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Faculty of Engineering

Problembased learning and project teamwork - a practical way to learn

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- **Why are we learning**

  Better job? better paid? prestige? interest to learn?

- **What shall we learn**

  Attractive disciplines? Niche? interesting topic`s?

- **How can we learn better and efficient**

  Read hard? seeking/asking help? Own interesting?

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“How can I get my students to think?" is a question asked by many faculty, regardless of their disciplines. Problem-based learning (PBL) is an instructional method that challenges students to "learn to learn," working cooperatively in groups to seek solutions to real world problems.
…... *Barbara Duch*

University of Delaware (http://www.udel.edu/pbl/)

Four Basic Teaching Styles

- Formal Authority: A instructor-centered approach, the instructor feels responsible for providing and controlling the flow of content.
- Demonstrator: A instructor-centered approach, the instructor demonstrates and models what is expected (skills and processes)
- Facilitator: A student centered approach, the instructor focuses on activities. Responsibility is placed on the students to take initiative.
- Delegator: A student-centered approach, the instructor places much control/responsibility for learning on individuals/groups of students.

http://tlt.its.psu.edu/suggestions/research/teaching_styles.shtml

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VARK Learning Styles (Fleming & Mills)

- **Visual (V) 视觉**
- **Depiction of information in charts, graphs, flow charts, and all the symbolic arrows, circles, hierarchies and other devices than words.**

- **Aural / Auditory (A) 听觉**
- **Information that is "heard." Students with this modality report that they learn best from lectures, tutorials, tapes, group discussion, speaking, web chat, talking things through.**

- **Read/write (R) 读/写**
- **Information displayed as words. Not surprisingly, many academics have a strong preference for this modality. This preference emphasizes text-based input and output — reading and writing in all its forms.**

- **Kinesthetic (K) 动手/实践**
- **Preference related to the use of experience and practice (simulated or real). The key is that the student is connected to reality, either through experience, example, practice or simulation.“**

(http://www.vark-learn.com/english/index.asp)

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Driscoll (2002) proposes the following principles for how people learn

Learning occurs in context: Learning must happen within certain context. Without an appropriate setting, learning is unlikely to succeed.

Learning is active: "Tell me, I forget. Show me, I remember. Involve me, I understand." This Chinese proverb suggests that learners have to be mentally active during learning activities, make connections between the new knowledge and existing knowledge, and construct meaning from their own experiences.

Learning is social. Learners benefit from working collaboratively in groups so that they can hear different perspectives and accomplish the learning tasks with the help of their peers and experts.

Learning is reflective. Learning is facilitated when learners are given chances to express and evaluate on their own thinking.

Facts about Norwegian Education and Training

Population	Category
590,000	Pupils in compulsory education
164,000	Pupils in upper secondary education
174,000	Students in higher education
1,000,000	Adults in various full time or evening courses
85,000	Teachers in compulsory education
23,000	Teachers in upper secondary education
11,300	Academic staff (full time equivalents)

- **The basic principles and priorities of Norwegian education policies have been focused on these elements:**

- **A high general level of education in the entire population**
- **Equal opportunity for all in access to education**
- **Decentralisation of educational administration**
- **Meeting long-term and short-term qualification requirements of the labour market**
- **Emphasis on a broad and general initial education, leaving specialisation to later stages and further training at work**
- **Lifelong learning (based on a "cradle to grave" definition)**
- **A comprehensive education system with easy transition between levels and courses**

The Norwegian government has also introduced essential curricula for the learners in order to meet the future demands

- Abilities of being creative
- Ability to define and solve problems (ability to think analytically and scientifically)
- Ability to cooperate and participate actively
- Ability to use ICT and a variety of methods in the education and training
- Ability to select information from huge amounts of sources and references
- Ability to play an important part in the ordinary running of the school or working place through democratic participation
- Ability to be enterprising
- Ability to communicate openly and a high degree of communicative competence
- Ability to acquire, evaluate, integrate and make use of knowledge leading to competence
- Ability to promote ethical values and appreciate multi-cultural respect

TABLE I: National Framework Plans for Engineering Education in Norway, A comparison of 2003 against 1996 in course Compositions

Content	2003 Plan (accounted in ECTS)	1996 Plan (accounted in ECTS)	Changes in 2003 Plan
Course type	Basic Courses 50-60 including (minimum): Mathematics 25, Physics 10, Chemistry and Environment 10, Computer Techniques 5	Basic Courses 45 including these: Mathematics 24, Physics 6, Chemistry and Environment 9, Computer Techniques 6	Increasing Mathematics and Sciences Basic Courses in 5-15 ECTS (Compulsory)
	Social Science Courses 15-20	Social Science Courses 15-18	No specific changes
	Technical Courses 75-90	Technical Courses 90 (Speciality 30, Major courses 60)	No longer distinction between speciality and major courses, possibly 15 less ECTS
	Optional/voluntary Courses 10-20	Optional/voluntary Courses 12-18	No specific changes
	Final Project Work 10-20	Final Project Work 12-18	No specific changes
Total ECTS	180	180	No specific changes

TABLE II: National Framework Plans for Engineering Education in Norway, A comparison of 2003 against 1996 in Working and Teaching Methods

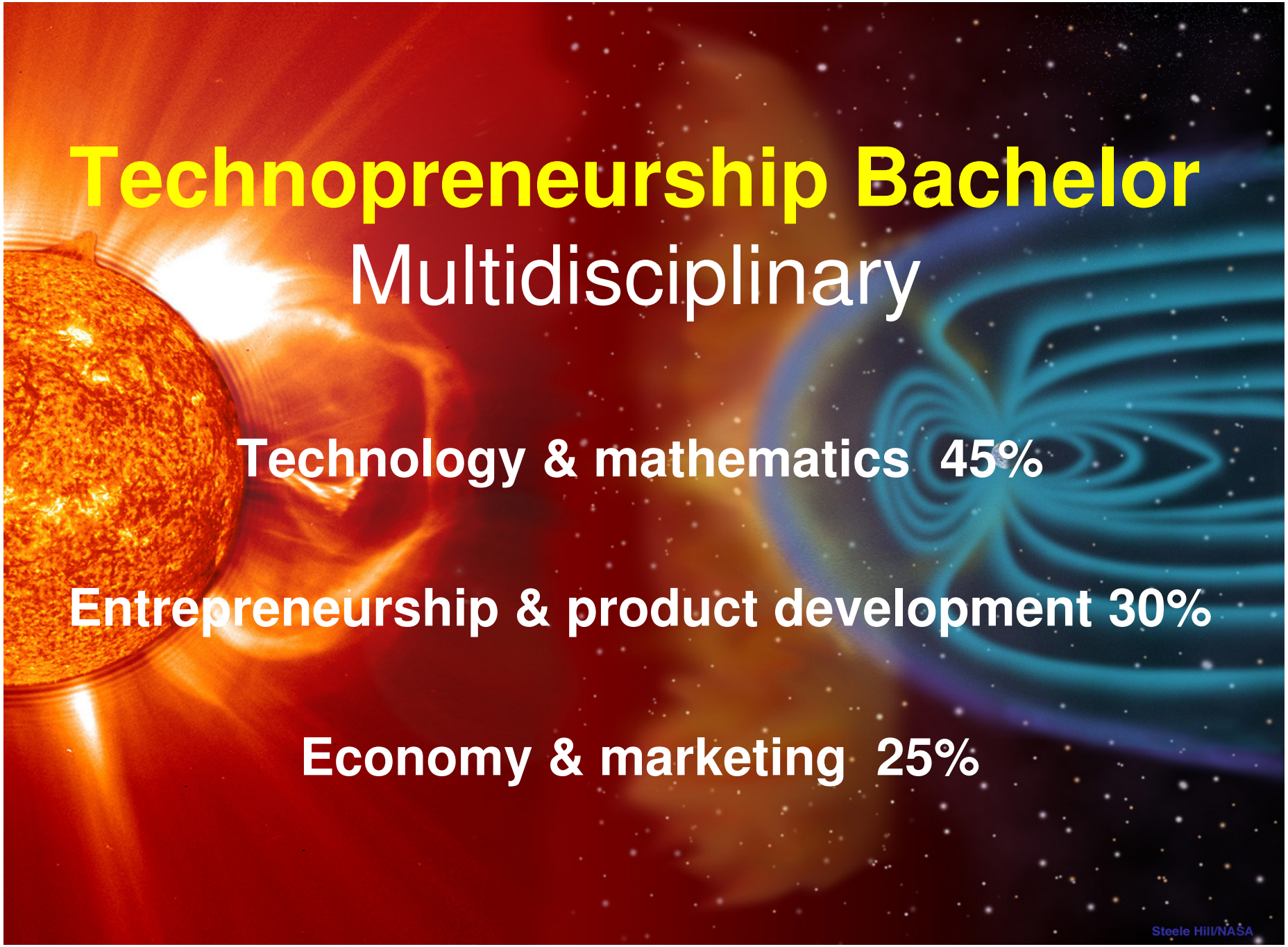
Content	2003 Plan	1996 Plan	Changes in 2003 Plan
Degree	Bachelor of engineering (bachelor i ingeniørfag)	College engineer (høgskoleingeniør)	Integrating with international degree systems
Quality assurance	Course plan settled by the institution level, including learning goal, teaching methods, evaluating process and relevant requirements.	Quality control and evaluation for course's learning goal, teaching content, methods, organizing, syllabus, R&D relevance, etc.	Decentralizing of course plan settlement to the institution level.
Working & teaching methods	Focusing on learners' abilities of cooperation, communication and practical problem solving skills, focusing on cross-section issues, implementing practice training, integrating final project with external companies or organizations.	Following the pedagogical principles, focusing on learners' abilities to seeking knowledge, learning skills, self-engagement, introducing institution for first year students, opportunities for practice arrangements, teaching information analysis skills.	More focusing on interactive abilities, such as cooperation, communication, cross-section skills. The practice became a more important step of teaching activities.
Evaluation	Assuring engineering students have learned and implemented knowledge and competence which satisfy the overall and partial goals.	Evaluating learning effect, developing and improving teaching methods, and evaluating institution's teaching levels.	More focusing on the learners and their competence upgrading after learning.

The World Moves Faster!

- International market
- Quicker restructuring
- Better and higher competence
- The importance of network
- Problem dealers
- Entrepreneurers are welcome!!!

The Industries Need:

1. Problem dealers, not problem creators
2. Job creators, not job applicants
3. Pro-active emplyees, not passive ones
4. Creative and motivated colleagues
5. Broad technical and economic competence
6. Willingness for responsibilty and risk
7. Employees with good network
8. Employees with international experience

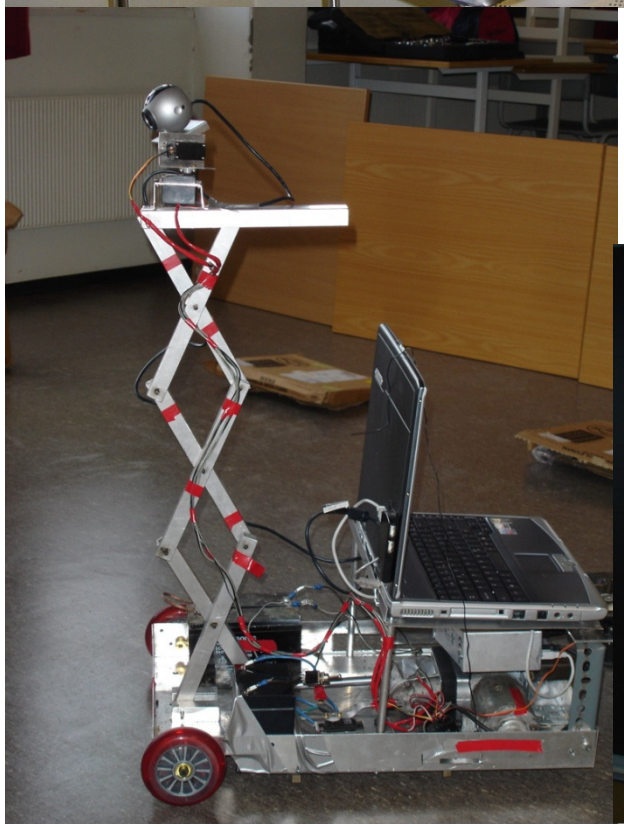

Technopreneurship Bachelor
Multidisciplinary
Technology & mathematics 45%
Entrepreneurship & product development 30%
Economy & marketing 25%
Steele Hill/NASA

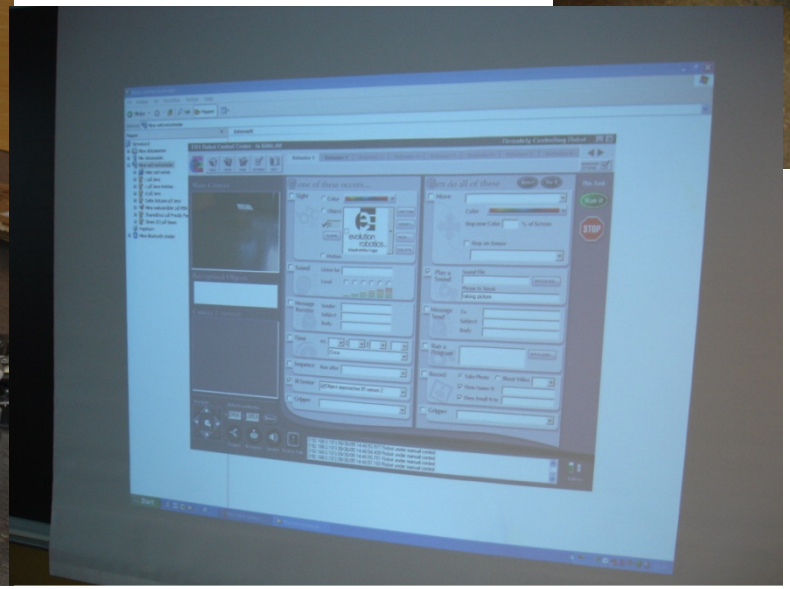
Stunt/Stress projects

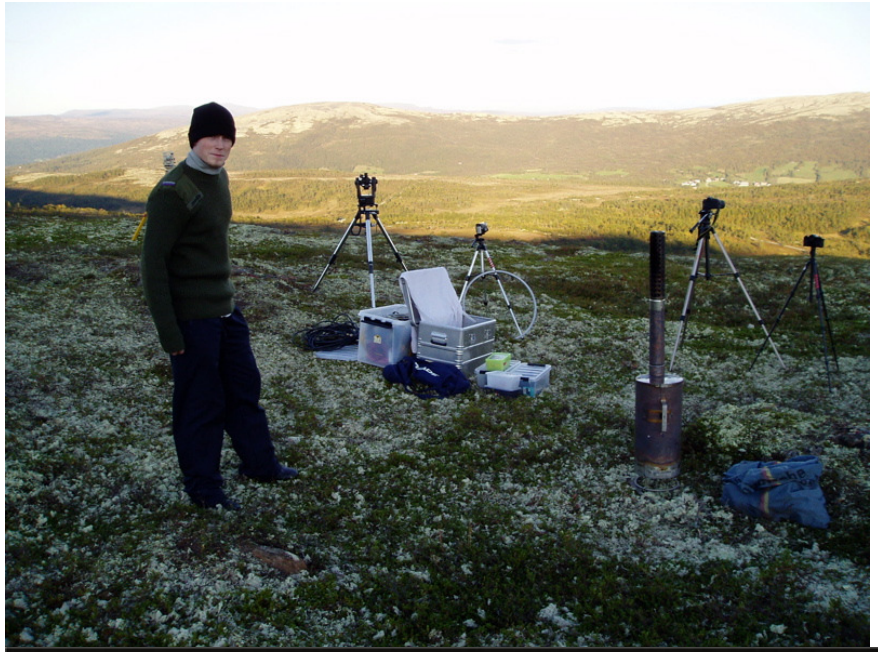
1 weeks project
Design parameters unknown before starting
Students decide budget
24 hours work intensity during the project
Risk takers and creators will be rewarded
Deliver on budget on time!!!
Destructive evaluation
Conducted publically with full media coverage

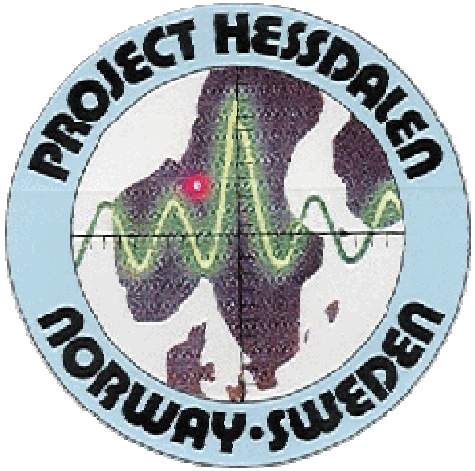

Rewarding Criteria
• Strength
• Cost
• Time consuming
• Design
• Creativity
• Team work


ROBOCOP
GAMMA 3





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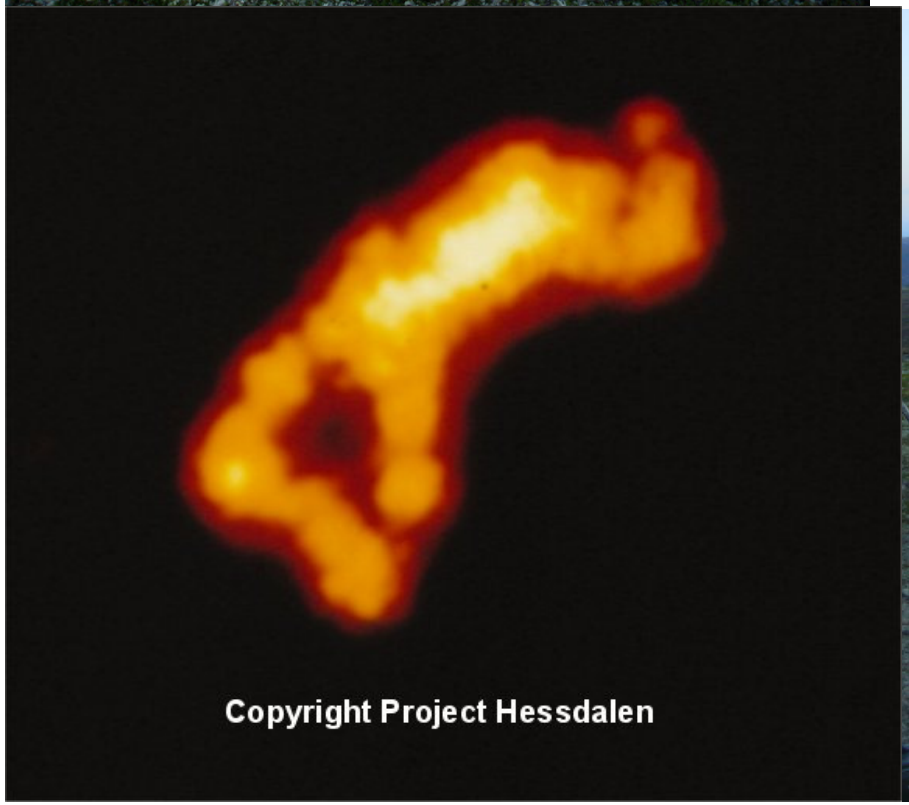
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2003 9 11

The MAMI concept of learning:

- **M = Mystery:** Create a real mystery that astonishes and starts the process of wondering.
- **A = Astonishment:** Positive astonishment gives basis for wondering and motivation.
- **M = Motivation:** Creates a need for new knowledge that helps solve the mystery.
- **I = Insight:** Need for knowledge creates insight.

BLUE BOX

Italian/Norwegian permanent research station

•RADAR

Process development

*Structured idea development process

•Ideaswarming

•Idea refinement

•Plan development

Idea-swarming phase 1

- **Teamwork with association-tools**

Idea-swarming phase 3

- **Idea refinement**

Idea description

Analysis/report writing and plan development

Final presentations

3 Year Program

FIRST YEAR	
Subjects	**%**
Entrepreneurship	25
Mechatronics	42
CAD, Computer aided design	16
Mathematics	16
Total	100

SECOND YEAR	
Subjects	**%**
Product development & design	25
Construction & machinery	25
Business development	15
Young Enterprise Graduate Pr.	20
Mathematics	15
Total	100

THIRD YEAR	
Subjects	**%**
Project control & economy	15
Financing & analyses	15
Marketing	15
Automation & digital control	25
Business development project	30
Total	100