

REPRESENTATION THEORY

WS 2020/21

A. ORGANISATION

- LECTURES: → Mo. 8:00 - 9:30 / Room 48-562 + live stream
→ Th. 8:00 - 9:30 / Room 48-562 + live stream
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 ↑ Contact tracing (INTAKE)
→ link will be sent to registered participants via e-mail
- EXERCISES: → Th. 12:00 - 13:30 / In OpenOlat - BigBlueButton
→ Assistant: Bernhard Böhmler
- Registration: in the URM system by Fr. 30th of Oct, noon.

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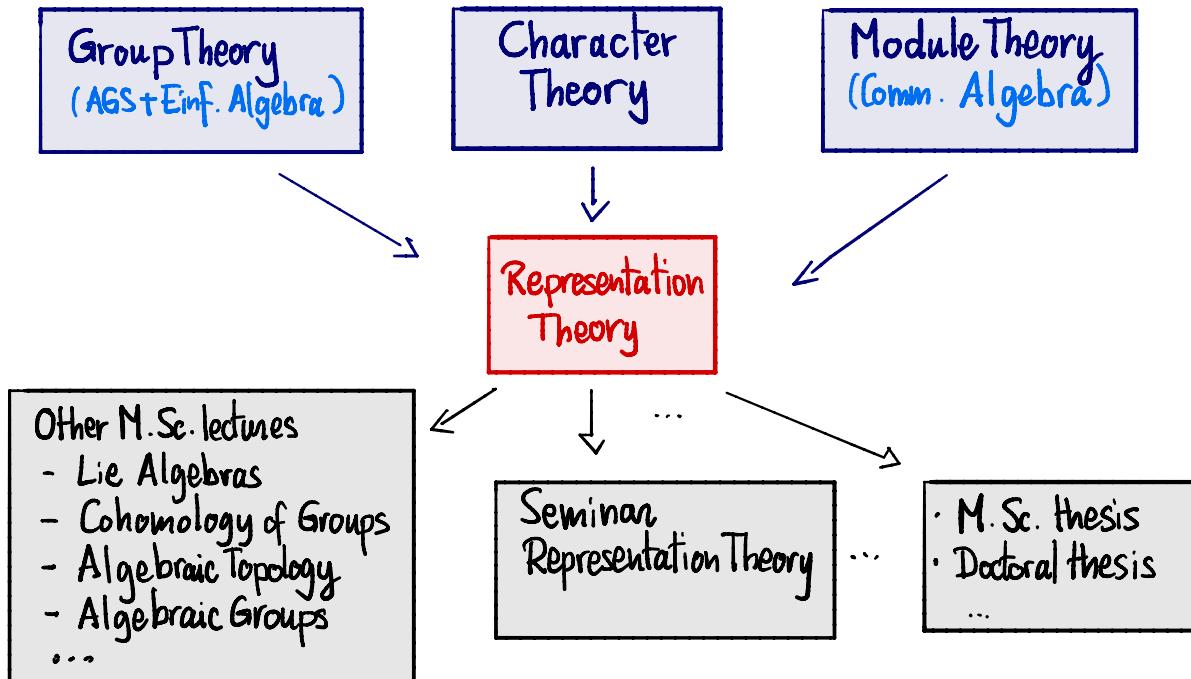
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- 2-week rhythm : tutorial/solution session /tutorial /solution session / ...
- Übungsschein: let us know this week if you to obtain one.
- Exercises : 6 Exercises per slot of two weeks
 - ↳ 3 example exercises to discuss during the tutorial
 - ↳ 3 exercises to work on on your own at home and hand in in OpenOLAT

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B. BEFORE AND AFTER



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C. BACKGROUND MODULE THEORY

The following elementary notions of module theory are assumed as known:

- Modules / submodules / homomorphisms / quotient modules
 - Free modules / projective modules
 - Direct sums / direct products
 - Exact sequences / short exact sequences
 - Tensor products
 - Algebras
- See Appendix 1 + Revision Sheet 0 (tutorial today 12:00 - 13:30)

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D. AIMS OF THE LECTURE

1. Study representations of finite groups over fields K of positive characteristic

$\rho: G \rightarrow GL(V)$ with $\begin{cases} \dim_K V < \infty \\ \text{char } K =: p \mid |G| \end{cases}$

\Updownarrow equiv. to

KG -module structure on V

Problems to overcome:

① Maschke's theorem not true \Rightarrow not every representation is semisimple!

② Character theory has major deficiencies! E.g. $\chi_p(1_G)$ only gives $\deg(\rho)$ modulo p .
 \Rightarrow Have to replace characters by "better" functions! \Rightarrow the "Brauer characters"