# Universität Koblenz-Landau

**FB 4 Informatik**

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**Prof. Dr. Viorica Sofronie-Stokkermans**                                            **June 19, 2014**

### Exercises for "Formal Specification and Verification"
### Exercise sheet 5

We use the following abbreviations in LTL:

- The future diamond $\Diamond \phi := \top \mathcal{U} \phi$

- The future box $\Box \phi := \neg \Diamond \neg \phi$

**Exercise 5.1:**
Let $TS = (S, \rightarrow, L)$ be a transition system and let $\pi = s_0 \rightarrow s_1 \rightarrow s_2 \rightarrow ...$ be a path in $TS$.

Show that:

(1) $\pi \models \bigcirc(\phi \rightarrow \psi) \rightarrow (\bigcirc \phi \rightarrow \bigcirc \psi)$

(2) $\pi \models \Box(\phi \rightarrow \psi) \rightarrow (\Box \phi \rightarrow \Box \psi)$

(3) $\pi \models \bigcirc \neg \phi \rightarrow \neg \bigcirc \phi$

(4) $\pi \models \neg \bigcirc \phi \rightarrow \bigcirc \neg \phi$

(5) $\pi \models \Box \phi \rightarrow \phi \wedge \bigcirc \Box \phi$

(6) $\pi \models \Box(\phi \rightarrow \bigcirc \phi) \rightarrow (\phi \rightarrow \Box \phi)$

(7) $\pi \models \phi \mathcal{U} \psi \rightarrow \psi \vee (\phi \wedge \bigcirc(\phi \mathcal{U} \psi))$

**Exercise 5.2:**
Show that there exists no transition system $TS = (S, \rightarrow, L)$ and no path
$\pi = s_0 \rightarrow s_1 \rightarrow s_2 \rightarrow ...$ in $TS$ with:

$$\pi \models p \wedge \Box(p \rightarrow \bigcirc p) \wedge \Diamond \neg p$$

Please submit your solution until Wednesday, June 25, 2014 at 11:00. Please do not forget to write your name on your solution.

Submission possibilities:

- By e-mail to `sofronie@uni-koblenz.de` with the keyword "Homework FSV" in the subject.

- Hand it in to me (Room B225) or drop it in the box in front of Room B224.