
E-learning in Engineering Design Education – some experiences

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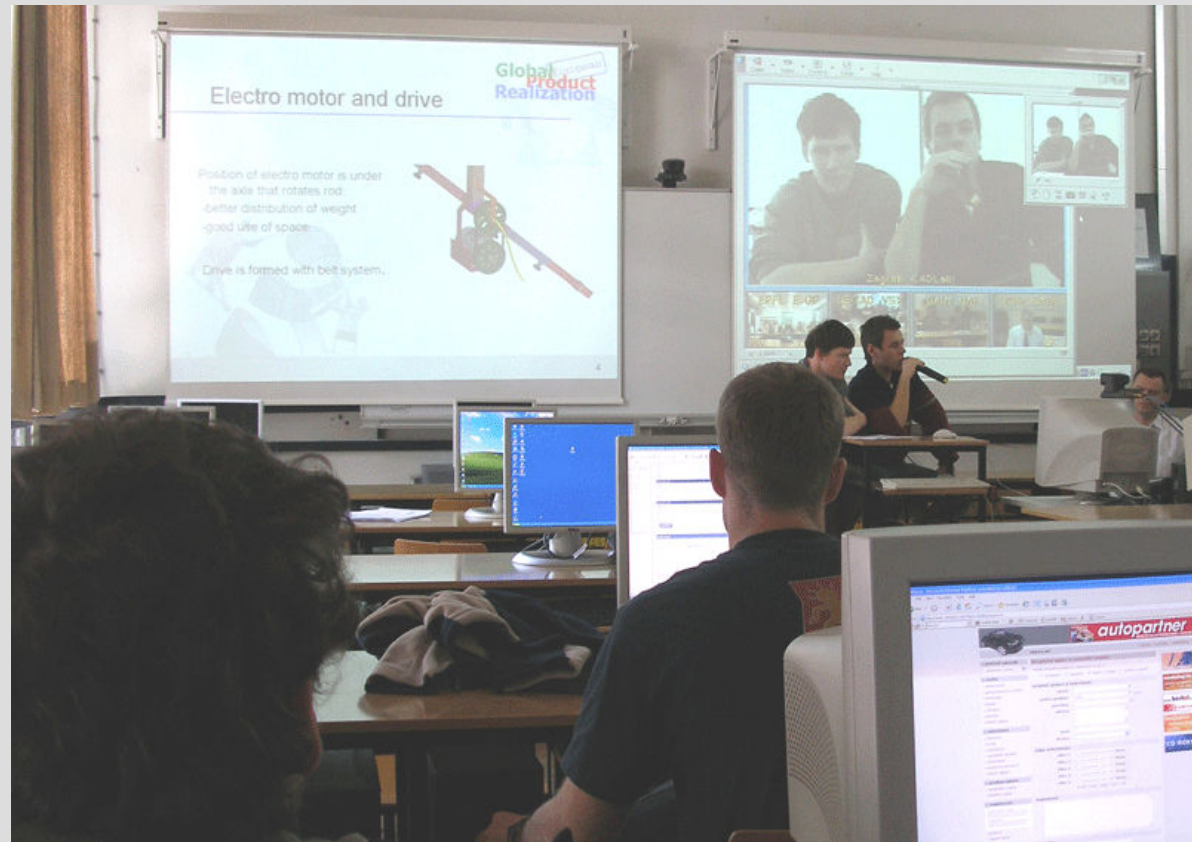
Chair of Product Design and Development

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Two case studies

- EGPR – international distant learning course
- e- courses at FSB
- Lessons learned

European Global Product Realization Course (E-GPR)



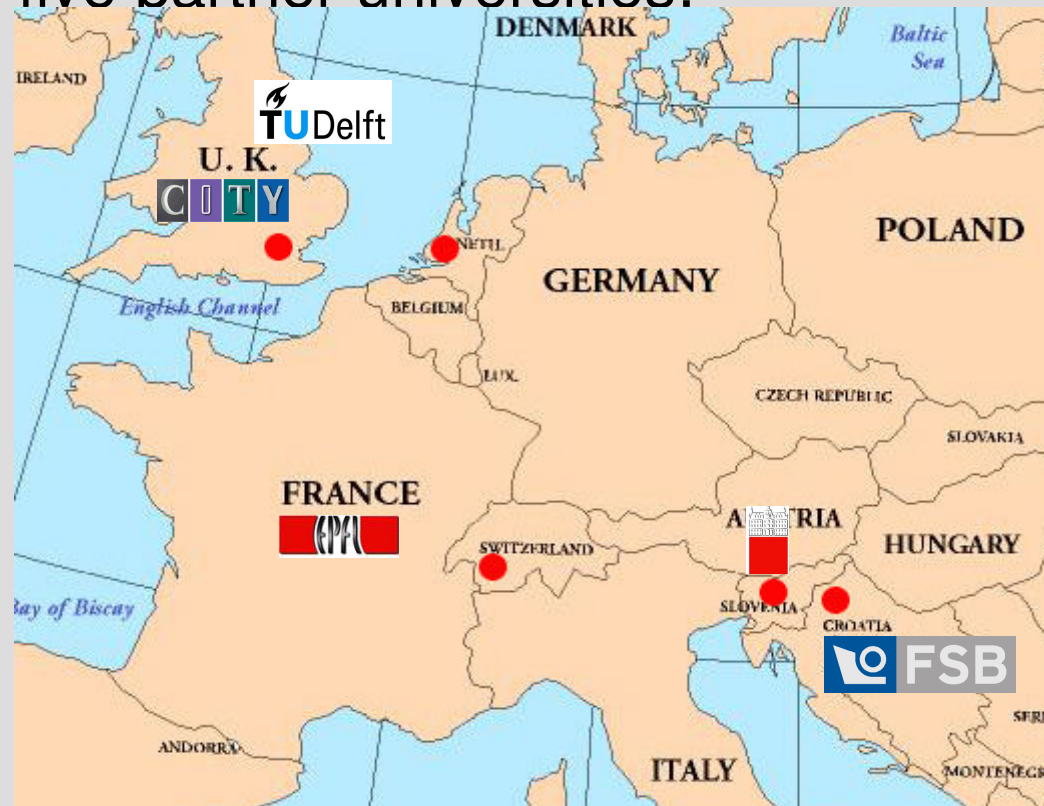
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What is EGPR?

- The **E**uropean **G**lobal **P**roduct **R**ealization is a course organized by an academic virtual enterprise consisting of five partner universities:

- Delft - Netherlands
- Lausanne - Switzerland
- Ljubljana - Slovenia
- Zagreb - Croatia
- London – UK

- Industrial partner.



Course Objectives

Besides standard objective of any course in engineering curriculum EGPR course has some specific objectives:

- conduct **product development** in **international teams** by using **videoconferencing** and collaboration support technologies,
- define and conceptualise **new global products** by applying state of the art knowledge and collaborative methods,
- **extend and apply** their **knowledge** related to product technologies, product structuring and adaptability, use and recycling of materials, technologies for manufacturing, and economic and environmental aspects,
- **realize** global product **concepts** in the form of virtual and physical models and **prototype, and**
- **acquire communication skills**: by organizing presentations using the communication equipment - individual ideas have to be presented to other team members using the available communication media (videoconference equipment, messages sent by e-mails, chat sessions, using “blackboard” service, etc.)

Motivation

- Expose students from partner universities to real life product development process in international teams on and see how well they perform:
 - students differ in culture, skills and domains of interests
 - they are expected to work in a collaborative way in a virtual environment
 - student have to assign responsibilities, share ideas, tasks and opinions on their meetings
 - to overcome the physical distance between the participants, students learn to use the videoconferencing as one of the key communication tools
 - work is coordinated and supported at each location by staff members and teachers giving lectures regarding given project.

Goals

Enhancement of student education:

- students gain additional professional knowledge ,
- they acquire communication skills using videoconference equipment,
- students learn working in teams (virtual teams),
- and in the end they materialize the concept .

Course history

- **EGPR 2007** - development of a point of purchase (POP) display
- **EGPR 2006** - development of a novel small transport device
- **EGPR 2005** - Research in and conceptual development of micro spraying equipment for the viticulture industry
- **EGPR 2004** - Welding mask that would use cameras and LCD screens instead of a conventional darkened glass



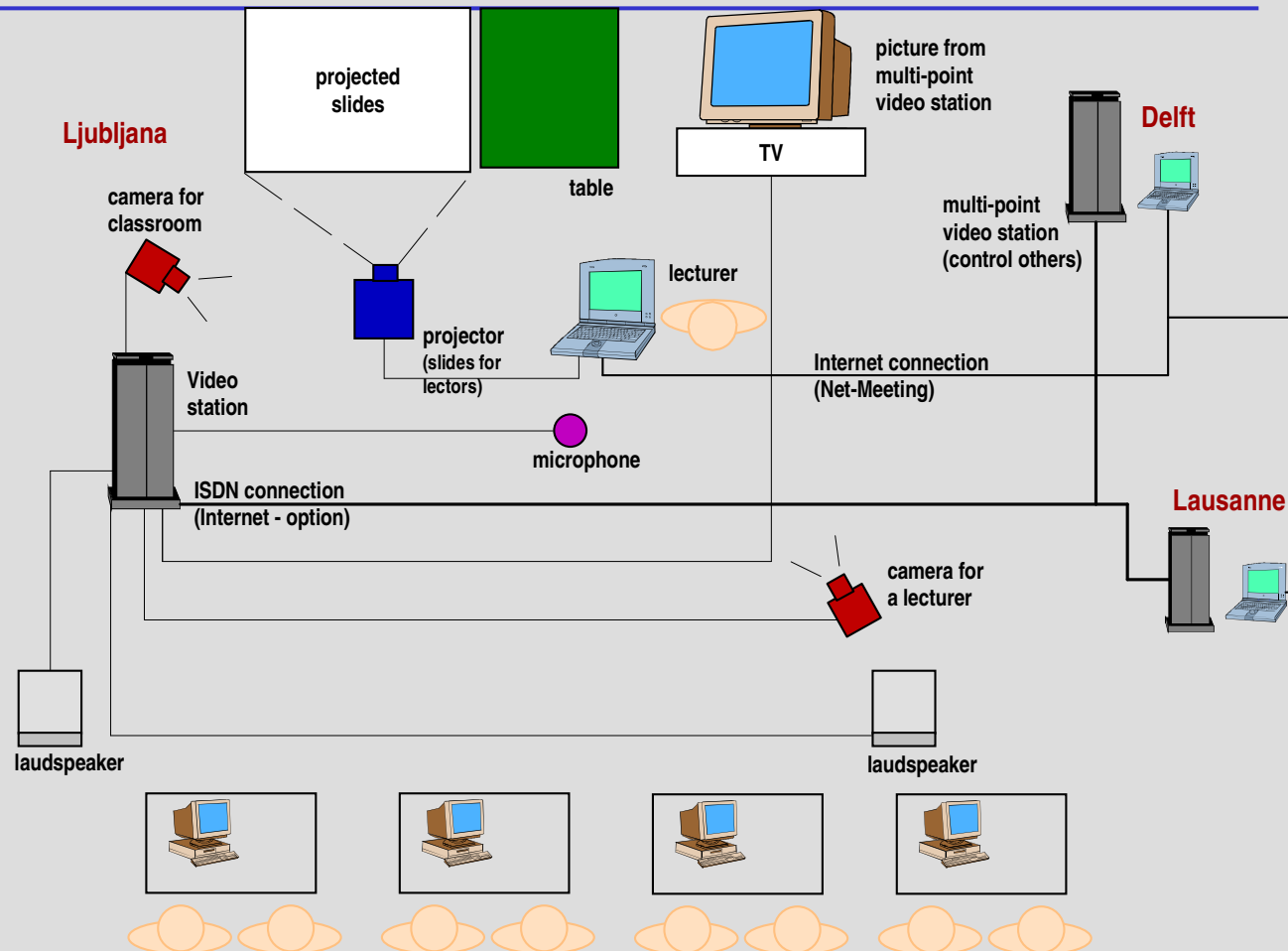
Course elements

- Project definition (industrial partner)
- Lectures composed to address project needs (partner universities)
- Students must produce 3 written reports presented online synchronised to PD phases:
 - Identifying customer needs, requirements spec., SWOT analysis,
 - Functional analysis, presenting and evaluating concepts,
 - Embodiment and detail design.
- Final workshop
- Prototype assembly and testing
- Final presentation
- Exhibiton

Education process schedule

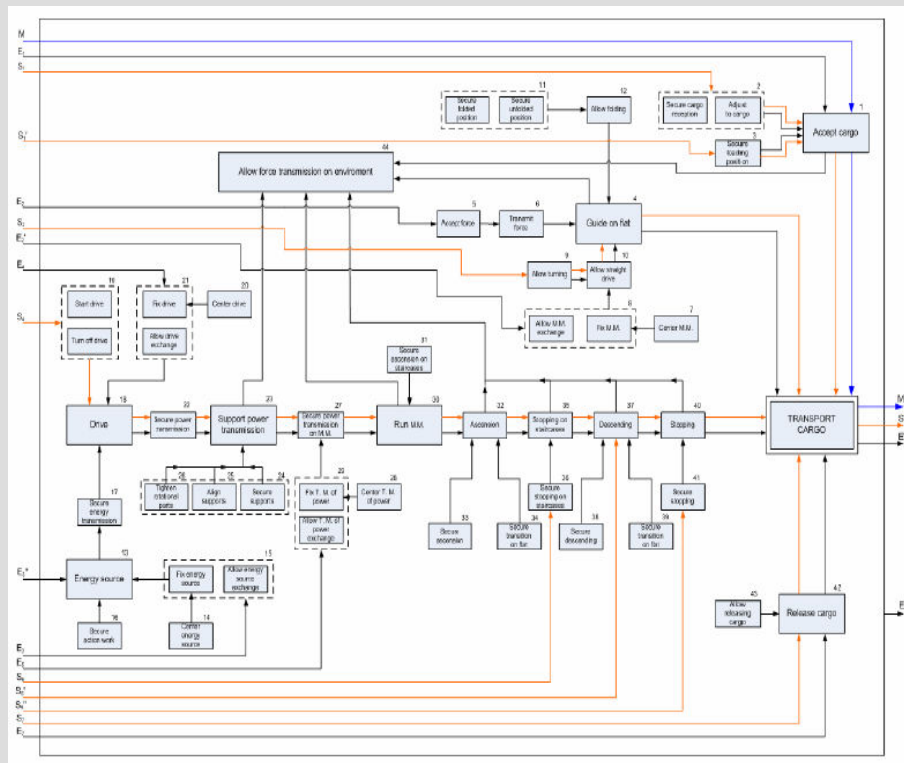
Class time: 13.00 - 14.45 CET (12.00 - 13.45 GMT)							V-07				9.2.2006															
Week	Session No	Day	Date	De	La	Lj	Lo	Za	Session type	Title	Lecturer	Moderator	Comments													
1	1	Monday	12.2.2007	De	La	Lj	Lo	Za	Opening presentation Discussion	- 5 min - Opening EGPR 2005 - 60 min - Introduction of students and presentation about universities - 10 min - Introduction of the teams - 20 min - Project assignment	Prof Horvath Students Dr Kolsek Dr Kovacevic	Ljubljana	Introductory block	10	19	Monday	16.4.2007	De	La	Lj	Lo	Za	Student team presentations	105 min - 2nd Project Review - Teams 4,5,6 - product concepts - preliminary design, make or buy policy 15 min presentation + 15 min questions	Students	Delft
	2	Thursday	15.2.2007	De	La	Lj	Lo	Za	Interactive oral presentation	- 45 min - Basic information about company and product and expectations from company 45 min - Issues of new product development in global content	Prof Duhovnik NIKO	Delft	Product, comp & technology related block	10	19	Thursday	19.4.2007	De	La	Lj	Lo	Za	Open discussion with teams	105 min - Consolidation of 2nd project review. - Concepts accepted for final design	Students NIKO Instructors	London
2	3	Monday	19.2.2007	De	La	Lj	Lo	Za	Interactive oral presentation	- 45 min - Collaboration in video-conferencing based virtual environments - 45 min - Using advanced design support systems in virtual environments	Mr J. Krek Dr A. Kovacevic	Zagreb		11	20	Monday	23.4.2007	De	La	Lj	Lo	Za	Interactive oral presentation	90 min - Advanced forming technologies	Prof. Kuzman	Ljubljana
	4	Thursday	22.2.2007	De	La	Lj	Lo	Za	Interactive oral presentation	- 90 min - Research methods to support Innovative product development	Prof. Horvath	London		11	21	Thursday	26.4.2007	De	La	Lj	Lo	Za	Interactive oral presentation	45 min - Introduction to basic control concepts 45 min - Design with new materials	Prof S. Milonidis Prof Mladen Franc	Lausanne
3	5	Monday	26.2.2007	De	La	Lj	Lo	Za	Interactive oral presentation	90 min - Global design processes, product characteristics and realization principles	Prof. Marjanovic	Ljubljana		12	22	Thursday	3.5.2007		La	Lj		Za	Interactive oral presentation	45 min - Advanced Prototyping techniques (Plastic materials, constraints, production capabilities) - 25 min - Capabilities for prototype finalising in Ljubljana and in company NIKO - 15 min - Preparation for 3rd design review	Benedicic, Reprenative of NIKO Instructors, Dr Stroud	Delft
	6	Thursday	1.3.2007	De	La	Lj	Lo	Za	Interactive oral presentation	45 min - Creative team work 45 min - Alternative energy sources and human powered products	Dr. van De Lugt Dr Arjen Jansen	Delft		12	23	Monday	7.5.2007	De	La	Lj		Za	Lectures			
4	7	Monday	5.3.2007	De	La	Lj	Lo	Za	Interactive oral presentation	45 min - Concept generation, selection and testing 15 min - Preparation for 1st project review	Prof. Duhovnik Instructors Dr A. Kovacevic	London		13	24	Thursday	10.5.2007	De	La	Lj		Za	Student team presentations	120 min - 3rd Project Review - detailed design - analyses & simulations - prototyping 10 min presentation & 10 minutes Q/A	Students	Zagreb
	8	Thursday	8.3.2007	De	La	Lj	Lo	Za	Interactive oral presentation	45 min - Research for better products in Industry (Case study) 45 min - Selecting and integrating product technologies	Dr. Tavcar Dr. Poelman	Zagreb		13	25	Monday	14.5.2007	De	La	Lj		Za	Student team presentations	120 min - 3rd Project Review - detailed design - analyses & simulations - prototyping 10 min presentation & 10 minutes Q/A	Students	Zagreb
5	9	Monday	12.3.2007	De	La	Lj	Lo	Za	Student team presentations	140 min - 1st Project Review, 20 min team - company and market analysis - problem definition and specification - project definition checking	Students	Lausanne		14	26	Thursday	17.5.2007	De	La	Lj		Za	Open discussion with teams	Consolidation of 3rd Project Review 15 min per group	Students NIKO Instructors	Ljubljana
	10	Thursday	15.3.2007	De	La	Lj	Lo	Za	Open discussion with teams	10 min - Final teaming 90 min - Consolidation of 1st project review	Students NIKO Instructors	Ljubljana		14	27	Monday	21.5.2007	De	La	Lj	Lo	Za	Coordination meeting	Preparation for closing workshop	Prof Duhovnik	Lausanne
6	11	Monday	19.3.2007	De	La	Lj	Lo	Za	Interactive oral presentation	45 min - Social processes in design 45 min - An Engineers guide to Intellectual Property Law (IP) & search IP database	Prof. P. Badke-Schaub Mrs T. Khan	Zagreb		15	28	Thursday	24.5.2007		Lj	Lo	Za	Student working time				
	12	Thursday	22.3.2007	De	La	Lj	Lo	Za	Interactive oral presentation	45 min - How other companies are developing global products 45 min - Rules for design of transport handling systems	Uljanki shipyard Mr.sc. Milan Milanović (Zag) Prof Joze Duhovnik	Lausanne		15	29	Monday	28.5.2007	De	La	Lj	Lo	Za	Student working time			
7	13	Monday	26.3.2007	De	La	Lj	Lo	Za	Interactive oral presentation	45 min - Financial analysis of the costs at product development 45 min - Ergonomy in design	Dr D. Peijhan Dr ir. N. CCM Moes	London		16	30	Thursday	31.5.2007	De	La	Lj	Lo	Za	Student working time			
	14	Thursday	29.3.2007	De	La	Lj	Lo	Za	Interactive oral presentation	45 min - Consideration of environmental aspects of design 15 min - Preparation for the 2nd project review	Prof P. Xirouchakis Instructors, Dr Kolsek	Delft			Monday	4.6.2007	De	La	Lj	Lo	Za	Workshop in London				
8	15	Monday	2.4.2007	La	Lj	Lo	Za	Interactive oral presentation	90 min - Design for assembly, maintenance and recycling	Prof Xirouchakis	Zagreb			Thursday	5.6.2007	De	La	Lj	Lo	Za						
	16	Thursday	5.4.2007	La	Lj	Lo	Za	Interactive oral presentation	105 min - 2nd Project Review Teams 1,2,3 - product concepts - preliminary design, make or buy policy 15 min presentation + 15 min questions	Students	Lausanne			Sunday	6.6.2007	De	La	Lj	Lo	Za						
9	17	Monday	9.4.2007	De	La	Lj	Lo	Za	Easter Monday																	
	18	Thursday	12.4.2007	De	La	Lj	Lo	Za	Break																	

Schematic of a virtual classroom



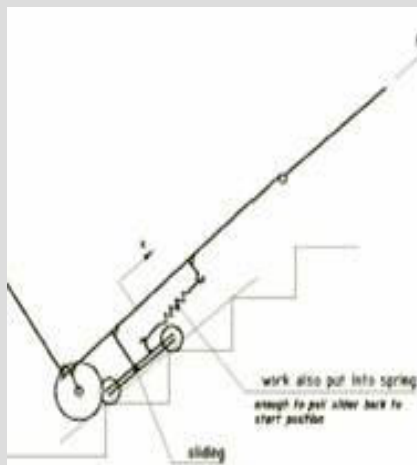
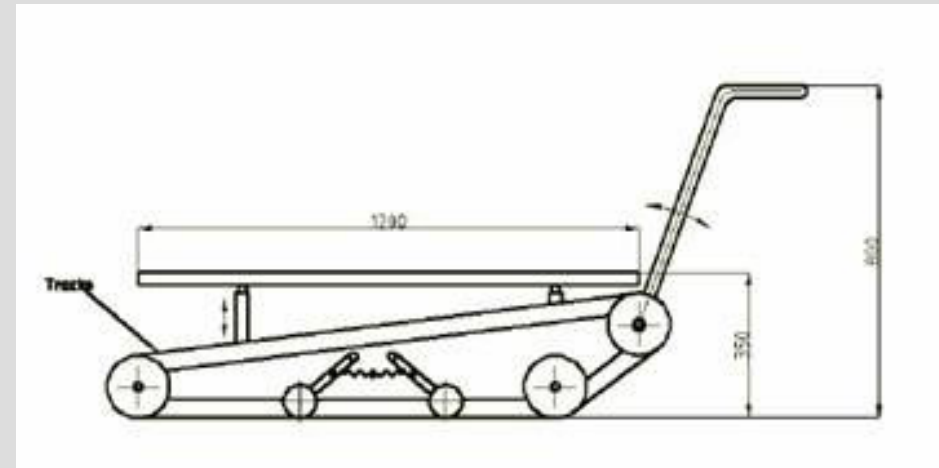
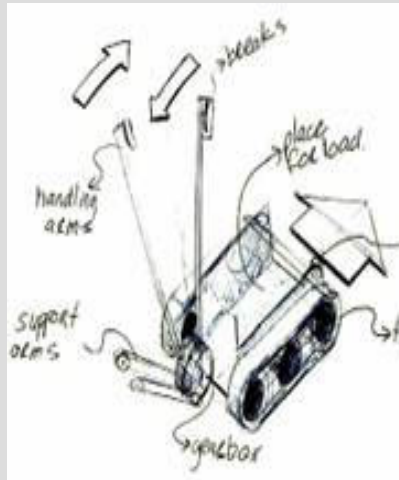
According to Tavcar, J. et. al. Active Learning At An International Virtual Product Development Project *1st International Science Symposium – Project Learning*

Functional analysis (EGPR 2006)

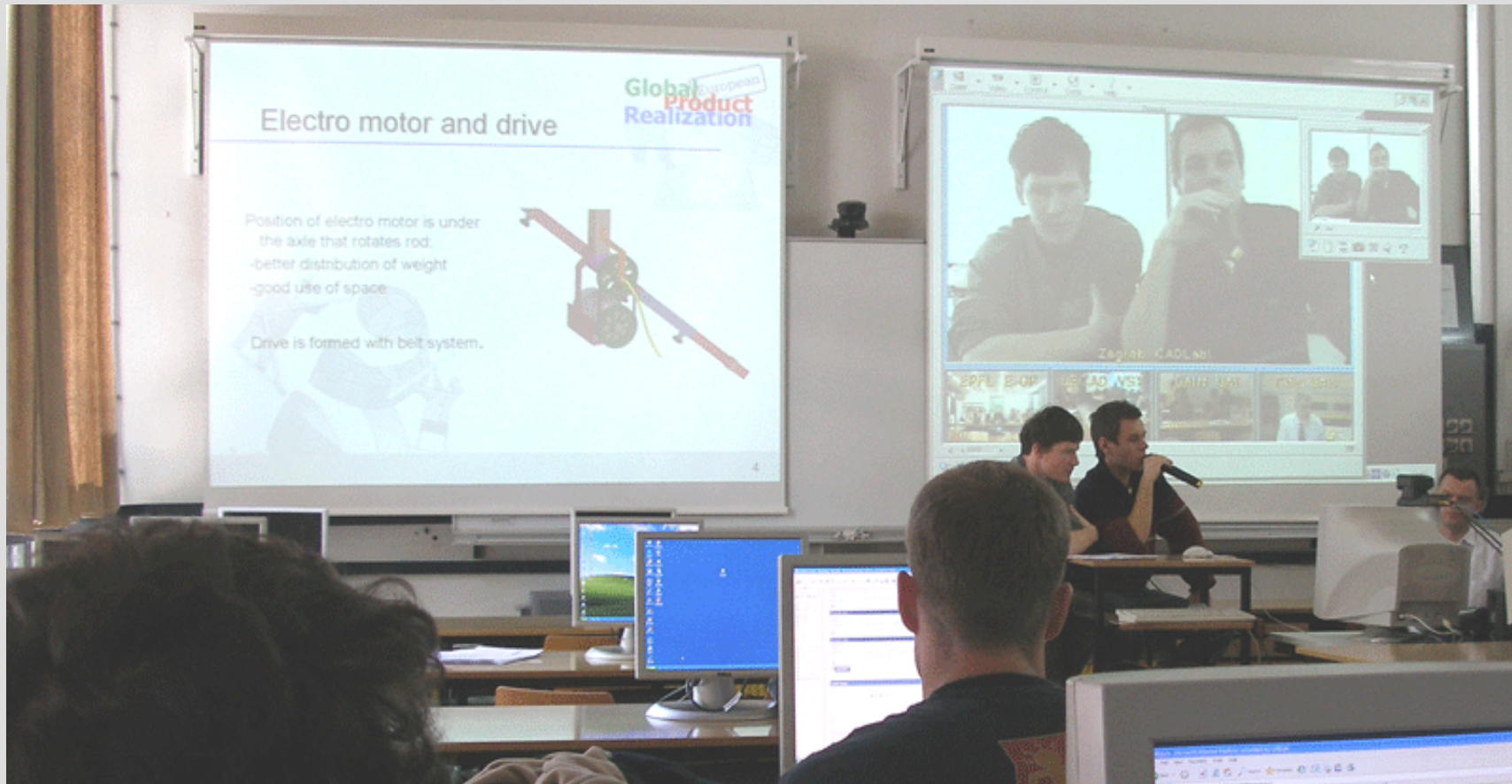


	N1	N2	N3	N4	N5	N6	N7
options of moving [1]	pulling	pushing	control panel				
lifting loads [2]	hand lifting on the device	self-lifting by using the device	with use of lever	with crane			
drive [3]	by hand	by motor	by gravity force				
source of power [4]	battery	electricity from electric network	solar cells	internal combustion engine	compressed air	human power	
brake [5]	hand brake	r/f braking	on a motor	disc			
elements for moving on flat [6]	wheels	legs	caterpillars	slipping			
elements for moving on stairs [7]	wheels	legs	caterpillars	slat-climbing mechanism	with use of clutch	pneumatic	screw park
carrying the load (place on which will be the load) [8]	plate	forks	bucket	Combination of plates and plates			
load regulation [9]	worm gear	hydraulic	pneumatic	small handle mechanism	by angle		
securing the load from falling [10]	bolt	with pin	with plate				

Conceptualization (EGPR 2006)

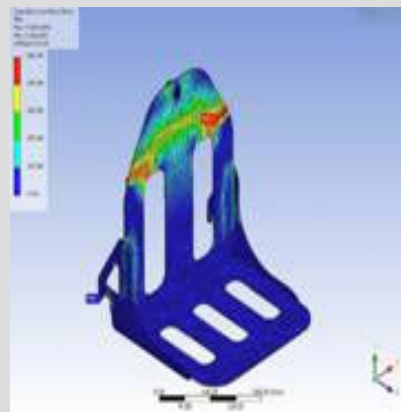
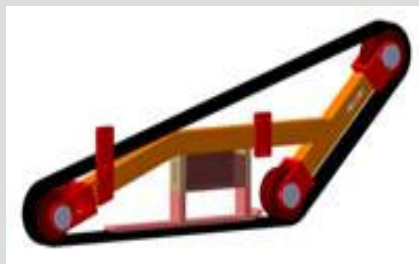
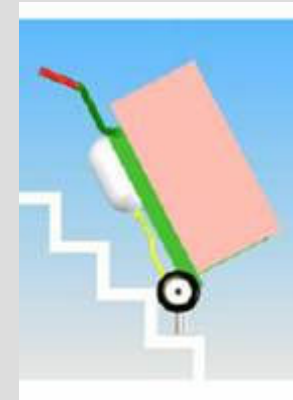


Presentations (EGPR 2006)



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CAx virtual modeling and testing (EGPR 2006)



Prototype manufacturing (EGPR 2006)



Prototypes testing (EGPR 2006)



EGPR 2007 - Course highlights

- EGPR 2007 – The project task is to develop a technologically and technically advanced POS display which will be used for displaying male grooming products produced by a brand at the premium range.
- **Requirements:**
 - **System requirements**
 - Floor standing or counter display.
 - Interaction with the client.
 - Stability.
 - Generic retail display.
 - Display and storage of a product
 - **Mechanical requirements**
 - Testing of product displayed.
 - Non invasive skin testing
 - Movement for exchange of products or emphasis of a brand
 - Interchange ability i.e. shelves must be adjustable.
 - **Electrical requirements**
 - Illumination
 - Modern electrical equipment i.e. LCD Screens.
 - ROSH and CE compliant.
 - **Human requirements**
 - Easy to assemble.
 - Must be able to be lifted by two people

EGPR 2007 - **CAX** virtual modeling



Prototype manufacturing (EGPR 2007)



Prototype manufacturing (EGPR 2007)



Prototype testing (EGPR 2007)



Lessons learned 1

Teachers' viewpoint

- Differences in course planning and constraints
- Different course visions at the beginning
- Unequal number of students from participating universities
- Not all lectures directly tied to the project
- Difficult to build the momentum to keep the project going

Students' viewpoint

- Great experience, to implement more of such practical assignments in curriculum.
- Great improvement in language communication skills.
- Felt how is to work in team.
- Very hard course, lot of work.....

e- courses at FSB or Moodle at e-cadlab portal

- usage history: since 2005.
- current number of courses: 4 (+1 in preparation)
- number of active students: cca 400
- number of teachers: 6

e-cadlab portal

course page screenshot

Kolegij: Razvoj proizvoda 2007/08. - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://e-cadlab.fsb.hr/course/view.php?id=18

Prijavljeni ste sustavu kao Mario Štorga (Odjava)

e-cadlab ▶ RP2007_08

Switch role to... Omogući izmjene

Korisnici

- Sudionici

Aktivnosti

- Forumi
- Resursi
- Zadaci

Administracija

- Omogući izmjene
- Postavke
- Assign roles
- Grupe
- Backup
- Restore
- Import
- Reset
- Reports
- Pitanja
- Skale
- Datoteke
- Ocjene

Ispiši me iz kolegija RP2007_08

Kalendar

Listopad 2007

Pon	Uto	Sri	Čet	Pet	Sub	Ned
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

Tjedni pregled

Upute za polaznike kolegija Razvoj proizvoda

Plan kolegija ak. godina 2007/08.

Forum s vijestima

DODATAK A: Upute za pripremu PowerPoint prezentacija [eng]

DODATAK B: Vjestina prezentiranja - Kako pročitati tuđe misli na osnovu njihove gestikulacije? [eng]

Forum s vijestima

1. Listopad - 7. Listopad

P1: Uvod u razvoj proizvoda

- 1.1 Uspješno poslovanje
- 1.2 Proces konstruiranja
- 1.3 Proizvod
- 1.4 Značajke razvojnih projekata
- 1.5 Vizija razvoja u budućnosti
- 1.6 Vrednovanje razvoja

P1: Uvod u informacijske modele proizvoda

8. Listopad - 14. Listopad

P2: Razvojni procesi i organizacija

- 2.1 Vrste projekata
- 2.2 Vrste procesa razvoja
- 2.3 Varijante osnovnog procesa razvoja
- 2.4 Organizacija razvoja
- 2.5 Utjecaj brzine RP
- 2.6 Troškovi razvoja

Seminarski rad 1

Zadaci za Seminarski rad 1

Predložak za pisanje seminarskog rada (MS Word)

V1: Općenito o razvoju proizvoda

Zadatak sa vježbi V1

Zadaci sa vježbi V1

Najsvježije vijesti

Dodajte novu temu...

6. Ruj. 14:42

Mario Štorga

RP2007_08 Pitanja i prijedlozi više...
Prošle teme ...

Buduća događanja

Zadatak sa vježbi V2
Četvrtak, 25. Listopad (14:00)

Seminarski rad 1
Ponedjeljak, 19. Studeni (14:00)

Zadatak sa vježbi V4
Četvrtak, 22. Studeni (14:00)

Zadatak sa vježbi V6
Četvrtak, 13. Prosinac (14:00)

Kolokvij sa predavanja (u terminu vježbi)
Četvrtak, 10. Siječanj (13:00)

Seminarski rad 2
Utorak, 15. Siječanj (14:00)

Zadatak sa vježbi V10
Četvrtak, 17. Siječanj (14:00)

Prikaži kalendar...
Novi događaj...

Done

Now: Sunny, 10° C Mon: 11° C Tue: 10° C

Motivation

- easy and fast access to the all necessary information in order to support classical classroom engineering education
- time independence and the possibility for an individual study pace - pre-lecture access to materials could motivated students to spend more time studying the subjects concerned and to come to class better prepared
- dynamic and more interactive communication between teachers and students
- decreasing cost for classical education (consulting hours – discussion forums, answers to particular questions are available to everyone)

Goal

- Support engineering design courses by online access to the resources and tasks from anywhere and at anytime

Moodle e-cadlab implementation elements

- **Lessons** – teaching material prepared by a teacher, who defines control questions for each chapter
- **Tasks** –students should solve and upload a file for evaluation and reflection of results (for example a drawn diagram, source code, written project)
- **Forum** – publishes work of course participants, which can be searched through and displayed with different points of view and evaluated. A part of each forum is a section for News serving a role as a notice board with up-to-date information
- **Surveys** - allow a teacher to ask a question and offer a few options for answering
- **Vocabulary** – enables students to understand and continuously maintain a list of definitions and terms. Each term can be searched and displayed in different formats and can have links to an index
- **Administration** – management of the participants, roles, results, etc.

Implementation issues

- course materials that require significant use of sketching and drawing have not been as easy to implement as topics that require only text-based discussion
- significant amount of time and work invest in preparing the online resources/tasks through several course cycles
- efficient support to specific organizational aspects of the engineering design education (small working groups, needs for often interaction between teachers and students working on a projects and discussion of the informal information on hard copy media)
- difficulties to run online tests that contain need for engineering input (sketch, drawing) – students are often more focused on computer tools that on their creativity and innovatively
- new media for communication – additional time necessary for regularly updating and answering all kinds of questions that students much easier asking by using online tool – for inexperienced teacher is easy to stuck in 24 hours per day answering scheme

Lessons learned

- challenges to all parties involved in the education process – teachers and students since specific topic
- students are more affected and involved in whole process, sometimes answer on forum is given by other student, even faster then would be provided by teacher
- students feedback about Moodle e-cadlab portal implementation is significantly positive (98%), the satisfaction with course materials was increased from 50% on up to more then 70% after introduction of the Moodle e-cadlab portal
- the time invested in preparing on line course materials start to return already in the next course cycle
- the assesment procedure appears as more transparent and available to everyone
- easier administration of the course available online for the teachers
- new improvements and implementation of additional features is planned (wiki, etc.)

Lessons learned

- Specific techniques of course writing and instructional design
- Specific methods of communication
- Specific organizational and administrative arrangements
- Well accepted among the students if (and only if):
 - the quality of online resources and tasks IS comparable to or better than the traditional classroom
 - the resources and tasks are available when needed and accessible from anywhere by any number of students

Students' appreciation

Extracted from EPFL local newspaper,
October 28, 2003:

« [...] then came the time to materialize everything. To do so, we went to Delft: the emails became words, the images on screens became real persons and the drawings of our project became a working prototype. It took us a whole hard working week that was very instructive, not only from an engineering point of view but also from a human point of view. [...] »

C. Tapparel, G. Collet,
M. Bellino, Y. Freese, I. Saglini, T. Sigrist



Thank you for your attention !

