GNSS Curriculum Development

Chris Rizos

Back in 2004 (WG on the implementation of recommendations of the Action Team)…

"… support should be provided for capacity-building through GNSS education and training….

Via?

U.N. Regional Centres for Space Science and Technology Education

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Why?

➢ …capacity-building for whom?…engineers, educators, administrators, policy-makers…

➢ …education or training?…yes, we need to be pedantic…

➢ …lack of structured and generic GNSS learning materials?…free of HW, national or educational institution bias…

➢ ***There are models***…

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What is available?

➢ University courses…typically semester length, parts of UG & PG programmes…

➢ Short courses…commercial, HW vendors, industry, institutions (e.g.ION, U.N.), adhoc…

➢ Books…

➢ Online materials… self-pace courses & turorials, SW tools, etc…

➢ *In the future podcasts?…*

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UNOOSA courses

- ➢ Satellite Communications
- ➢ Satellite Meteorology & Global Climate
- ➢ Remote Sensing & GIS
- ➢ Space & Atmospheric Science
- ➢ *35 weeks (Lec/Tut 40/60) (200x6hr) (2 modules + fieldwork) + one year project in participant's home country*

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Bangalore, India, 18 June - 18 July 2008

- ➢ "International Training Course on Satellite Navigation & LBS"
- ➢ Space Applications Centre, ISRO, Ahmedabad
- ➢ 18 participants from 10 countries
- ➢ 120 hours… approx 50% lectures
- ➢ *Module 1… Basics of Satellite Navigation*
- ➢ *Module 2… Applications of Satellite Navigation with Special Emphasis on Location Based Services*

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Why standardise courses?

➢ Standard set of teaching materials

➢ Ability to interchange teachers

➢ Easier to update

➢ Easier to develop "add-ons" (advanced or app-specific courses)

➢ Accreditation (award "advanced standing" for university programmes)

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ICG GNSS curriculum: issues

➢ Varying backgrounds of students… depth?

➢ Variety of end-users… breadth?

➢ Training or education?

➢ Delivery mode?

➢ "Hands-on" exercises?

➢ Custom designs… no reuse?

➢ *Universities typically offer 40-60hr (F2F) semester courses*

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GNSS curriculum: *how much can you squeeze into 120hrs?*

Module 1: 3d (18hrs)

- Coordinates & reference systems
- Satellite orbit principles
- Introduction to GPS & GNSS
- Measurements & modelling
- Positioning principles
- Information sources

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GNSS curriculum: *how much can you squeeze into 120hrs?*

Module 2: 3d (18hrs)

- Introduction to GPS receivers
- Receivers & applications
- Other GNSS
- RNSS & SBAS
- Single point positioning
- GPS performance

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GNSS curriculum: *how much can you squeeze into 120hrs?*

Module 3: 3d (18hrs)

- Advanced tracking principles
- Errors & biases
- Optimal estimation principles
- DGPS/DGNSS
- CPH-based positioning
- Standards & interoperability

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GNSS curriculum: *how much can you squeeze into 120hrs?*

Module 4: 3d (18hrs)

- Geodesy & scientific applications
- Surveying & mapping
- Industrial applications
- Air & marine navigation
- LBS & infomobility applications
- *The Future*

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GNSS curriculum: *how much can you squeeze into 120hrs?*

Labs/Fieldwork: 3hr each (18hrs)

- Internet tools… satviz, geoid, SDR rx, DGPS, IGS…
- Matlab/Excel… SPP, coord conversion/transformation, bias algorithms…
- Receiver interfacing… NMEA, RTCM/RTCA, NTRIP, RINEX, I/O OEMs…
- Commercial SW… CPH & PR data processing, web…
- App-specific… survey & GIS, car nav, LBS, etc…
- Outdoor pracs… handheld nav, accuracy tests, CPH, RTK/DGPS, kinematic tests, LBS…

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GNSS curriculum: *how much can you squeeze into 120hrs?*

Extras (12hrs)

- Seminars
- Introduction/feedback/graduation
- Demonstrations
- Field visits
- Extra tutorials
- ...

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Where to from here?

➢ 2009, two more GNSS courses (Morroco & Mexico)… local university teachers, a variation on Bangalore course?…

➢ Engage WG-C members in discussion on GNSS curriculum design…

➢ Strawman proposal…

➢ Evaluation of options & experiences…

➢ *Outcome*

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