

# Advanced Seminar on Group Theory - SuSe 2021

## Cohomology of Profinite Groups

After an introductory talk that explains how to define the theory of cohomology of groups in the setting of profinite groups, we turn to selected cohomological topics. In particular, we study the cohomology of uniform pro- $p$  groups and the relation between the cohomology groups of discrete groups to those of their profinite completions (Cohomological goodness).

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### **TALK 1: Cohomology of Profinite Groups** (*23rd June 2021*)

Keywords: continuous cohomology of profinite groups, comparison with abstract cohomology. If possible give some examples.

Main source: Ch. 9, 10 of [Wi98]. In particular focus on sections 9.1, 9.2, 9.7 and 9.8.

It could be useful also to look at Ch. 6 (in particular section 6.1) and 7 of [Wi98] for further clarification of the notions of modules and group algebras in the setting of profinite groups.

### **TALK 2: Cohomology of Uniform Pro- $p$ Groups - a Lemma of Serre** (*30th June 2021*)

Keywords: uniform pro- $p$  groups, graded algebras for pro- $p$  groups, a lemma of Serre (Lemma 11.5.4 in [Wi98]).

Main source: Ch. 8, in particular Sec. 8.5, 8.6 and 8.7.

Sec. 11.5 of Ch. 11 of [Wi98].

### **TALK 3: Cohomology of Uniform Pro- $p$ Groups - a Theorem of Lazard** (*7th July 2021*)

Keywords: Poincaré duality groups, a theorem of Lazard (Theorem 11.6.1 in [Wi98]) and consequences (Theorem 11.6.5 in [Wi98]).

Main source: Ch. 8, 11 of [Wi98], in particular Sec. 11.6.

### **TALK 4: Cohomological Goodness** (*14th July 2021*)

Keywords: basic concepts and results from [Se97], selected results from [GJZ08].

Main source: Ch. I, Exercises from Sec. 2.6 of [Se97] and [GJZ08].

## References

- [GJZ08] F. Grunewald, A. Jaikin-Zapirain, P.A. Zalesskii, *Cohomological goodness and the profinite completion of Bianchi groups*, Duke Math. J. 144, 53-72, 2008.
- [Se97] J.P. Serre, *Galois Cohomology*, Springer-Verlag, Berlin, 1997.
- [Wi98] J. S. Wilson, *Profinite groups*, Clarendon Press, Oxford, 1998.