Study @ University?

Learning just by doing

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Is this what we will see the coming years?

"I don't love studying. I hate studying. I like learning. Learning is beautiful."

- Natalie Portman

@ engineering (me: electronics & control)
Our Satellite Building Strategy (educational strategy)

• Prof Bob Twiggs (CalPoly) was founder of Cubesat Idea (around 2000)

• Idea: to enable students to design, build, test and operate a spacecraft

• First cubesat launch was in 2003 (AAU CUBESAT was onboard)

• AAU concept:

  • 100 % DIY no COTS
  • Student do all parts of process:
    • Analysis
    • Design
    • Manufacturing
      • Soldering, assembly,...
      • Mech, SW,...
    • Test
    • Dialogue with launch provider
    • ....
  • Teachers do “nothing”
Becoming an engineer - the Satlab way

• Best way of learning is - just to do it
• Problem & project based learning principle
• Project groups/teams of 4-7 each semester
• 50% of time for project, rest for lectures
• Very efficient
but - no free meals ...

- Project ends up with a functional prototype (fp)
- Educational credits for...
  - methodology, knowledge, innovation, demonstration
- No educational credits for moving from fp to flight quality!
- Nobody will send a functional prototype in orbit
coming to the real satellite

- Summer holiday, Christmas, weekends, nights,...
- Parallel with their normal study

- ESTIMATE
  - 40% of work is *within* study
  - 60%+ of work is voluntary work - not creditable by Uni
    - also for staff ;-

- So no free meals
Fun - but not only fun

- Research based
- Semi pro quality
- Results of high quality
- Useful in Industry and science
- (last 10 years two spinoff of space companies)
Our initiating problem/request

- Mission proposed by the Danish Maritime Authority
- In charge of the safety in Danish territorial waters
- This includes Greenland

- Sovereignty & Safety
- Practically impossible to monitor from land and sea
- Increased traffic
- Increased risk

IS THIS POSSIBLE FROM A CUBESAT?
What is applicable in a 10cm * 10cm * 10 cm cubesat?

- Optics? “No”
- Radar? No
- AIS? Yes
- Student project? Yes

Contains
- Theory (radio signals)
- And usual cubesat stuff
  - communication
  - power systems
  - flight planner, logsystems...

- All in all suitable for the mission, educational and research purpose
2014 13th February - 45000 messages downloaded
“CV”

- 1992-2006 Ørsted (first danish satellite) - pro science
- 2001-2003 AAU Cubesat 2 month of “operations”
- 2003-2005 ESA SSETI EXPRESS 14 hours of operations
- 2003-2008 AAUSAT-II +1 year of operations...
- 2004-2006 Baumanetz OBC lost during launch
- 2006-2011 GENSO global ground station system
- 2008-2009 AAUSAT3/BEXUS ballon flight(DLR, SSC,ESA)
- 2007-2013 AAUSAT3 AIS receiver +1 year of operations
- 2010-2015 DLR-AISAT AIS receiver – around the corner

Upcoming (in production line)

- 2013-2014 AAUSAT4 SDR AIS ng ESA FYS
- 2014-2016 AAUSAT5 SDR AIS ng (ISS launch Oct 2015)
Concluding remarks

• Fun fun fun
  • for students - for staff
  • “in the press”

• international coop (ESA, ESERO Norway)

• Very very skilled students/engineers

• Has spread to high schools (cansats, ballons,...)

• Makes it more fun to come to work :-(