"Spectral Sequence Seminar"

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Topic	Day	Participant
···	FIRST HALF	···
Introduction to the topic	March 4	Samuel
Main construction	March 11	Abel
Convergence and extensions	March 18	Rolf
Serre Spectral sequence	March 25	Samuel
Computations of different sequences	April 1	Thomas
···	SECOND HALF	···
Quillen's argument for homological stability	April 15	Alba
The Adams Spectral Sequences	April 22	Guy
Homotopical fixed points	April 29	Inbar
Spectral sequences in homological mirror symmetry	May 6	Jesse
Spectral systems and Eilenberg-Cartan systems	TBD	Rob
Applications in TDA	TBD	Bernat
TBD	TBD	···

First Half

Lecture 1 (Samuel Castelo Mourelle) 04/03/2026

First, we will see a quick overview of the history of the development of spectral sequences. Secondly, we will see some basic concepts and the main idea of the tool.

Here we have a link to the notes (not very clear) and slides used for the talk. HERE and HERE

Lecture 2 (Ábel Juhász) 11/03/2026

In this talk we will fully set up the algebraic machinery of Spectral sequences, giving a detailed description of the construction of the spectral sequence with it's differentials.

Here we have the link to the recording HERE
Passcode: n$1zLrcS

Lecture 3 (Rolf A. Vlierhuis) 18/03/2026

In this talk, we will look into some more practical aspects of working with spectral sequences. We will discuss convergence, extension and lifting problems and when they do or (hopefully) do not arise. On top of this, we will use spectral sequences to prove some cool topological results: we will show that cellular homology equals singular homology, and we will compute the rational cohomology ring of the Eilenberg-MacLane spaces $K(Z, n)$.

Here we have the link to the recording HERE
Passcode: Z7smqJVt

Lecture 4 (Samuel Castelo Mourelle) 25/03/2026
In this talk we will have an introduction to the Serre spectral sequence, seeing how the famous theorem for the second page.

Here we have the link to the recording HERE
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Lecture 5 (Thomas Rot) 01/04/2026
I will compute the cohomology ring of $K(Z, 1)$, $K(Z, 2)$, and the first eleven or so groups of $H^*(K(Z, 3), Z)$, with some partial information on the ring structure. I will also discuss Serre's exact sequence; this is an analogon of the long exact sequence of homotopy groups of fibrations, but then for (co)homology. This gives full information of the first few cohomology groups of a fiber bundle. This sequence is unfortunately not very long, it stops at some point.

Here we have the link to the recording HERE
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Second Half

Lecture 6 (Álba Sendón Blanco) 15/04/2026
In previous sessions of the seminar, we used spectral sequences to compute the homology of the Eilenberg MacLane spaces $K(Z, n)$. In this session, we will use spectral sequences to study the homology of the Eilenberg MacLane spaces $K(\Sigma_n, 1) = B\Sigma_n$, where Σ_n is the symmetric group. In particular, we will see that $B\Sigma_n$ and $B\Sigma_{n+1}$ are homologically equal in small degrees.

Here we have the link to the recording HERE
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Lecture 7 (Guy Boyde) 22/04/2026

I'll talk about the Adams Spectral Sequence, focussing on how you can use it to calculate stable homotopy groups of various spaces; in particular, I'll try to show you which part of the calculation can be done on a computer (and why that's possible) and with luck we'll manage to compute the first few stable homotopy groups of spheres.

Here we have the link to the recording HERE
Passcode: ci3tr?Yy

Lecture 8 (Inbar Klang) 29/04/2026

Lecture 9 (Jesse Straat) 6/05/2026