Foundation in Analysis F4B1:
- Functional Analysis and PDE (winter term)
- PDE and Modelling (not every year)
- Global Analysis (winter term)

Lectures of Foundation modules may be taught in German.

Core Lecture Courses (taught in English):
- V4B1 Nonlinear PDE I (winter term)
- V4B2 Nonlinear PDE II (summer term)
- V4B3 Advanced Global Analysis I (winter term)
- V4B4 Advanced Global Analysis II (summer term)
- V4B5 Real and Harmonic Analysis (not every year)

Advanced Lecture Courses (taught in English):
- V5B1 Advanced Topics in Analysis and PDE
- V5B2 Selected Topics in Analysis and PDE
- V5B3 Advanced Topics in PDE and Mathematical Models
- V5B4 Selected Topics in PDE and Mathematical Models
- V5B5 Advanced Topics in Analysis and Calculus of Variations
- V5B6 Selected Topics in Analysis and Calculus of Variations
- V5B7 Advanced Topics in Analysis
- V5B8 Selected Topics in Analysis

Typical topics treated in advanced lecture courses include for example:
- Differential inclusions
- Entropy solutions
- Viscosity solutions
- Navier-Stokes equation
- Schrödinger equation, quantum mechanics
- Quasiconformal maps
- Gamma convergence, homogenization
- Global Analysis

Useful supplementary courses from other areas:
- F4E1/2 Scientific Computing I / II
- F4F1 Stochastic Processes
- F4D1 Geometry
- V4E1 Numerical Algorithms
- V4E2 Numerical Simulation
- V4F1 Stochastic Analysis
- V4F2 Markov Processes
- NP420 Theoretische Physik III (Quantenmechanik) (taught in German)
- NP520 Theoretische Physik IV (Statistische Physik) (taught in German)

You will find the list of modules that are actually offered in a given term in the course overview BASIS at https://basis.uni-bonn.de.

Please note that the summer/winter distribution can sometimes differ from the general schedule shown in the example curricula. Therefore please check BASIS first!
Recommended Curricula

- A good background in basic measure theory (Analysis III) is required and not part of our Master studies.
- Background in functional analysis (including Sobolev spaces) and classical theory of PDEs is needed. If lacking, this may be acquired in the module F4B1.
- **Option I** is intended for students who already have the complete background required.
- **Options II and III** are intended for students who do not have good knowledge of functional analysis yet.
- At least one advanced lecture course is offered each winter term. One or more may be additionally offered in some summer terms, but this is not guaranteed.
- A typical curriculum with specialization in Analysis should include 3 or 4 lecture courses in Analysis.

**Start in the Winter Term – October:**

- **Option I**
  1. Nonlinear PDE I
  2. Nonlinear PDE II or Real and Harmonic Analysis (+ Topics)
  3. Topics
  4. (Topics)

- **Option II**
  1. Functional analysis
  2. Nonlinear PDE II or Real and Harmonic Analysis
  3. Nonlinear PDE I (+ Topics)
  4. (Topics)

- **Option III**
  1. Functional Analysis + Nonlinear PDE I
  2. Nonlinear PDE II or Real and Harmonic Analysis
  3. (Topics)
  4. (Topics)

- **Option IV**
  2. Advanced Global Analysis I
  3. Advanced Global Analysis II
  4. Topics
  5. (Topics)
### Example Curriculum – Major Area B – Start in the Winter Term (October)

<table>
<thead>
<tr>
<th>Major (Area B)</th>
<th>Minor (Area F)</th>
<th>Minor (other)</th>
<th>Options</th>
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<tbody>
<tr>
<td>1 Nonlinear PDE I</td>
<td>Graduate Seminar</td>
<td>Markov Processes</td>
<td>e.g. Practical Teaching Course</td>
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<tr>
<td>9 CP</td>
<td>6 CP</td>
<td>9 CP</td>
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<tr>
<td>2 Nonlinear PDE II</td>
<td>Graduate Seminar</td>
<td>Adv. Top. in Probability Theory</td>
<td>Geometry</td>
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<td>6 CP</td>
<td>7 CP</td>
<td>Scientific Computing</td>
</tr>
<tr>
<td>3 Advanced Topics</td>
<td>Master's Thesis + Master's Thesis Seminar</td>
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<td>7 CP</td>
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<td>4 Selected Topics</td>
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<td>17-24 CP</td>
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<tbody>
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<td>1 Advanced Global Analysis I</td>
<td>Graduate Seminar</td>
<td>Algebraic Topology I</td>
<td>e.g. Practical Teaching Course</td>
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<td>Algebra</td>
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<tr>
<td>5 CP</td>
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</table>
Start in the Summer Term – April:

- **Option I**
  1. Nonlinear PDEs II or Real and Harmonic Analysis
  2. Nonlinear PDEs I ( + Topics)
  3. Topics
  4. (Topics)

- **Option II**
  1. Introduction to PDE (no credits for the master program!)
  2. Functional Analysis + Nonlinear PDE I
  3. Nonlinear PDE II or Real and Harmonic Analysis ( + Topics)
  4. (Topics)

- **Option III**
  1. PDE and Modeling
  2. Nonlinear PDE I ( + Topics)
  3. Nonlinear PDE II or Real and Harmonic Analysis
  4. (Topics)

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**Example Curriculum – Major Area B – Start in the Summer Term (April)**

<table>
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<th>Minor (Area F)</th>
<th>Minor (Area E)</th>
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<td>6 CP</td>
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<td>e.g. Practical Teaching Course</td>
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<td>2 Nonlinear PDE I</td>
<td>Graduate Seminar</td>
<td>Scientific Computing I</td>
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<td>External Internship Quantum Mechanics</td>
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<td>Statistical Physics Mathematical Finance</td>
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