Laboratory works on control theory using Scilab/Xcos

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Control theory course:
- Bachelor studies, terms 7 and 8;
- The course consists of:
  * lectures (terms 7 and 8);
  * seminars (terms 7 and 8);
  * laboratory classes (term 7).
- Laboratory classes:
  * 16 hours;
  * 8 classes (2 hours);
  * 4 classes (4 hours).

Term 7:
- Linear dynamical systems and their dynamical characteristics;
- Structure of linear dynamical systems;
- Stability of linear dynamical systems;
- Tuning of single-loop systems with typical linear regulators (P, I, PI, PID);
- Linear dynamical systems under influence of random disturbances.
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Laboratory works:
- Computer simulation;
- Remote laboratory works.

Software:
- calculation;
- Simulation;
- Free;
- Accessible for students (computers).
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Laboratory works:
1. Dynamical units and their connections.
2. Control plant parameters identification for integrating and non-integrating plants.
3. Typical linear regulators and their characteristics.
4. A single-loop control system with typical linear regulators (P, I, PI).
5. A single-loop control system with a PID-regulator.

Laboratory works, opportunities:
1. Different variants of units and structures.
2. Different variants of plants.
3. Different regulators, PD and real-PID including.
4. Varying tuning parameters, plant parameters, applying different disturbances, etc.
5. Varying tuning parameters, plant parameters, applying different disturbances, etc.
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Laboratory work №1. Dynamical units and their connections
Laboratory work №2. Control plant parameters identification for integrating and non-integrating plants.

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Laboratory work №3. Typical linear regulators and their characteristics.

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Laboratory work №4. A single-loop control system with typical linear regulators (P, I, PI).
Laboratory work №5. A single-loop control system with a PID-regulator.

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Conclusions

1. Five laboratory works for bachelor students on the control theory course have been considered.
2. The laboratory works may be carried out in Matlab/Simulink or Scilab/Xcos, the latter is free, non-demanding and easy to master and use.
3. The laboratory works are suitable for both regular students and remote students.
4. Doing the laboratory works the students improve their simulation skills and control theory knowledge.
5. The students can use Scilab/Xcos not only for these laboratory works but also for homeworks, projects, bachelor work, etc.
Thank you for your attention!

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