17 ECTS) + SBB Industrial Internship (23 ECTS). You can take these modules instead of your electives (17 ECTS) + the Industrial Internship (13 ECTS). The Master's Thesis project for your track will have a total of 35 ECTS, instead of 45 ECTS.

Detailed information about the SBB modules is available at <http://sbb.leidenuniv.nl>

2. List of course modules (*D = Delft, L = Leiden*)

2.1 COMPULSORY TRACK COURSES CELL FACTORY

Code	Title	ECTS
LM3431	Analysis of Metabolic Networks (d)	5
LM3441	Metabolic Reprogramming (d)	5
LM3451	Bioprocess Integration (d)	5

Choice

Cells as Factories

Code	Title	ECTS
LM3401	Metabolic Diversity (D)	3
LM3411	Industrial Genomics (D)	3
LM3491	Molecular Biotechnology (D)	3

Cells in Factories

Code	Title	ECTS
BE3131TU	Fermentation Technology (D)	3
BE3191TU	Bioseparations (D)	3
BE3151TU	Bioconversion Technology (D)	3

2.2 COMPULSORY TRACK COURSE CELL DIAGNOSTICS

Code	Title	ECTS
LM3031	Bioinformatics 3 (D)	4
LM3011	Metals in biology and medicine (D)	3
LM3461	Microbiology of man, animal, food and environment (D)	3
LM3471	Modern drug development technology (D)	3
LM3482	Advanced bioinformatics (D)	4
LM3541	Proteomics, Capita Selecta (D)	3
*NS3511	Biophysics (D) *	6

* Instead of NS3511, LM3431 from the CF track may be taken

2.3 COMPULSORY TRACK COURSE FUNCTIONAL GENOMICS

Code	Title	ECTS
LM3021	Bioinformatics 2 (L)	4
LM3031	Bioinformatics 3 (D)	4
LM3131	Transcriptome & Proteome analysis (L)	5
LM3051	Biophysical structure determination (L)	6
LM3061	Gene expression (L)	5

2.4 COMPULSORY TRACK COURSES LIVING MATTER

(choice of 24 ects, LM3092 is compulsory)

Code	Title	ECTS
LM3511	Systems biology (D)	6
LM3521	Dynamic energy budgets (D)	4
LM3092	Mathematical modelling in development and evolutionary biology (L)	6
LM3021	Bioinformatics 2 (L)	4
LM3031	Bioinformatics 3 (D)	4
LM3051	Biophysical structure determination (L)	6

2.5 LM3901 MASTER'S THESIS PROJECT

(compulsory for all students in the chosen profile): 45 ects **

2.6 GENERAL COMPULSARY MODULES

Code	Title	ECTS
WM0329	Ethics & Technology (D)	6
LM3811	Literature study	4
LM3801	Industrial internship	13 -18*
LM3821	Design project (D)	11

2.7 ELECTIVES: 12 - 17 ECTS*

(depending on the total for the Industrial Internship, see 2.6) Electives can be chosen from courses in other tracks, but in principle all kinds of Master's courses are allowed with agreement from your track co-ordinator.

** If LM3841 is chosen, LM3901 has an extent of 35 ects (LM3911) and LM3801 is not required see also page 9

2.8 SCIENCE BASED BUSINESS MODULES

Code	Title	ECTS
LM3831	SBB Fundamentals	17
LM3841	SBB Industrial Internship **	23

** If LM3841 is chosen, LM3901 has an extent of 35 ects (LM3911) and LM3801 is not required see also page 9

General rules for the Master's programme

(see also www.lst.leidendelft.nl for the detailed Course and Examination regulations).

1. The admission requirements for the LS&T Master's programme are:
 - a. Students with a Bachelor's degree in LS&T are admissible unconditionally.
 - b. Bachelor's students in LS&T who have not fully completed their BSc programme (no more than approximately 15 ECTS below requirement), are admissible to MSc exams ('tentamens') when they have finished their Bachelor's research project and the compulsory courses from the third year's programme.
 - c. Students with other diplomas (other Dutch BSc degrees, HBO (professional education) diplomas, foreign diplomas) are admissible under certain conditions. An admissions committee compares the programme followed by the applicant, with a number of central subjects from the Bachelor's programme in LS&T in order to determine under which conditions the applicant may be admissible. For more details concerning the admissions for the LS&T MSc programme: see www.lst.leidendelft.nl.
2. In general, during the Master's programme, the planning and content of the programme for the most part depends on the initiative and interests of the student. The track subjects, the Ethics & Technology course, and the Design project will be included in the yearly schedule. The planning of the other parts varies for each student. Therefore, it is important to start to think about this planning early on and to acquaint yourself with the possibilities/impossibilities.
3. To choose the desired track, and to find out more about the content of the programme, you need to make an appointment with the relevant track co-coordinator in order to discuss matters and to have your programme approved. This is particularly important for the Master's Thesis research

project; the choice of optional subjects; when following parts of the programme at another university or abroad, etc. It is advisable to think about your choices beforehand and to gather sufficient information. For this, you can turn to the track co-coordinators, the internship co-coordinator and/or lecturers in the field of study in which you are interested. If you have made your choices and have made (tentative) arrangements with your track co-coordinator with respect to the organisation of your programme, you must complete this information on the relevant form for the Master's programme, which can be obtained from Education and Student Administration TNW. e-mail: osa@tnw.tudelft.nl or tel: 015 2789826. The form can also be downloaded from Blackboard Delft (community > Master LS&T > documents > forms). All further decisions that are made during the Master's programme have to be completed on the form and undersigned by the people concerned (see the form). After every change, the form has to be returned to Education and Student Administration.

4. Departures from and variations to the regular Master's programme must always be submitted in the first instance to the track co-coordinator for approval. If need be, the approval of the examination committee may also be required. This also holds for internships or research projects abroad.
5. For participation in the track subjects (LS&T courses), the Ethics and Technology course and the Design project, timely application is always obligatory. For participation in these subjects, you have to subscribe to the course in question via Blackboard for the course concerned. For details about how to apply for a course, see the Course Descriptions section in this handbook. For examinations and re-examinations, you must apply via the Examination Application System - Tentamen Aanmeld Systeem (TAS) - of the TNW faculty, TU Delft. For questions and information about TAS, contact Education and Student Administration TNW, e-mail: osa@tnw.tudelft.nl or tel: 015 2789826.
6. For participation in subjects (courses), examinations and re-examinations that are taken in the optional subject areas and not in LST track courses, the rules of the faculties offering these subjects apply.
7. The content of the Master's Thesis project strongly depends on your own interests and abilities. Gather sufficient information from the sections and lecturers in the field of study in which you are interested and consult with

your track co-coordinator for approval. The internship co-coordinator can also provide you with additional information. For up-to-date offers look at Blackboard Delft > community > Stagebureau TNW. The grading of the Master's Thesis project is done by and/or under the supervision of the head (leader) of the group/section, etc. where the research is performed. In consultation with the first reviewer, the student chooses a second reviewer. A copy of the research report must be handed to the internship co-coordinator.

8. To arrange an Industrial Internship, it is advisable to contact the internship co-coordinator well before the desired start date (see the relevant chapter in this booklet). She has at her disposal a limited, but ever-growing, network of contacts with companies that may be considered and she can help you make contacts. The final placement requires the approval of the track co-coordinator.
9. For the Colloquium (Literature course), every Master's student must complete a Literature course and give a presentation on it of about 35 minutes, followed by a discussion with the audience. The subject matter and the relevant literature are determined on the initiative of the student in consultation with a lecturer from the relevant field of study. It is recommended that this part of the study is completed in the last phase of the Master's programme. For a more detailed description, see the part of this booklet concerning the Colloquium.
10. Master's graduation. The Board of Examiners convenes three times yearly to decide formally which students have passed their Master's degree. All students who have registered themselves as ready to receive their degree will be assessed in one of these sessions.
 - Students must register at Education and Student Administration TNW, in writing (by means of a form available from Blackboard Delft > community > TNW student adm. > documents > exam application forms), at least a month before the respective session of the Board of Examiners (graduation date).
 - The completed Form for the Master's programme (see 3) must be handed in at least two weeks before the graduation date.
 - Certificates that prove a student has passed the required examinations must be submitted to Student Administration at the latest a week before the expected graduation date.

The Board of Examiners determines the level of the degree (e.g. pass, cum laude, etc.) based on the requirements of the Rules and Regulations of the Board. Besides a Master's diploma in Life Science & Technology, an additional diploma supplement will be given to the candidates who have passed. The diploma supplement includes the results (marks) for all the parts of the Master's programme, the final attainment levels of the programme, and the competencies of the candidates, as well as a description of the Dutch Education system. It also states that a Master in Life Science & Technology is entitled to bear the title of Engineer ("Ingenieur").

Graduation dates 2007-2008:

- **18 September 2007 (Delft)**
- **12 February 2008 (Leiden)**
- **24 June 2008 (Delft)**

Graduation for International students:

- **Second half of August 2008 (Delft)**

Timetables 2007-2008

INTRODUCTION & GENERAL REMARKS

In the timetable, the year (3 September – to the beginning of July) is divided into 4 periods.

First period: 3 September – 2 November

Second period: 5 November – 1 February (week 52 and week 1: Christmas Holiday)

Third period: 4 February – 4 April (except 21 March: Good Friday, 24 March: Easter Monday)

Fourth period: 7 April – 27 June (except week 18: May Holiday, 5 May: Liberation Day and 12 May: Whit Monday)

Re-examinations can be scheduled in the first two weeks of July and the last weeks of August.

Table of teaching periods as used in the course descriptions and timetable

	Delft	Leiden
1/2 hr	8.45 – 10.30	9.00 – 10.45
3/4 hr	10.45 – 12.30	11.00 – 12.45
5/6 hr	13.45 – 15.30	13.30 – 15.15
7/8 hr	15.45 – 17.30	15.30 – 17.15

Track courses:

Some of the courses are scheduled with lectures once or twice a week during one or two periods ("lecture courses"), other courses are scheduled as a continuous unit for 2 or 3 weeks ("block courses"). It is inevitable that these two types of course will clash at certain points on the timetable, but on the whole this will not be a problem because there are a limited number of compulsory lectures in the "block courses". Most of the time allocated during a "block course" will be self-study and you can plan your own schedule.

Ethics & Technology is offered twice a year, in the first and third periods. You will find the dates in the course description.

Furthermore, you can participate in the Design project which is offered twice a year in the second and fourth periods. See the course description for details.

The timetable is set up in such a way that, during one year (preferably the first year of your MSc), you can schedule the following parts of your study:

1. All your compulsory courses for the chosen track (24 ECTS)
2. Ethics & Technology (6 ECTS) in the first or third period
3. Design project (11 ECTS) in the second or fourth period
4. Some of the courses from other tracks (approx. 15 ECTS) as electives. While you are planning your programme, keep the following in mind:
 - a. Try to avoid clashes between "lecture courses" and "block courses" as much as possible. At some point, you will notice that clashes are inevitable.
 - b. You will also notice that during the Design project you will have to participate in one of your compulsory courses or electives. Do not plan any other courses in that period, as you will need all the available time.

In the second year, you can complete your MSc study with the Master's Thesis Research project (45 ECTS, 32 weeks) and the Company Internship (13- 18 ECTS, 2 – 3 months). During your Research project, you can find time to do your Literature course (4 ECTS).

Examinations: The way assessments or examinations are held at the conclusion of a programme will vary for the different courses. In general, for "lecture courses", there will be a written exam in the last two or three weeks of the final period of the course. "Block courses" will mostly conclude with an oral presentation on the last day of the "block" and a written report or an essay to be delivered on the last day of the "block", or shortly thereafter. See the course descriptions, or contact the lecturer for details.

Timetable 2007-2008 MSc LS&T

1st period

week nr	Date Monday	Mon 1/2	3/4	5/6	7/8	Tue 1/2	3/4	5/6	7/8	Wed 1/2	3/4	5/6	7/8	Thu 1/2	3/4	5/6	7/8	Fri 1/2	3/4	5/6	7/8	
36	3-Sep		MD caf	ET ap	ET ap	AMNcf	ET ap	AMNcf	ET ap	FT of	BS of	MMA cd		BSD fg&lm	B12 fg&lm	BPh cd		B12 fg&lm	BSD fg&lm			
37	10-Sep		MD caf	ET ap	ET ap	AMNcf	ET ap	AMNcf	ET ap	FT of	BS of	MMA cd		BSD fg&lm	B12 fg&lm	BPh cd		B12 fg&lm	BSD fg&lm			
38	17-Sep		MD caf	ET ap	ET ap	AMNcf	ET ap	AMNcf	ET ap	FT of	BS of	MMA cd		BSD fg&lm	B12 fg&lm	BPh cd		B12 fg&lm	BSD fg&lm			
39	24-Sep		MD caf	ET ap	ET ap	AMNcf	ET ap	AMNcf	ET ap	FT of	BS of	MMA cd		BSD fg&lm	B12 fg&lm	BPh cd		B12 fg&lm	BSD fg&lm			
40	1-Oct		MD caf	ET ap	ET ap	AMNcf	ET ap	AMNcf	ET ap	FT of	BS of	MMA cd		BSD fg&lm	B12 fg&lm	BPh cd		B12 fg&lm	BSD fg&lm			
41	8-Oct		MD caf	ET ap	ET ap	AMNcf	ET ap	AMNcf	ET ap	FT of	BS of	MMA cd		BSD fg&lm	B12 fg&lm	BPh cd		B12 fg&lm	BSD fg&lm			
42	15-Oct		MD caf	ET ap	ET ap	AMNcf	ET ap	AMNcf	ET ap	FT of	BS of	MMA cd		BSD fg&lm	B12 fg&lm	BPh cd		B12 fg&lm	BSD fg&lm			
43	22-Oct																					
44	29-Oct																					written exam B12

MMA: Microbiology of man, animal, food & environment, LM3461, Delft

MD: Metabolic Diversity, LM3401, Delft

ET: Ethics & Technology, WM3029, Delft

AMN: Analysis of Metab. Networks, LM3431, Delft

FT: Fermentation Technology, BE3131TU, Delft

BS: Bioseparations, BE3191TU, Delft

B12: Biophysical Structure Determination, LM3051, Leiden

BPh: Bioinformatics2, LM3021, Leiden

BSD: Biophysics, NS3511, Delft

If you want to include the SBB-fundamentals module, LM3831, in your programme, take into account that it's a full-time course from week 36 - week 47; for details see www.sbb.leidenuniv.nl

cf,(cf,caf),cd,fg,lm: compulsory course for profile (or variation) Cell Factory, (Cells in factories, Cells as factories), CellDiagnostics, Functional Genomics, Living Matter.

ap: compulsory course for all profiles (= all MSc LS&T students).

For more details about the courses (application, contents etc.): see Course Descriptions in this guide.

Timetable 2007-2008 MSc LS&T

2nd period

week nr	Date Monday	Mon 1/2	3/4	7/8	Tue 1/2	3/4	5/6	7/8	Wed 1/2	3/4	5/6	7/8	Thu 1/2	3/4	5/6	7/8	Fri 1/2	3/4	5/6	7/8
45	5-Nov		AMNcf	MMA cd				FT cif	BS cif	BS cif				MD caf	BPh cd			BSD fg&lm		
46	12-Nov	MBM cd	AMNcf	MMA cd	MBM cd			FT cif	BS cif	BS cif	MBM cd		MBM cd	MD caf MBMcd	BPh cd			BSD fg&lm	MBM cd	
47	19-Nov	MBM cd	AMNcf	MMA cd	MBM cd			FT cif	BS cif	BS cif	MBM cd		MBM cd	MD caf MBMcd	BPh cd			BSD fg&lm	MBM cd	
48	26-Nov		AMNcf	MMA cd				FT cif	BS cif	BS cif				MD caf	BPh cd			BSD fg&lm		
49	3-Dec		AMNcf	MMA cd				FT cif	BS cif	BS cif				MD caf	BPh cd			BSD fg&lm		
50	10-Dec		AMNcf	MMA cd				FT cif	BS cif	BS cif				MD caf	BPh cd			BSD fg&lm		
51	17-Dec		AMNcf	MMA cd				FT cif	BS cif	BS cif				MD caf	BPh cd			BSD fg&lm		
52	24-Dec		Christmas holiday		Christmas holiday			Christmas holiday			Christmas holiday		Christmas holiday	Christmas holiday				Christmas holiday		
1	31-Dec		Christmas holiday		Christmas holiday			Christmas holiday			Christmas holiday		Christmas holiday	Christmas holiday				Christmas holiday		
2	7-Jan													Exam AMN						
3	14-Jan										Exam FT							Presentations MD		
4	21-Jan							Exam BS										Presentations MMA		
5	28-Jan				Exam BSD														Exam BPh	

MBM: Metals in biology and medicine, LM3001, Delft

MMA: Microbiology of man, animal, food & environment, LM3461,

DelftMD: Metabolic Diversity, LM3401, Delft

AMN: Analysis of Metab. Networks, LM3431, Delft

FT: Fermentation Technology, BE3131TU, Delft

BS: Bioseparations, BE3191TU, Delft

BSD: Biophysical Structure Determination, LM3051, Leiden

BPh: Biophysics, NS3511, Delft

If you want to attend the Design project LM3821 in the 2nd period, take into account that it is scheduled as a full-time course from week 48 - week 5; for details see the course description in this handbook.

Mathematical Modelling in development & evolutionary biology, LM3092 (1m course in Leiden and not included in the above schedule), is in week 48-51. The schedule of activities is made i.c.w. the lecturer. See also the course description

cf,(cif,caf),cd,fg,lm: compulsory course for profile (or variation) Cell Factory, (Cells in factories, Cells as factories), Cell Diagnostics, Functional Genomics, Living Matter.

ap: compulsory course for all profiles (= all MSc LS&T students).

For more details about the courses (application, contents etc.): see Course Descriptions in this guide.

Timetable 2007-2008 MSc LS&T

3rd period

week nr	Date Monday	Mon 1/2	3/4	5/6	7/8	Tue 1/2	3/4	5/6	7/8	Wed 1/2	3/4	5/6	7/8	Tue 1/2	3/4	5/6	7/8	Fri 1/2	3/4	5/6	7/8
6	4-Feb		B13 fg&lm	ET ap	ET ap	PCS cd	ET ap	B13 fg&lm	ET ap	SB lm	SB lm	PCS cd	PCS cd	BCT cif	BPI cf	ABI cd	ABI cd	BCT cif	BPI cf		
7	11-Feb		B13 fg&lm	ET ap	ET ap	PCS cd	ET ap	B13 fg&lm	ET ap	SB lm	SB lm	PCS cd	PCS cd	BCT cif	BPI cf	ABI cd	ABI cd	BCT cif	BPI cf		
8	18-Feb		B13 fg&lm	ET ap	ET ap	PCS cd	ET ap	B13 fg&lm	ET ap	SB lm	SB lm	PCS cd	PCS cd	BCT cif	BPI cf	ABI cd	ABI cd	BCT cif	BPI cf		
9	25-Feb		B13 fg&lm	ET ap	ET ap	PCS cd	ET ap	B13 fg&lm	ET ap	SB lm	SB lm	PCS cd	PCS cd	BCT cif	BPI cf	ABI cd	ABI cd	BCT cif	BPI cf		
10	3-Mar		B13 fg&lm	ET ap	ET ap	PCS cd	ET ap	B13 fg&lm	ET ap	SB lm	SB lm	PCS cd	PCS cd	BCT cif	BPI cf	ABI cd	ABI cd	BCT cif	BPI cf		
11	10-Mar		B13 fg&lm	ET ap	ET ap	PCS cd	ET ap	B13 fg&lm	ET ap	SB lm	SB lm	PCS cd	PCS cd	BCT cif	BPI cf	ABI cd	ABI cd	BCT cif	BPI cf		
12	17-Mar		B13 fg&lm	ET ap	ET ap	PCS cd	ET ap	B13 fg&lm	ET ap	SB lm	SB lm	PCS cd	PCS cd	BCT cif	BPI cf	ABI cd	ABI cd	BCT cif	BPI cf		
13	24-Mar		Easter Monday					Exam B13								Exam PCS					
14	31-Mar					Exam ABI															Exam BPI

If you want to include the SB8-fundamentals module, LM3831, in your programme, take into account that it's a full-time course from week 6- week 17; for details see www.sbb.leidenuniv.nl

cf(cif,caf),cd,fg,lm: compulsory course for profile (or variation) Cell Factory, (Cells in factories, Cells as factories), Cell Diagnostics, Functional Genomics, Living Matter.

ap: compulsory course for all profiles (= all MSc LS&T students).

For more details about the courses (application, contents etc.) see Course Descriptions in this guide.

Timetable 2007-2008 MSc LS&T

4th period

week nr	Date Monday	Mon 1/2	3/4	5/6	7/8	Tue 1/2	3/4	5/6	7/8	Wed 1/2	3/4	5/6	7/8	Thu 1/2	3/4	5/6	7/8	Fri 1/2	3/4	5/6	7/8	
15	7-Apr			SB Im	SB Im	GE fg	GE fg	GE fg	GE fg	IG caf	MB caf	GE fg	GE fg	IG caf	MR cf	MR cf		GE fg	GE fg	GE fg	GE fg	
16	14-Apr			SB Im	SB Im	GE fg	GE fg	GE fg	GE fg	IG caf	MB caf	GE fg	GE fg	IG caf	MR cf	MR cf		GE fg	GE fg	GE fg	GE fg	
17	21-Apr			SB Im	SB Im	GE fg	GE fg	GE fg	GE fg	IG caf	MB caf	GE fg	GE fg	IG caf	MR cf	MR cf		GE fg	GE fg	GE fg	GE fg	
18	28-Apr	May holiday																				
19	5-May	Liberation Day																				
20	12-May	Whit Monday																				
21	19-May			MR cf SB Im	SB Im	MDD cd	MDD cd	MDD cd	MDD cd	IG caf	MB caf	IG caf	MDD cd	IG caf	MR cf	MR cf		MDD cd	MDD cd	MDD cd	MDD cd	
22	26-May			MR cf SB Im	SB Im	TPA fg	TPA fg	TPA fg	TPA fg	IG caf	MB caf	IG caf	TPA fg	IG caf	MR cf	MR cf		TPA fg	TPA fg	TPA fg	TPA fg	
23	2-Jun			SB Im	SB Im	TPA fg	TPA fg	TPA fg	TPA fg	TPA fg	TPA fg	TPA fg	TPA fg	TPA fg	TPA fg	TPA fg	TPA fg	TPA fg	TPA fg	TPA fg	TPA fg	
24	9-Jun																					
25	16-Jun																					
26	23-Jun																					

SB: Systems Biology, LM3511, Delft

IG: Industrial Genomics, LM3411, Delft

MR: Metabolic Reprogramming, LM3441, Delft

MB: Molecular Biotechnology, LM3491, Delft

GE: Gene Expression, LM3061, Leiden

MDD: Modern Drug Development, LM3471, Delft

TPA: Transcriptome & Proteome Analysis, LM3131, Leiden

If you want to attend the Design project LM3821 in the 4th period, take into account that it's scheduled as a full-time course from 19 - week 26; for details see the course description in this handbook.

Dynamic Energy Budgets, LM3521, (im course in Leiden and not included in the above schedule!), will take place in the 4th period. The schedule of activities i.c.w. the lecturer. See also the course description

ap: compulsory course for all profiles (= all MSc LS&T students).

cf,(cf,caf),cd,fg,lm: compulsory course for profile (or variation) Cell Factory, (Cells in factories, Cells as factories), Cell Diagnostics, Functional Genomics, Living Matter.

For more details about the courses (application, contents etc.); see Course Descriptions in this guide.

Timetable 2007-2008 MSc LS&T

Summer period/re-examinations

week nr	Date Monday	Mon 1/2	3/4	5/6	7/8	Tue 1/2	3/4	5/6	7/8	Wed 1/2	3/4	5/6	7/8	Thu 1/2	3/4	5/6	7/8	Fri 1/2	3/4	5/6	7/8	
27	30-Jun	reserved for re-examinations 1st and 2nd period i.c.w. the lecturer	reserved for re-examinations 1st and 2nd period i.c.w. the lecturer	reserved for re-examinations 1st and 2nd period i.c.w. the lecturer	reserved for re-examinations 1st and 2nd period i.c.w. the lecturer	reserved for re-examinations 1st and 2nd period i.c.w. the lecturer	reserved for re-examinations 1st and 2nd period i.c.w. the lecturer	reserved for re-examinations 1st and 2nd period i.c.w. the lecturer	reserved for re-examinations 1st and 2nd period i.c.w. the lecturer	reserved for re-examinations 1st and 2nd period i.c.w. the lecturer	reserved for re-examinations 1st and 2nd period i.c.w. the lecturer	reserved for re-examinations 1st and 2nd period i.c.w. the lecturer	reserved for re-examinations 1st and 2nd period i.c.w. the lecturer	reserved for re-examinations 1st and 2nd period i.c.w. the lecturer	reserved for re-examinations 1st and 2nd period i.c.w. the lecturer	reserved for re-examinations 1st and 2nd period i.c.w. the lecturer	reserved for re-examinations 1st and 2nd period i.c.w. the lecturer	reserved for re-examinations 1st and 2nd period i.c.w. the lecturer	reserved for re-examinations 1st and 2nd period i.c.w. the lecturer	reserved for re-examinations 1st and 2nd period i.c.w. the lecturer	reserved for re-examinations 1st and 2nd period i.c.w. the lecturer	reserved for re-examinations 1st and 2nd period i.c.w. the lecturer
28	7-Jul																					
29	14-Jul																					
30	21-Jul																					
31	28-Jul																					
32	4-Aug																					
33	11-Aug																					
34	18-Aug																					
35	25-Aug	reserved for re-examinations 3rd and 4th period i.c.w. the lecturer	reserved for re-examinations 3rd and 4th period i.c.w. the lecturer	reserved for re-examinations 3rd and 4th period i.c.w. the lecturer	reserved for re-examinations 3rd and 4th period i.c.w. the lecturer	reserved for re-examinations 3rd and 4th period i.c.w. the lecturer	reserved for re-examinations 3rd and 4th period i.c.w. the lecturer	reserved for re-examinations 3rd and 4th period i.c.w. the lecturer	reserved for re-examinations 3rd and 4th period i.c.w. the lecturer	reserved for re-examinations 3rd and 4th period i.c.w. the lecturer	reserved for re-examinations 3rd and 4th period i.c.w. the lecturer	reserved for re-examinations 3rd and 4th period i.c.w. the lecturer	reserved for re-examinations 3rd and 4th period i.c.w. the lecturer	reserved for re-examinations 3rd and 4th period i.c.w. the lecturer	reserved for re-examinations 3rd and 4th period i.c.w. the lecturer	reserved for re-examinations 3rd and 4th period i.c.w. the lecturer	reserved for re-examinations 3rd and 4th period i.c.w. the lecturer	reserved for re-examinations 3rd and 4th period i.c.w. the lecturer	reserved for re-examinations 3rd and 4th period i.c.w. the lecturer	reserved for re-examinations 3rd and 4th period i.c.w. the lecturer	reserved for re-examinations 3rd and 4th period i.c.w. the lecturer	reserved for re-examinations 3rd and 4th period i.c.w. the lecturer

Contacts

Director of Education

Prof. Mathieu Noteborn
Gorlaeus Laboratoria
Room L 020
Einsteinweg 55
2300 RA Leiden
E-mail: M.Noteborn@chem.leidenuniv.nl
Tel: 071 527 4544

Secretariat LST

Kluyver Laboratorium
Julianalaan 67
2628 BC Delft
Room 0.360Tel: 015 27 88271
Fax: 015 27 82355
Or
Gorlaeus Laboratoria
Einsteinweg 55
2300 RA Leiden
Room LCP069
Tel: 071 527 6991
E-mail secretariat: LST@tnw.tudelft.nl

Academic Counsellor

(appointments via the secretariat)
Mirjam van der Geur
E-mail: M.vanderGeur@tudelft.nl

Leiden

Gorlaeus Laboratoria
Einsteinweg 55
2300 RA Leiden
Room: LCP 68
Tel: 071 527 46 34

Delft

Kluyver Laboratoria
Julianalaan 67
2628 BC Delft
Room: 0.360
Tel: 015 27 88718

Programme co-coordinator

Dick Fabery de Jonge
E-mail: D.P.Faberydejonge@tudelft.nl

Leiden

Gorlaeus Laboratories
Einsteinweg 55
2300 RA Leiden
Room: LCP 69
Tel: 071 527 6991

Delft

Kluyver Laboratory
Julianalaan 67
2628 BC Delft
Room: 0.360
Tel: 015 27 82413

Profile co-ordinators

Cell Factory: Prof. J.T. Pronk
Kluyver Laboratory
Julianalaan 67
2628 BC Delft
Room: 1.080
Tel: 015 27 83214
E-mail: J.T.Pronk@tnw.tudelft.nl

Cell Diagnostics: Prof. S. de Vries
Kluyver Laboratory
Julianalaan 67
2628 BC Delft
Room: k640
Tel: 015 27 85139
E-mail: S.deVries@tnw.tudelft.nl

Functional Genomics: Prof. J.Brouwer
Gorlaeus Laboratories,
Einsteinweg 55
2300 RA Leiden
Room: HB219
Tel: 071 527 4755
E-mail: brouwer@chem.leidenuniv.nl

Living Matter: Dr. E.M. Blokhuis
Gorlaeus Laboratories,
Einsteinweg 55
2300 RA Leiden
Room: HB339
Tel: 071 527 4542
E-mail: edgar@chemfcb.leidenuniv.nl

Internship Co-ordinator

Stephanie Hessing
Lorentzweg 1
2628 CJ Delft
Room A210
Tel: 015 27 87495
E-mail: stagebureau-tnw@tnw.tudelft.nl

Education and Student Affairs Faculty TNW

Grade registration for all LS&T students, TAS and enrolment examinations

Correspondence address:

Jaffalaan 9a
2628 BX Delft

Visitors' address:

Service Desk
Lorentzweg 1, head entrance, reception desk

or

Jaffalaan 9a (entrance at Mekelweg)

Tel: 015 27 89826

E-mail: osa.tnw@tudelft.nl

Ordering study materials

TU Delft has decided to make it possible for students to order readers through the Internet. The immediate advantage of this is that you can order your study materials at any time and from anywhere in the world and that the materials will be delivered to the address specified by you as soon as you have paid the order amount. It is also possible to pick up your order at the campus.

Readers can be ordered online through Blackboard (blackboard.tudelft.nl). For access to Blackboard, you will need the NetID and password you received when you enrolled at TU Delft.

LST staff telephone numbers and E-mail addresses

Abrahams, Prof. J.P.	071 527 42 3 Abrahams@chem.leidenuniv.nl
Blokhuis, Dr. E.M.	071 527 4552 e.blokhuis@chem.leidenuniv.nl
Brouwer, prof. dr. J.	071 527 4755/ 527 4557 brouwer@chem.leidenuniv.nl
Daran, Dr. J.M.	015 27 82412 j.m.daran@tudelft.nl

Daran-Lapujade, Dr. P.	015 27 82410 P.A.S.Daran-Lapujade@tudelft.nl
Degenaaars, drs. G.H.	071 527 4354 degenaaars@sbb.leidenuniv.nl
Dekker, Dr. N.H.	015 27 83219 N.H.Dekker@tudelft.nl
Fabery de Jonge, Drs. D.P.	015 27 82413/ 071 527 6991 d.p.faberydejonge@tudelft.nl
Geur, Ms. M. van der	015 27 88718/ 071 527 4634 m.vandergeur@tudelft.nl
Gulyaev, Dr. A.P.	071 527 4432 gulyaev@rulsfb.leidenuniv.nl
Hasselt, G.J. van	015 27 82388 g.j.vanhasselt@tudelft.nl
Heijnen, Prof. J.J.	015 27 82341 j.j.heijnen@tudelft.nl
Hessing, S.J.	015 27 87495 S.J.Hessing@tudelft.nl
Jongejan, Dr. J.A.	015 27 82371 j.a.jongejan@tudelft.nl
Jousma, Dr. H.	071 527 4424 jousma@sbb.leidenuniv.nl
Kiers, J.A.	015 27 86654 j.a.kiers@tudelft.nl
Koper, Dr. G.J.M.	015 27 88218 g.j.m.koper@tudelft.nl
Kuil, Dr. M.E	071 527 4237 m.kuil@chem.leidenuniv.nl
Metz, Prof. J.A.J.	071 527 4937 metz@rulsfb.leidenuniv.nl
Muyzer, Prof. G.	015 27 81193 g.muyzer@tudelft.nl
Noteborn, Prof. M.H.M.	071 527 45 44 m.noteborn@chem.leidenuniv.nl
Pronk, Prof. J.T.	015 27 83214

Reinders, Dr. M.J.T.	j.t.pronk@tudelft.nl 015 27 86424 m.j.t.reinders@ewi.tudelft.nl
Sheldon, Prof. R.A.	015 27 82627 r.a.sheldon@tnw.tudelft.nl
Straathof, Dr. A.J.J.	015 27 82330 a.j.j.straathof@tnw.tudelft.nl
Verhaert, Prof. P.D.E.	015 27 82332 p.d.e.verhaert@tudelft.nl
Vries, Prof. S. de	015 27 85139 s.devries@tnw.tudelft.nl
Wessels, Dr. L.F.A.	015 27 85114 l.f.a.wessels@ewi.tnw.tudelft.nl
Wielen, Prof. L.A.M. van der	015 27 82361 l.a.m.vanderwielen@tnw.tudelft.nl
Winde, Prof. J.H. de	015 27 82412 j.h.dewinde@tnw.tudelft.nl
Zandvoort, dr. H.	015 27 81927 h.zandvoort@tbn.tudelft.nl

Addresses Leiden University

For all important information go to: <http://www.leidenuniv.nl> and choose 'onderwijs en studenten'.

Student centre Plexus

Kaiserstraat 25

Office hours: Monday - Friday 09.00-17.00 hours

Tel: 071 527 8011

E-mail: informatiecentrum@ics.leidenuniv.nl

Website: www.leidenuniv.nl/ics/sz

Addresses TU Delft

For all important information go to: <http://www.tudelft.nl>

Central student administration

Central Student Administration (CSA)

PO Box 5

2600 AA Delft

Tel: 015 27 84249

E-mail: msc2@tudelft.nl

Website: www.csa.tudelft.nl

Office hours: 8:30-17:00

International Office

Jaffalaan 9A

2628 BX Delft

Visitors' entrance at the Mekelweg

Tel: +31(0)15 27 88012

E-mail: msc2@tudelft.nl

Website: www.studyat.tudelft.nl

Course descriptions

GENERAL COURSES

LM3801	Work Placement (Internship) (13-18 ECTS)	ECTS: 13
Education Period	None (Self Study)	
Course Language	English	
Course Contents	<p>You will be working full-time in an (industrial) organization. Your project should have a 'hands-on' character and it's necessary you'll need your LST-knowledge to make this project a success.</p> <p>During the work placement you're also expected to go further into the organization itself. Prior to the internship, you are expected to start gathering information about the company of your choice and to make a list of questions you'd like to be answered. During the internship you should find the time to take a look at other places within the company and interview, for example, a number of people in different parts of the organization.</p>	
Study Goals	<p>The aim of the Masters Industrial Internship is to work in a LST-related organisation (non-academic !!) for 9-13 weeks. The internship is a 'learn and explore' kind of internship, to make sure you acquire skills different from the ones taught at university.</p> <p>There are three goals of the Master internship:</p> <ol style="list-style-type: none">1. Industrial orientation<ul style="list-style-type: none">- To increase your understanding of employment options after graduation- To get a better perception of your tasks and responsibilities within a professional environment2. Social-psychologic<ul style="list-style-type: none">- To learn a different way of behaviour, suitable for a different environment- To obtain a better view of the position of a company compared to other companies (competition, achievements)3. Academical skills<ul style="list-style-type: none">- To use the obtained knowledge and skills in an environment different from that of the university- To obtain, rapidly and effectively, new skills that are necessary to successfully accomplish the project	
Education Method	Practical training on the job	

Literature and Study Materials	<p>For more detailed information, available projects, contacts, procedures and forms look at:</p> <p>WWW.TNW.TUDELFT.NL/STAGEBUREAU</p> <p>BLACKBOARD > communities > TNW > stagebureau (enroll!!)</p> <p>To get in contact by email please use the following address: STAGEBUREAU-TNW@TUDELFT.NL</p>
Assessment	<p>2 reports:</p> <ul style="list-style-type: none"> - a (scientific) report using format and guidelines of the company - an evaluation report (for details see Stagebureau website) <p>Final mark will be given by your supervisor within the company (2/3) and a tutor within the university (1/3). Both marks will be evaluated by the internship office together with the evaluation report in a short meeting.</p>

LM3811 Colloquium		ECTS: 4
Education Period	None (Self Study)	
Course Language	English	
Course Contents	<p>The subject to be studied is chosen from a LST field of study by the student in consultation with a supervisor from that field. The subject is not allowed to be part of the field of study of the research project, but it may be related to it.</p> <p>The literature to be studied is determined in consultation with the lecturer. After studying the literature, the student gives a presentation, which in any case contains the following elements:</p> <ul style="list-style-type: none"> - Survey and summary of the literature studied (ca. 30 minutes) - Possible new research on the basis of the knowledge and insights acquired (ca. 10 minutes) - Discussion based on questions of listeners (fellow students, scientific staff, other persons interested) (ca. 15 minutes) <p>In order to satisfy all conditions for this part of the study, every Master students graduating in September 2007 and later must attend two presentations of fellow students.</p>	
Study Goals	<p>Acquiring knowledge of and insight in a Life Science & Technology theme (subject) by studying (recent) literature, presenting a clear summary of the contents of this literature, indicating possible new research on the basis of the knowledge and insights acquired and participating in a scientific discussion (as discussion leader and as listener) on the basis of the presentation.</p>	

Education Method	<>
Literature and Study Materials	<>
Assessment	<p>The assessment of the study and presentation will be made by the supervisor. The student is informed of this assessment as soon as possible after the presentation. The supervisor also offers the possibility to listening fellow students to have their attendance registered.</p> <p>The assessment of the presentation and the registration of attending students is handed in to the LS&T secretariat after the session. The secretariat takes care of processing the results via the Education administration TNW</p>

LM3821 Design ECTS: 11	
Responsible Instructor	Drs. J.A. Kiers(J.A.Kiers@tudelft.nl)
Education Period	2
	4
Course Language	English
Course Contents	<p>A characteristic element of an engineering education is training in design aspects. This implies integration of existing knowledge, exploration of new fields, making choices and relating the result to a range of constraints (economy, environment, society, safety, validation, quality assurance etc.). For LS&T, the design project can comprise a wide range of subjects: specific bioproducts (e.g. a pharmaceutical or food additive), a specific bioprocess (for fine or bulk chemicals, environmental), a methodology for design of a specific micro-organism or (diagnostic) equipment. Depending on the exact subject, a team of students from all LST-profiles will collaborate in a structured manner towards a complete design to be presented in a written report as well as oral. The team has to organize itself such that the 2 months are spend in the most efficient manner. There will be meetings with the coaches, at which progress is presented (progress meetings). It is foreseen that some projects will be performed in collaboration with an industrial partner.</p>
Study Goals	<>
Education Method	<>
Literature and Study Materials	<>
Assessment	<>

WM0329TU Ethics and Engineering		ECTS: 6
Contact Hours / Week x/x/x/x	56/0/0/0 of 0/0/56/0	
Education Period	1	
	2	
	3	
	4	
Course Language	English	
Course Contents	<p>In this course you will explore the ethical and social aspects and problems related to technology and to your future work as professional or manager in the design, development, management or control of technology. You will be introduced to and make exercises with a range of relevant aspects and concepts, including professional codes, (collective) reasoning, philosophical ethics, ethical aspects of technological risks, responsibility within organisations, responsible conduct of companies and the role of law, and game theory as a tool for analyzing ethical problems and solutions. You will analyse legal, political and organisational backgrounds to existing and emerging ethical and social problems of technology, and you will explore possibilities for resolving, diminishing or preventing these problems.</p>	
Study Goals	<p>After having completed the course you:</p> <ul style="list-style-type: none"> - can better recognise and analyse ethical and social aspects and problems inherent in technology and in the work of professionals and managers active in the design, development, management and control of technology. - have insight into how these ethical and social aspects and problems are related to legal, political and organisational backgrounds. - are able to explore and assess possibilities for solving or diminishing existing and emerging ethical and social problems that attach to technology and the work of professionals and managers. - are better prepared to perform your future work as a professional or manager in the design, development, production and control of technology in an ethical and socially responsible way. 	
Education Method	A series of about ten lectures and work sessions (also role playing) concluded with a written test; writing an essay in groups of five.	
Literature and Study Materials	Reader and exercise book "Ethics and Engineering" available at Nextprint	
Assessment	Written test and essay (50/50)	

TRACK COURSES CELL FACTORY

LM3431	Analysis of Metabolic Networks	ECTS: 5
Responsible Instructor	Prof.dr.ir. J.J. Heijnen(J.J.Heijnen@tudelft.nl)	
Contact Hours / Week x/x/x/x	14/14/0/0	
Education Period	1	
	2	
Course Language	English	
Course Contents	Quantitative approach to metabolic and regulatory networks in living cells, Stoichiometric and Kinetic modelling of product formation	
Study Goals	<>	
Education Method	Lectures	
Assessment	Optional examination date: January 10, 14 -17 hrs	
Location	Delft	

LM3441	Metabolic Reprogramming	ECTS: 5
Responsible Instructor	Dr. P.A.S. Daran-Lapujade(P.A.S.Daran-Lapujade@tudelft.nl)	
Contact Hours / Week x/x/x/x	0/0/0/14	
Education Period	4	
Course Language	English	
Course Contents	Application of genetic modification for the optimization of existing product-formation pathways in micro-organisms, introduction of new product formation pathways, physiological constraints on process optimization.	
Study Goals	<ol style="list-style-type: none">1. Teach fundamental aspects, possibilities, limitations & challenges in the rational optimization of microbial cells for industrial product formation.2. Teach students how to critically read scientific papers and discuss their contents with colleagues in a structured manner.	

Education Method	The Course is initiated with a single 'informal' lecture, in which the teachers introduce the subject and the challenges in this field of Life Science and Technology. After this, a collection of relevant scientific publications is handed out to the students participating in the Course. Each student participating in the Course prepares a critical (oral) presentation on one of these papers. Furthermore, all students read the complete set of publications, which allows them to participate in a plenary discussion (led by the teachers) on the papers. In addition to the scientific content, attention will be paid to key issues in presenting scientific publications (style, statistics, internal consistency, impact etc.).
Literature and Study Materials	A set of scientific publications will be provided by the teachers at the outset of the course.
Assessment	Students will be assessed based on their critical discussion of a scientific publication and, importantly, on their contribution to the discussion following presentations by their fellow students.
Location	Delft

LM3451	Bioprocess Integration	ECTS: 5
Responsible Instructor	Dr.ir. A.J.J. Straathof(A.J.J.Straathof@tudelft.nl)	
Contact Hours / Week	0/0/26/0 x/x/x/x	
Education Period	3	
Course Language	English	
Course Contents	How to approach the design of bioprocesses in an integrated fashion, how a realistic and practical bioprocess can be achieved starting from basic information, using the 'expert team' approach. An important aspect of this course is the fact that the students will be brought into contact with an actual industrial bioprocess.	
Study Goals	<>	
Education Method	<>	
Literature and Study Materials	<>	
Assessment	Optional examination date: april 4, 2008	
Location	Delft	

CHOICE CELLS AS FACTORIES

LM3411TU	Industrial Genomics	ECTS: 3
Responsible instructor	Prof.dr. J.H. de Winde (J.H.deWinde@tudelft.nl)	
Contact Hours / Week x/x/x/x	0/0/0/28	
Education period	4	
Course language	English	
Course Contents	Introduction into genomics technologies. Application of genomics technologies and functional genomics approaches in the set up and maintenance of modern biotechnological processes. Importance for the investigation and improvement of industrial cell factories. Target identification for metabolic engineering via classical and modern genomics approaches. Application of genomics in industrial strain and process improvement programs.	
Study goals	Obtain insight into the utility and application of genomics technologies in modern biotechnology.	
Education method	Interactive workshop format; introduction and short presentations, followed by and intermingled with round table discussions. Several assignments for self-study or study in small groups; presentation and discussion of results. Final assignment with report.	
Literature and Study Materials	Hand outs of presentations and explanations. Scientific literature to be distributed during the course.	
Assessment	Interactive and cooperative attitude, original contribution to intermediate assignments, handling of final assignment and quality of report.	
Location	Delft	

LM3491	Molecular Biotechnology	ECTS: 3
Responsible instructor	Dr. J.G. Daran (J.G.Daran@tudelft.nl)	
Contact Hours / Week x/x/x/x	0/0/0/14	
Education period	4	
Exam period	4	
Course language	English	
Expected prior knowledge	BSc Life Science and Technology, and especially the Courses Molecular Cell Biology I, II and III	

Course Contents	After a brief introduction to the topic and organization of the course by the teacher, individual students (or, in case of a large attendance, small groups of students) will select an appropriate subject at the interface of molecular cell biology/molecular genetics and biotechnology. The student then independently compiles a set of 4-6 relevant publications which in her/his opinion give an accurate reflection of the current state of affairs. This set is first discussed with the teacher, which may lead to revision of the set of publications. The student then writes a comprehensive essay of 10-15 pages A4. If necessary, references cited in the set of 4-6 publications should be read as well. Subsequently, sessions are organized in which students are interviewed about their essay by the teacher as well as by fellow students.
Study goals	<ul style="list-style-type: none"> · Obtain a deeper understanding of the possibilities and limitations of molecular cell biology/molecular genetics applications in modern biotechnology · Integrate knowledge on (i) molecular cell biology/molecular genetics and (ii) cell factory research · Train MSc students to form an independent opinion on scientific literature in the area of applied molecular cell biology
Education method	<p>Introductory lecture</p> <p>Independent study of scientific literature</p> <p>Writing and defending essay</p> <p>Critically reading and questioning essays written by colleagues</p>
Literature and Study Materials	Hand-outs; scientific publications selected by the students in consultation with the teacher
Assessment	<p>Grading is based on:</p> <p>(i) choice of publications (20 %)</p> <p>(ii) essay and response to questions (40 %)</p> <p>(iii) critical questions asked during interview sessions (40 %)</p>
Location	Delft

ICE CELLS IN FACTORIES

BE3131TU	Fermentation Technology	ECTS: 3
Responsible instructor	Prof.dr.ir. J.J. Heijnen (J.J.Heijnen@tudelft.nl), Dr.ir. R.G.J.M. van der Lans (R.G.J.M.vanderLans@tudelft.nl)	
Contact Hours / Week x/x/x/x	2/2/0/0	
Education period	1, 2	
Exam period	2	
Course language	English	
Expected prior knowledge	Basic biosciences (biochemistry and microbiology) and Engineering principles.	
Course Contents	Stoichiometry, thermodynamics, kinetics of growth and product formation, Metabolic networks, Modeling of batch, chemostat, fed batch fermentation, Role of mass transfer, mixing and heat transfer.	
Study goals	Designing/evaluating industrial fermentation processes from technological and microbial fundamentals.	
Education method	Lectures, exercises.	
Literature and Study Materials	Lecture notes on Blackboard Recommended: Basic Bioreactor design, van 't Riet en Tramper, Dekker, New York 1991	
Assessment	Assignments and examination. PdEng trainees are subject to special requirements (code ST6532).	
Permitted Materials during Tests	Open book	
Location	Delft	

BE3191TU	Bioseparations	ECTS: 3
Responsible instructor	Dr.ir. M. Ottens (M.Ottens@tudelft.nl), Prof.dr.ir. L.A.M. van der Wielen (L.A.M.vanderWielen@tudelft.nl)	
Contact Hours / Week x/x/x/x	2/2/0/0	
Education period	1, 2	
Course language	English	
Course Contents	Concerns itself with the systematic design of integrated separations processes specially geared to biotechnology. Much attention is focussed on the consequences resulting from the choice made, the order of the process and the interface between the various steps in the process, in particular, in cases of multi-component separations.	

Study goals	<ul style="list-style-type: none"> - Knowledge of basic terms and theory. - Be able to make estimates on equipment size and operation conditions using simple models. - Be able to set up more advanced, mathematical models for specific problems and to use these models. - Be able to make grounded choices for unit operations and separation chains with estimates of efficiency and possible bottlenecks.
Education method	Lectures
Literature and Study Materials	Lecture notes Bioseparation Processes by Van der Wielen, Luyben en Krijgsman; handouts
Assessment	Optional examination date: January 22 14-17 hrs
Enrolment / Application	not later than August 19 via BlackBoard Delft (courses > Master > LS&T)
Schedule	See Blackboard time schedules
Location	Delft

BE3151TU	Bioconversion Technology	ECTS : 3
Responsible instructor	Prof.dr. R.A. Sheldon (R.A.Sheldon@tudelft.nl), Dr.ir. A.J.J. Straathof (A.J.J.Straathof@tudelft.nl)	
Contact Hours / Week x/x/x/x	0/0/4/0	
Education period	3	
Course language	English	
Expected prior knowledge	Basic knowledge of Organic Chemistry and Biochemical Engineering	
Course Contents	The course deals with the application of biological catalysts for the synthesis, interconversion or degradation of chemical species. The focus is on resting cells that catalyze one or several reaction steps, and on enzymes.	
Study goals	After this course the students should: <ul style="list-style-type: none"> - Be able to judge the advantages and disadvantages of biocatalysis - Understand how bioconversions are applied in industrial practice - Be able to indicate how suitable biocatalysts can be found - Be able to indicate how suitable conditions for bioconversion processes can be found. 	
Education method	Lecture series, 4hrs a week, with assignments	

Literature and Study Materials	Handouts on Blackboard, syllabus of 2nd part incl. exercises. Optional: A.J.J. Straathof and P. Adlercreutz, Applied Biocatalysis, 2nd edn. (2000), Harwood Academic Press, 443 pp. (49 euro). K. Faber, Biotransformations in Organic Chemistry, 5th edn. (2004), Springer (35 euro)
Assessment	Two assignments during the course, and a final literature essay equivalent to 32 h.
Location	Delft

TRACK COURSES FUNCTIONAL GENOMICS

LM3021 Bioinformatics 2		ECTS: 4
Responsible Instructor	Dr. A.P. Gulyaev(gulyaev@rulsfb.leidenuniv.nl)	
Contact Hours / Week x/x/x/x	28/0/0/0	
Education Period	1	
Course Language	English	
Course Contents	<ul style="list-style-type: none">· Comparative genomics.· Functional annotation of proteins.· Protein structure prediction: homology modeling; fold recognition; knowledge-based potentials; ab initio structure prediction.· RNA structure prediction: energy minimization; folding simulations; comparative analysis; non-canonical base pairs; 3D-modeling. RNomics: search for RNA and RNA motifs in genomic sequences.	
Study Goals	Understanding of approaches in bioinformatics and computational biology	
Education Method	Lectures/discussions/assignments.	
Literature and Study Materials	Lecture notes and software/literature reviews available in the Internet.	
Assessment	(written) exam	
Location	Leiden	

LM3031 Bioinformatics 3		ECTS: 4
Responsible Instructor	Dr.ir. J.A. Jongejan(J.A.Jongejan@tudelft.nl)	
Contact Hours / Week x/x/x/x	0/0/28/0	
Education Period	3	
Course Language	English	

Course Contents	<ol style="list-style-type: none"> 1. Introduction of the application of molecular modeling techniques in the field of structural genomics. Recapitulation of structural features of biomolecules. Focus on representations, structural details, and nomenclature applied to proteins. 2. The pivotal role of (the conservation of) energy and entropy. Recalling basic issues of classical and quantum dynamics. Linking macroscopic variables and molecular properties: an overview of statistical thermodynamics. Comparing static systems, i.e. protein structure prediction by molecular modeling and dynamic systems, i.e. enzyme catalysis and receptor - ligand interactions. 3. Structure-function relationships: a dynamical picture of protein function. Microscopic events involved in binding and catalysis. Focus on (chiral) discrimination in protein-ligand interactions: enantioselectivity of enzymes. Applications of molecular dynamics, Monte Carlo modeling, and Quantum Mechanics/Molecular Mechanics (QM/MM) approaches to enzyme reactivity. 4. Structure-function relationships: Linear free energy relationships, LFERs. Application of phenomenological approaches to produce lead structures for pharmaceutical applications, Quantitative Structure-function Relationships, QSARs. 5. Additional feature: Molecular self-organization and molecular evolution. Evolution and propagation of chiral features.
Study Goals	<ol style="list-style-type: none"> 1. to be able to explore and interpret available data on biomolecular structures and their function. 2. to appreciate the important role of (Gibbs free) energy estimates in structure-function predictions. 3. to acquire insight into the applicability, accuracy, and complexity of the currently available computational tools in the fields of molecular, semi-empirical, and quantum mechanics. 4. to design and execute molecular modeling experiments on some simple systems involving energy minimization, thermodynamic integration, and (chiral) recognition
Education Method	<p>The course consists of (interactive) lectures, seeded with questions, small problems, and scientific "teasers". At regular intervals, hands-on practicals are scheduled during which specific projects are carried out. Each of these projects must be properly documented by the participants, providing the material for the final (individual) mark. Alternative examination protocols (additional project(s), interview, specific report) will be considered if necessary.</p>

Literature and Study Materials	<p>A basic introduction to structural bioinformatics can be found in: Philip E. Bourne and H. Weissig, Structural Bioinformatics, John Wiley & Sons, Hoboken, 2003 (expensive!).</p> <p>A substantial part of the material presented in the course can be found (in more detail) in the book by Andrew R. Leach, Molecular Modelling: Principles and Applications, 2nd ed., Prentice Hall, 2001. For a "diagonal" approach see G.H. Grant and W.G. Richards, Computational Chemistry, Oxford University Press, Oxford, 1995. Other sources and references will be quoted when appropriate.</p> <p>A "course book" containing background material and lectures (ppt) will be (made) available on CD. Most of the software used in the course can be obtained from the internet. Packages will include RasMol, Swiss Protein Database Viewer, PyMol/Python. Individual projects may involve the use of academic software (Insight/Discover, Gromos) Commercial software, Adobe Premiere, ChemPro, will be made available for the duration of the course.</p>
Assessment	see Teaching Methods
Location	Delft

LM3051 Biophysical Structure Determination		ECTS: 6
Responsible Instructor	Prof. dr. J.P. Abrahams(abrahams@chem.leidenuniv.nl) Dr. M.Kuil	
Contact Hours / Week	28/14/0/0 x/x/x/x	
Education Period	1	
	2	
Course Language	English	
Course Contents	Insight in the three dimensional structure of biomolecular complexes is essential for the understanding of life. In this course structure determination and analysis will be explained. Special attention will be paid to physical and functional properties that are a consequence of the three dimensional molecular structure.	
Study Goals	<>	
Education Method	<>	
Literature and Study Materials	Van Holde, K.E. et al, Principles of Physical Biochemistry, Prentice Hall	
Location	Leiden	

LM3061 Gene-Expression		ECTS: 5
Responsible Instructor	Prof. dr. J. Brouwer(brouwer@chem.leidenuniv.nl)	
Education Period	4	
Course Language	English	
Course Contents	Regulation of Transcription in eukaryotes. Structure of Polymerase-complex, general transcriptionfactors. Chromatin structure and epigenetics. RNA processing. Integrated view on eukaryotic transcription.	
Study Goals	<>	
Education Method	<>	
Literature and Study Materials	<>	
Assessment	<>	
Location	Leiden	

LM3131 Transcriptome & Proteome Analysis		ECTS: 5
Responsible Instructor	Prof. dr.J. Brouwer(brouwer@chem.leidenuniv.nl) Prof. dr. M. Noteborn	
Education Period	4	
Course Language	English	
Course Contents	Enormous progress has been made in the field of genetics. However, to understand how a cell functions, we have to know the regulation of the expression of its genes (transcriptome) and its protein-protein interactions (proteome). Lectures and technical sessions will illustrate the current state of several modern transcriptome & proteome techniques.	
Study Goals	To get familiar with the latest developments in transcriptome and proteome analysis	
Education Method	Lectures, workshops and practicals	
Literature and Study Materials	Course lecture notes	
Assessment	Oral presentations, reporting and interview	
Location	Leiden	

TRACK COURSES LIVING MATTER

LM3092	Mathematical Modelling in Development and Evolutionary Biology	ECTS: 6
Responsible Instructor	Prof. dr. J.A.J. Metz(metz@rulsfb.leidenuniv.nl)	
Education Period	2	
Course Language	English	
Course Contents	The focus is on developing mathematical concepts basic to evolutionary and developmental biology. Attention is paid to (1) the change of gene frequencies in populations, (2) the longer term change of individual traits through mutation and ecological as well as internal selection, and (3) the way the developmental system biases mutational variation at the levels of genetic networks and pattern forming mechanisms.	
Study Goals	To learn to understand how the diversity of life is shaped by the interplay between genetic mechanisms, pattern formation, and selection.	
Education Method	Reading and discussing the above books, in parallel with lectures on population genetics, adaptive dynamics, and pattern formation.	
Literature and Study Materials	Andrew H Knoll (2003) Life on a Young Planet. Princeton UP, USA 0691009783 L Wolpert (1991) Triumph of the embryo. OUP 0198542437 Carl Zimmer (1999) At the Water's Edge. Free Press 0684856239 SB Carroll, JK Grenier, S Weatherbee (2001) From DNA to Diversity. Blackwell 0632045116 (a small number of each of these books are available for lending.) In addition the material of the lectures is made available on paper, or as pdf files.	
Assessment	On the basis of the presentations about the books and the contributions to the discussion.	
Location	Leiden, van der Klaauw laboratory, Kaiserstraat 63	

LM3021 Bioinformatics 2		ECTS: 4
Responsible Instructor	Dr. A.P. Gulyaev(gulyaev@rulsfb.leidenuniv.nl)	
Contact Hours / Week x/x/x/x	28/0/0/0	
Education Period	1	
Course Language	English	
Course Contents	<ul style="list-style-type: none"> · Comparative genomics. · Functional annotation of proteins. · Protein structure prediction: homology modeling; fold recognition; knowledge-based potentials; ab initio structure prediction. · RNA structure prediction: energy minimization; folding simulations; comparative analysis; non-canonical base pairs; 3D-modeling. RNomics: search for RNA and RNA motifs in genomic sequences. 	
Study Goals	Understanding of approaches in bioinformatics and computational biology	
Education Method	Lectures/discussions/assignments.	
Literature and Study Materials	Lecture notes and software/literature reviews available in the Internet.	
Assessment	(written) exam	
Location	Leiden	

LM3031 Bioinformatics 3		ECTS: 4
Responsible Instructor	Dr.ir. J.A. Jongejan(J.A.Jongejan@tudelft.nl)	
Contact Hours / Week x/x/x/x	0/0/28/0	
Education Period	3	
Course Language	English	
Course Contents	<p>1. Introduction of the application of molecular modeling techniques in the field of structural genomics. Recapitulation of structural features of biomolecules. Focus on representations, structural details, and nomenclature applied to proteins.</p> <p>2. The pivotal role of (the conservation of) energy and entropy. Recalling basic issues of classical and quantum dynamics. Linking macroscopic variables and molecular properties: an overview of statistical thermodynamics. Comparing static systems, i.e. protein structure prediction by molecular modeling and dynamic systems, i.e. enzyme catalysis and receptor - ligand interactions.</p> <p>3. Structure-function relationships: a dynamical picture of protein function. Microscopic events involved in binding and catalysis. Focus on (chiral) discrimination in protein-ligand interactions: enantioselectivity of enzymes. Applications of molecular dynamics, Monte Carlo modeling, and Quantum Mechanics/Molecular Mechanics (QM/MM) approaches to enzyme reactivity.</p>	
	<p>4. Structure-function relationships: Linear free energy relationships, LFERs. Application of phenomenological approaches to produce lead structures for pharmaceutical applications, Quantitative Structure-function Relationships, QSARs.</p> <p>5. Additional feature: Molecular self-organization and molecular evolution. Evolution and propagation of chiral features.</p>	
Study Goals	<p>1. to be able to explore and interpret available data on biomolecular structures and their function.</p> <p>2. to appreciate the important role of (Gibbs free) energy estimates in structure-function predictions.</p> <p>3. to acquire insight into the applicability, accuracy, and complexity of the currently available computational tools in the fields of molecular, semi-empirical, and quantum mechanics.</p> <p>4. to design and execute molecular modeling experiments on some simple systems involving energy minimization, thermodynamic integration, and (chiral) recognition</p>	

Education Method	The course consists of (interactive) lectures, seeded with questions, small problems, and scientific “teasers”. At regular intervals, hands-on practicals are scheduled during which specific projects are carried out. Each of these projects must be properly documented by the participants, providing the material for the final (individual) mark. Alternative examination protocols (additional project(s), interview, specific report) will be considered if necessary.
Literature and Study Materials	<p>A basic introduction to structural bioinformatics can be found in: Philip E. Bourne and H. Weissig, Structural Bioinformatics, John Wiley & Sons, Hoboken, 2003 (expensive!).</p> <p>A substantial part of the material presented in the course can be found (in more detail) in the book by Andrew R. Leach, Molecular Modelling: Principles and Applications, 2nd ed., Prentice Hall, 2001. For a “diagonal” approach see G.H. Grant and W.G. Richards, Computational Chemistry, Oxford University Press, Oxford, 1995. Other sources and references will be quoted when appropriate.</p> <p>A “course book” containing background material and lectures (ppt) will be (made) available on CD. Most of the software used in the course can be obtained from the internet. Packages will include RasMol, Swiss Protein Database Viewer, PyMol/Python. Individual projects may involve the use of academic software (Insight/Discover, Gromos) Commercial software, Adobe Premiere, ChemPro, will be made available for the duration of the course.</p>
Assessment	see Teaching Methods
Location	Delft

LM3051	Biophysical Structure Determination	ECTS: 6
Responsible Instructor	Prof. dr. J.P. Abrahams(abrahams@chem.leidenuniv.nl)	
Contact Hours / Week x/x/x/x	28/14/0/0	
Education Period	1	
	2	
Course Language	English	
Course Contents	Insight in the three dimensional structure of biomolecular complexes is essential for the understanding of life. In this course structure determination and analysis will be explained. Special attention will be paid to physical and functional properties that are a consequence of the three dimensional molecular structure.	
Study Goals	<>	
Education Method	<>	
Literature and Study Materials	Van Holde, K.E. et al, Principles of Physical Biochemistry, Prentice Hall	
Location	Leiden	

LM3511TU	Systems Biology	ECTS: 6
Responsible Instructor	Prof.dr.ir. J.J. Heijnen(J.J.Heijnen@tudelft.nl)	
Contact Hours / Week x/x/x/x	0/0/28/24	
Education Period	3	
	4	
Course Language	English	
Course Contents	For most of the biological processes is no fundamental, theoretical description available. To obtain a meaningful description of nature, it is therefore important to discover the adherence to the laws of nature. This is the subject of this course, in which biological processes are being described in models without knowing the theory behind these processes.	
Study Goals	<>	
Education Method	<>	

Literature and Study Materials	Handouts.
Assessment	<>
Location	Delft

LM3521	Dynamic Energy Budgets	ECTS: 4
Responsible Instructor	Dr.ing. G.J.M. Koper(G.J.M.Koper@tudelft.nl)	
Education Period	4	
Course Language	English	
Course Contents	During this module the book of Bas Kooijman on Dynamic Energy Budget (DEB) theory will be discussed. DEB theory presents simple mechanistic rules to describe the uptake and use of energy and nutrients and the consequences for physiological organisation throughout an organism's life cycle.	
Study Goals	The student should, after following the course, be able to critically assess issues regarding the energetics and efficiency of organisms.	
Education Method	Working class	
Literature and Study Materials	Dynamic Energy and Mass Budgets in Biological Systems by S.A.L.M. Kooijman; Cambridge University Press.	
Assessment	Case study	
Location	Delft	

LM3901	Research Work Placement	ECTS: 45
Responsible instructor	Dr. E.M. Blokhuis (E.M.Blokhuis@tudelft.nl), Prof.dr. J. Brouwer (J.Brouwer@tudelft.nl), Prof.dr. J.T. Pronk (J.T.Pronk@tudelft.nl), Prof.dr. S. de Vries (S.deVries@tudelft.nl)	
Course Contents	The student has to work independently on a research project. The work deals with the following aspects: <ul style="list-style-type: none"> - Literature study, problem formulation and planning - practical and theoretical work in one of the research groups, including interpretation and evaluation of the results - oral and written presentation of the work 	

Study goals	<p>The student</p> <ul style="list-style-type: none"> - has to read and understand international literature of a specific topic - is able to work independently on an academic level in a R&D environment - is able to work in an interdisciplinary and multicultural team of experts and supporting technologists/analysts - has to be able to present his/her results in English by means of a presentation to a professional audience and by means of a written scientific report
Literature and Study Materials	Provided by the research group

LM3911	Research Work Placement	ECTS: 35
Responsible instructor	Dr. E.M. Blokhuis (E.M.Blokhuis@tudelft.nl), Prof.dr. J. Brouwer (J.Brouwer@tudelft.nl), Prof.dr. J.T. Pronk (J.T.Pronk@tudelft.nl), Prof.dr. S. de Vries (S.deVries@tudelft.nl)	
Course Contents	<p>The student has to work independently on a research project. The work deals with the following aspects:</p> <ul style="list-style-type: none"> - Literature study, problem formulation and planning - practical and theoretical work in one of the research groups, including interpretation and evaluation of the results - oral and written presentation of the work 	
Study goals	<p>The student</p> <ul style="list-style-type: none"> - has to read and understand international literature of a specific topic - is able to work independently on an academic level in a R&D environment - is able to work in an interdisciplinary and multicultural team of experts and supporting technologists/analysts - has to be able to present his/her results in English by means of a presentation to a professional audience and by means of a written scientific report 	
Literature and Study Materials	Provided by the research group	

SCIENCE BASED BUSINESS MODULES

LM3831	Science Based Business Fundamentals	ECTS: 17
Responsible Instructor	H. Jousma(h.jousma@fwnbur.leidenuniv.nl)	
Education Period	1	
	2	
	4	
Course Language	English	
Course Contents	www.sbb.leidenuniv.nl	
Study Goals	www.sbb.leidenuniv.nl	
Education Method	www.sbb.leidenuniv.nl	
Literature and Study Materials	www.sbb.leidenuniv.nl	
Assessment	www.sbb.leidenuniv.nl	

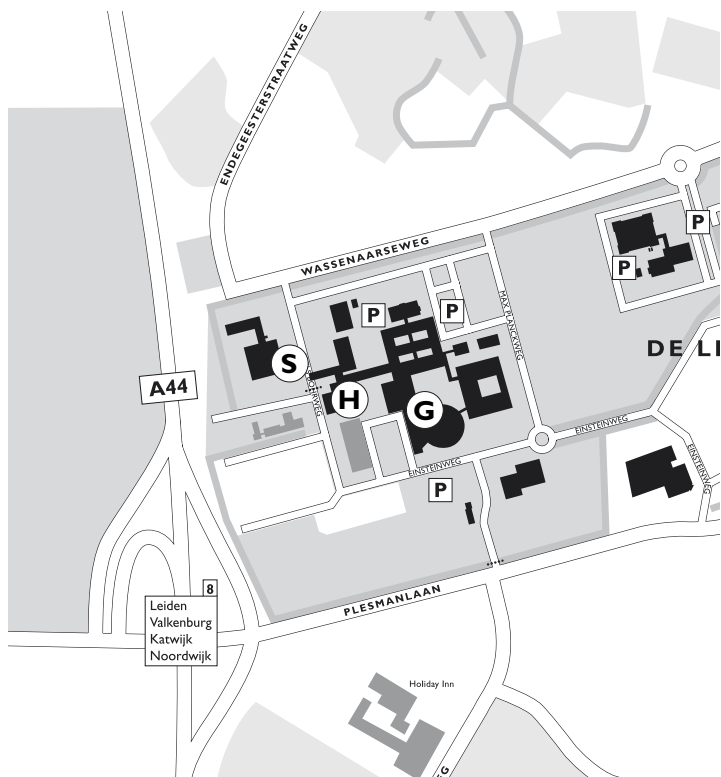
LM3841	Science Based Business Work Placement	ECTS: 23
Responsible Instructor	H. Jousma(h.jousma@fwnbur.leidenuniv.nl)	
Education Period	None (Self Study)	
Course Language	English	
Course Contents	www.sbb.leidenuniv.nl	
Study Goals	www.sbb.leidenuniv.nl	
Education Method	www.sbb.leidenuniv.nl	
Literature and Study Materials	www.sbb.leidenuniv.nl	
Assessment	www.sbb.leidenuniv.nl	

A	Ezelsveldlaan 61	Delft Technology Museum
3	Mijnbouwstraat 120	Applied Earth Sciences building / Centre for Technical Geoscience
5	Julianalaan 67	Biotechnology (Kluyver Lab)
6	Poortlandplein 6	Botanic Gardens
8	Julianalaan 132-134	Former main building
9	Zuidplantsoen 2	MultiMedia Services (MMS)
10	Zuidplantsoen 6	'Tempel'
12	Julianalaan 136	Delft ChemTech
15	Prins Bernhardlaan 6	Kramers Laboratorium voor Fysische Technologie
17	iWEB	Virtual reality pavillion
20	Mekelweg 5	Aula Congress Centre
21	Prometheusplein 1	TU Delft Library / Marketing & Communications
22	Lorentzweg 1	Faculty of Applied Sciences
23	Stevinweg 1	Faculty of Civil Engineering and Geosciences / University Services
24	Berlageweg 1	Faculty of Architecture
28	Van Mourik Broekmanweg 6	TNO Built Environment and Geosciences
30	Jaffalaan 9	OTB Research Institute / Education & Student Affairs
31	Jaffalaan 5	Faculty of Technology, Policy and Management
32	Landbergstraat 15	Faculty of Industrial Design Engineering / SSC ICT
33	Landbergstraat 19	Composites laboratory INHOLLAND/TU Delft
34	Mekelweg 2	Faculty of Mechanical, Maritime and Materials Engineering (3mE) / CICAT / NIMR
34a	Cornelis Drebbelweg 9	Executive Board / Supervisory Board
35	Cornelis Drebbelweg 5	EEMCS Examination and Laboratory Class Building
36	Mekelweg 4 + 6	Faculty of Electrical Engineering, Mathematics and Computer Science (EEMCS) / DIMES / IRCTR
37	Mekelweg 8	Sports Centre
38	Mekelweg 10	Cultural Centre
43	Leeghwaterstraat 36	Cogeneration plant
44	Rotterdamseweg 145	Yes! Delft/Technostarters
45	Leeghwaterstraat 42	Low Speed Wind Laboratory & VSSD
46	Leeghwaterstraat 44	Process and Energy Laboratory (API)
50	Mekelweg 15	Radiation, Radionuclides & Reactors (RRR) / Reactor Institute Delft (RID)
60	Anthony Fokkerweg 5	Logistics & environment
61	Kluyverweg 3	Faculty of Aerospace Engineering: Vliegtuighal
62	Kluyverweg 1	Faculty of Aerospace Engineering / Adhesion Institute
63	Anthony Fokkerweg 1	Faculty of Aerospace Engineering: SIMONA Research Flight Simulator
64	Kluyverweg 2	High Speed Wind Laboratory
65	Kluyverweg 4 + 6	SUPAIR / TRAIL / Facility Management & Real Estate

Map of TU Campus



Map of Leiden Campus



- G** Gorlaeus Laboratory
(Chemistry/MST/LST)
- H** Huygens Laboratory
(Physics)
- S** Snellius Building
(Mathematics & Informatics)



C Clusius Laboratory
(Biology)

