The role of four-hour blocks in promoting active learning strategies:

The impressions of Students and Teachers

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Electrical Engineering

1st Semester							
	Area	Curricular Unit	H/smt TP	TO	TH	ECTS Part.	Total
1st Year	M	Mathematics I	80	0	216		8.0
	F	Physics	60	0	162		6.0
	Ph	Elements of Electromagnetism	50	0	108		4.0
		Applied Informatics					
		Total	300		810		30.0

2nd Semester							
	Area	Curricular Unit	H/smt TP	TO	TH	ECTS Part.	Total
1st Year	M	Mathematics II	60	0	162		6.0
	M	Applied Mathematics	60	0	162		6.0
	Ph	Elements of Thermodynamics	50	0	108		6.0
		Electric Circuits					
		Total	290		810		30.0

2nd Year		Analogue Electronic Systems					
	Aut.:	Optional I	50	0	162		6.0
		Digital Electronic Systems					
		Total	300		810		30.0

2nd Year		Industrial Instrumentation					
	Aut.:	Optional II	50	0	162		6.0
		Electrical Technology					
		Total	310		810		30.0

Branch: **Electrical Installations**

3rd Year		Energy Usage and Distribution					
	EL Aut.:	Electrical Apparatus	40	0	108		4.0
		Project of Electrical Installations					
		Total	300		810		30.0

3rd Year		Industrial Automation					
	Aut.:	Optional III	50	0	162		6.0
		Project of Special Installations					
		Total	285		810		30.0

Branch: **Mechatronics**

3rd Year		Thermodynamics and Fluids					
	ME Aut.:	Materials Resistance and Mechanics	60	0	60		6.0
		Technology of Materials and Processes					
		Total	310		708		30.0

3rd Year		Computer Assisted Machining					
	ME Aut.:	Hidraulics & Pneumatics	60	0	60		4.0
		Mechatronics Project					
		Total	330		762		30.0

Electrical Engineering

1st Semester				H/smt				ECTS
	Area		Curricular Unit	TP	TO	TH	Part.	Total
1st Year	M		Mathematics I	80	0	216		8.0
	F		Physics	60	0	162		6.0
	Ph		Elements of Electromagnetism	50	0	108		4.0
	I	Them. Proj.:	**Applied Informatics**	0	20	162	6.0	12.0
	I	Ass.:	Informatics and Programming	60	0	108	4.0	
	MNG		Project Work Methodologies	30	0	54	2.0	
			Total	300		810		30.0
2nd Year	EL	Them. Proj.:	**Analog Electronic Systems**	0	30	162	6.0	12.0
	EL	Ass.:	Semiconductors - Devices and Applications	50	0	81	3.0	
	EL		Electronic Systems	50	0	81	3.0	
		Aut.:	Optional I	50	0	162		6.0
	EL	Them. Proj.:	**Digital Electronic Systems**	0	30	162	6.0	12.0
	EL	Ass.:	Microprocessors and Microcontrollers	50	0	81	3.0	
	EL		Digital Systems	40	0	81	3.0	
			Total	300		810		30.0

Branch: Electrical Installations

3rd Year	EL	Them. Proj.:	**Energy Distribution and Usage**	0	30	162	6.0	12.0
	EL	Ass.:	Energy Transport, Usage and Management	40	0	81	3.0	
	EL		Electrical Machines - Command and Protections	50	0	81	3.0	
	EL	Aut.:	Electrical Apparatus	40	0	108		4.0
	EL	Them. Proj.:	**Electrical Energy Installations Project**	0	60	216	8.0	14.0
	EL	Ass.:	Electrical Installations I	80	0	162	6.0	
			Total	300		810		30.0

Branch: Mechatronics

3rd Year	ME	Them. Proj.:	**Thermodynamics and Fluid Dynamics**	0	30	162	6.0	12.0
	ME	Ass.:	Fluid Mechanics	40	0	81	3.0	
	ME		Thermal Machines and Heat Transfer	50	0	81	3.0	
	ME	Aut.:	Materials Resistance and Mechanics	60	0	60		6.0
	ME	Them. Proj.:	**Materials Technology and Processes**	0	30	162	6.0	12.0
	ME	Ass.:	Technological Processes	50	0	81	3.0	
	ME		Materials	50	0	81	3.0	
			Total	310		708		30.0

2nd Semester				H/smt				ECTS
	Area		Curricular Unit	TP	TO	TH	Part.	Total
1st Year	M		Mathematics II	60	0	162		6.0
	M		Applied Mathematics	60	0	162		6.0
	Ph		Elements of Thermodynamics	50	0	162		6.0
	EL	Them. Proj.:	**Electric Circuits**	0	30	108	4.0	12.0
	EL	Ass.:	Circuit Analysis	50	0	108	4.0	
	L		Technical English	40	0	108	4.0	
			Total	290		810		30.0
2nd Year	EL	Them. Proj.:	**Industrial Instrumentation**	0	30	162	6.0	12.0
	EL	Ass.:	Industrial Electronics	50	0	81	3.0	
	EL		Instrumentation and Measurements	50	0	81	3.0	
		Aut.:	Optional II	50	0	162		6.0
	EL	Them. Proj.:	**Electrical Technology**	0	30	162	6.0	12.0
	EL	Ass.:	Electrical Machines	50	0	81	3.0	
	EL		Applied Electrotechny	50	0	81	3.0	
			Total	310		810		30.0

3rd Year	EL/ME	Them. Proj.:	**Industrial Automation**	0	30	108	4.0	12.0
	EL	Ass.:	Automation	60	0	108	4.0	
	ME		Hidraulics e Pneumatics	60	0	108	4.0	
		Aut.:	Optional III	50	0	162		6.0
	EL	Them. Proj.:	**Special Installations Project**	0	45	162	6.0	12.0
	EL	Ass.:	Electrical Installations II	40	0	162	6.0	
			Total	285		810		30.0

3rd Year	ME	Them. Proj.:	**Computer Assisted Machining**	0	20	81	3.0	10.0
	ME	Ass.:	Computer Assisted Production	30	0	81	3.0	
	ME		Technical Drawing	50	0	108	4.0	
	ME	Aut.:	Hidraulics & Pneumatics	60	0	60		4.0
	EL/ME	Them. Proj.:	**Mechatronics Project**	0	60	216	8.0	16.0
	EL	Ass.:	Automation	60	0	108	4.0	
	ME		Elements of Mechanical Systems	50	0	108	4.0	
			Total	330		762		30.0

Why four-hour blocks?

- Classes can be adjusted to the course, or the learning needs.
- Encourage adoption of active learning strategies in the classroom (enough time).
- Lecturing becomes little less than excruciating, driving teachers away from the temptation.
- Better articulation with the thematic projects.

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Research questions

- How are four-hour classes being implemented “on the field”?
- What are the advantages and disadvantages of this format? (From the students’ and teachers’ points of view)
- Does the format actually foster the implementation of active learning strategies?

Data collection and analysis

- Student discussion sessions:
  - One for each of the academic years, in the middle of the spring semester 2012.
  - Remit to identify, on their own, the various categories of four-hour classes to which they had been exposed so far in the programme (30min) + Brief clarification with the investigator.
- After the sessions, students were individually asked to list, and for each of the classes's categories identified earlier:
  - The three most positive aspects;
  - The three least positive aspects.
- Teachers were also asked to list, anonymously, and regarding teaching in four-hour blocks, in general (13/16 answers):
  - The three most positive aspects;
  - The three least positive aspects.

Results: Types of classes

Categories	Description	Student Sessions		
		S 1st	S 2nd	S 3rd
Full lecture	Traditional lectures (4h long) Eventually, the teacher discusses example problems. Student interaction restricted to posing questions.	0	1	2
Traditional layout	Lecturing period (up to 2h) Problem-solving sessions: • Students may be asked to answer questions. • Students may be asked to "come to the board".	2	4	8
Tutorial-like organization	Classes are flexible. Short periods of explanation intertwined with problem solving activities, involving students' active work.	2	7	11
Active learning sessions	Classes much less teacher-driven. A range of active learning activities, made possible by the duration of the class, are proposed as challenges to the students, usually in groups. Student presentations, debates and overall discussion of subject matter are frequent.	1	3	4

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Results: Students + Full Lectures

		Description	S 2nd (N=15)	S 3rd (N=10)
Full lecture	+	Systematic organisation of the subject matter.	7	5
		Examples tend to be similar to exam problems.	4	2
		No indication of positive aspects	8	5
	-	Tiring and boring.	12	9
		Large volume of subject matters addressed.	10	7
		Inability to follow the teachers' reasoning for such a long time.	7	6
		Lack of link to reality (and project work).	4	2
		No opportunities to get "hands on" experience.	8	7

Results: Students + Traditional Layout

		Description	S 1st (N=30)	S 2nd (N=15)	S 3rd (N=10)
Traditional layout	+	Students end up with quite a lot of solved "typical" problems.	22	10	4
		Structured approach to subject matters.	18	7	4
		Students get to see "the way teachers solve problems".	23	8	3
		Good "coverage" of the syllabus.	5	4	2
	-	Long lectures are hard to follow.	20	10	8
		Four-hours on a single subject can be tiring and boring	23	12	8
		Articulation with project work is not obvious.	3	5	5
		The pace at which subject matters are addressed is sometimes "too fast".	20	10	6

Results: Students + Tutorial Organization

Tutorial-like organisation		Description	S 1st (N=30)	S 2nd (N=15)	S 3rd (N=10)
	+	Allows for "hands-on" problem solving.	20	12	7
		Feedback on the students' work is available almost "on-line".	10	6	5
		Students are involved in the classroom activities	22	10	7
		Teacher helps students organize their reasoning.	8	6	5
		Students' engagement makes classes more interesting	15	10	6
	-	Students feel exposed when they are asked to solve problems "on the board".	14	4	2
		Students end up with fewer problems solved "by the teacher".	17	8	3
		Four-hour blocks can be quite tiring, since students "work a lot".	28	6	3

Results: Students + Active Learning Sessions

Active learning sessions		Description	S 1st (N=30)	S 2nd (N=15)	S 3rd (N=10)
	+	Students are fully engaged in the learning activities.	12	10	8
		Classes are "more fun" and time "goes by quickly".	15	12	7
		Group work fosters deeper understanding learning, since "they teach each other".	5	5	4
		Usually, various assessment instruments are used (not only exams and tests), which helps academic success.	17	7	6
		The teacher helps students to see different perspectives on subject matters.	6	8	7
		Articulation with project work is usually much more explicit.	5	7	8
	-	It is difficult to get a "structure" for the subject matters solely from the classes. The word "fuzzy" is often used.	20	12	5
		Students seldom see how the "teacher would solve the problems".	25	10	3
		Workload is high, both in class and out of class.	10	6	8
		Little contact with "typical" exam problems, which are also more difficult to typify (when there are exams).	22	8	4
		Continuous assessment represents a constant pressure.	15	5	4

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Results: Teachers' Impressions

Teachers' Perspectives		Description	Frequency (N=13)
	+	Learning activities can be better organized, given the amount of time available.	8
		Delivery can be adjusted to the students' learning needs, sometimes "on the fly". Flexibility is the keyword.	6
		Articulation with project work is much easier.	4
		Larger variety of learning activities may be used, which would be impossible to use in traditional environments.	6
		Directly supporting students and becoming aware of students' difficulties is possible and easier.	6
	-	Teachers may only have contact with students once a week, which calls for longer "recap" periods.	9
		Classes may be very tiring for both students and teachers.	4
		Keeping students' attention may be difficult.	3
		When holidays coincide with classes, periods between classes are too long, which make it difficult to keep the pace.	12

Discussion

- Students value engagement in learning activities and learning process. Engagement is fostered by four-hour blocks.
- But students still feel the need for "safety nets" (more structured, syllabus oriented and teacher-centred organised)
  - This aspect is less evident as students progress along the programme.
- Teachers:
  - Positive aspects tend to be more related to the learning process.
  - Negative aspects are more related to organisational aspects.

Conclusions

- How are four-hour classes being implemented “on the field”?
  - Four types of classes;
  - “Usual” formats are still an important part of the teaching practice.
- What are the advantages and disadvantages of this format?
  - The results speak for themselves
- Does the format actually foster the implementation of active learning strategies?
  - Students learn to value more engaging learning environments.
  - Four-hour format seems to pressure teachers to engage in less traditionally organized classes.
  - The conditions are there…

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Feel free to contact me

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