Checklists

Here you find two short checklists for the exam in Applied Analysis from February 21, 2014.
Checklist - What’s to do before the exam?

☐ Register in LSF-QISPOS. You have to register until the fourth day before the exam.

☐ Learn and practice! (see also the next checklist)

☐ I have tried the second and third mock exam.

☐ Go through the mock exams, script and the exercises. Concentrate and learn around the material coming up in one of the mock exams.

☐ I can state and I understand all named theorems.

☐ I can give all definitions from the lecture.

☐ It’s known to me, that in the exam no additional material is allowed, except a permanent pen and one double-sided A4 sheet of handwritten notes.

☐ Prepare your A4 sheet with notes.

☐ Be sure to have a permanent pen with you.

☐ Take your student identity card with you.

☐ The first exam is a written test.

☐ Appear for the first exam at 10 am in He18 E.20. The exam will be 2 hours long.

☐ The exam is closed. That means you can only take the second exam, if you don’t pass the first written exam.
Checklist - What should I learn for the exam (eventually not complete!)?

☐ **Metric spaces:** Learn the important definitions, e.g. convergent or Cauchy sequences; compact, complete metric spaces; open and closed subsets; continuous functions ...

☐ **Metric spaces:** Learn basic statements, e.g. the preimage of an open set under a continuous function is open, every continuous function on a compact set attains minima and maxima,....

☐ **Metric spaces:** Learn important statements, e.g. Banach’s fixed point theorem,....

☐ **Metric spaces:** You know basic examples, e.g. the Euclidean spaces ($\mathbb{R}^n, d_2$), the discrete metric, $\ell_\infty$, ...

☐ **Metric spaces:** You can check the definitions and use the statements in simple concrete situations.

☐ **Measurable spaces and measures:** Learn all important definitions, e.g. measurable maps, measurable functions, $\sigma$-algebras, measurable spaces, measure spaces, rings, pre-measures, ...

☐ **Measurable spaces:** You know basic implications, e.g. a continuous function is measurable with respect to the Borel-$\sigma$-algebra, every map is measurable if the $\sigma$-algebra on the domain is the complete power set,....

☐ **Measure spaces:** You know standard examples of measure spaces, e.g. $(\mathbb{N}, \mathcal{P}(\mathbb{N}), \zeta)$, $(\mathbb{R}, \mathcal{B}([0,1]), \lambda)$, ...

☐ **Measures:** You know how to construct measures (Carathéodory theorem). You know basic manipulations for example by using densities. You know that a measure is not completely determined on a set of generators (How is the condition on the set of generators such that this is true?). You know how to construct product measures, ...

☐ **Integral:** You know the definitions, e.g. The integral of a non-negative measurable function, What is the definition of an integrable function?, ...

☐ **Integral:** It is important to know and to be able to state all named theorems in this context, e.g. monotone convergence, dominated convergence, Fubini, Tonelli, ....

☐ **Integral:** You know the basic principle to show identities and inequalities for integrals: Show it for simple functions, use monotone convergence to prove the claim for positive functions and then decompose functions in a positive and a negative part to deduce the inequality/identity for all integrable functions, ....

☐ **Integral:** You know the definition of the spaces $L^p(\Omega, \Sigma, \mu)$, you know basic properties (e.g. they are complete, you know their norm, Hölder inequality,...) What is the difference to $L^p(\Omega, \Sigma, \mu)$?
- **Integral:** You can use all the above statements to calculate Lebesgue integrals in concrete situations.

- **Linear maps:** You can show that a map is linear. You are able to show that a linear map is bounded. What is the connection between linear bounded maps and continuous linear maps?

- **Property of good sets:** This should be familiar to you: Dynkin’s π-λ theorem, \( \sigma(\mathcal{E}) \), \( \text{dyn}(\mathcal{E}) \), ...

- **Property of good sets:** It is best to go through all the proofs in the lecture and the exercises and try them alone.

- **Countability:** You are able to decide which sets are countable and which not. You know which manipulations (e.g. countable union) of countable sets gives a countable set again and which not (e.g. countable product), ...

- **Last lectures:** You know the fundamental results about Hilbert spaces from the last lectures.