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 a 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 a 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, ℓ^∞, ...
- ☐ **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, σ-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-σ-algebra, every map is measurable if the σ-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 $\mathcal{L}^p(\Omega, \Sigma, \mu)$?

- ☐ **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, $\sigma(\mathcal{E})$, $\mathrm{dyn}(\mathcal{E})$,...
- ☐ **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.