

REPRESENTATION THEORY WS 2020/21

A. ORGANISATION

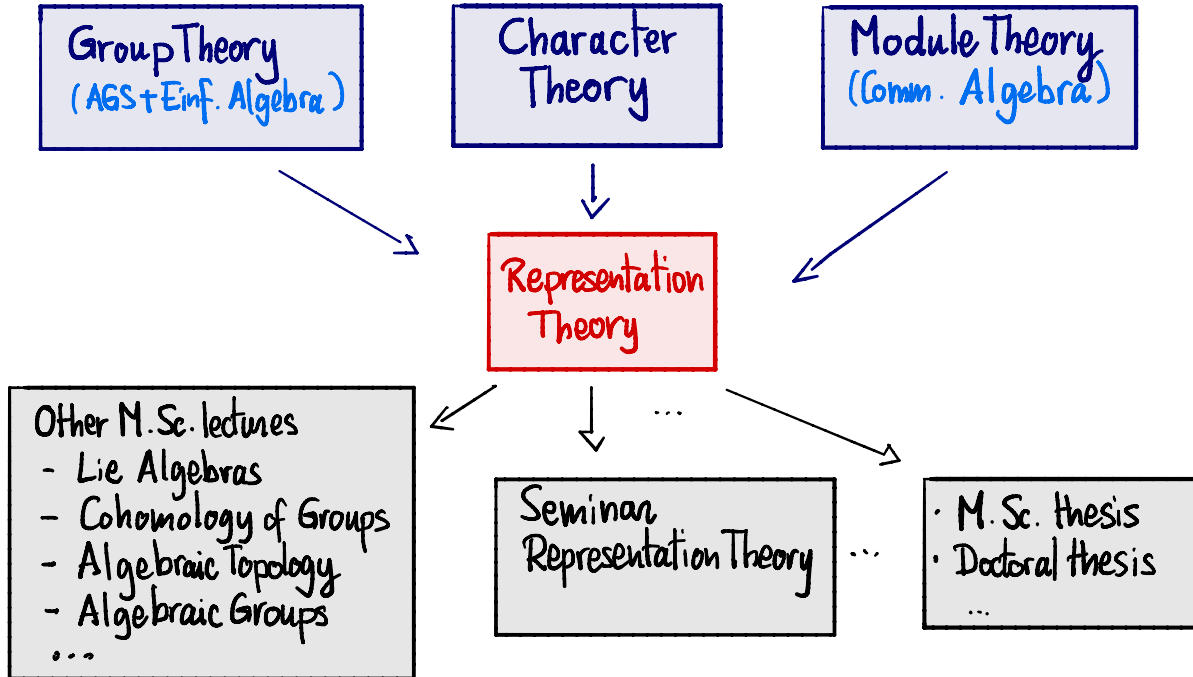
- LECTURES:
 - Mo. 8:00 - 9:30 / Room 48-562 + live stream
 - Th. 8:00 - 9:30 / Room 48-562 + live stream
 - ! Contact tracing (INTAKE)
 - EXERCISES:
 - Th. 12:00 - 13:30 / In OpenOlat - BigBlueButton
 - Assistant: Bernhard Böhmeler
 - Registration: in the URM system by Fr. 30th of Oct, noon.
- link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

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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



REPRESENTATION THEORY

WS 2020/21

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

$$\rho: G \rightarrow GL(V) \quad \text{with} \begin{cases} \dim_K V < \infty \\ \text{char } K =: p \mid |G| \end{cases} \quad \begin{matrix} \triangle \\ \textcircled{1}, \textcircled{2} \end{matrix}$$

\Updownarrow equiv. to

2. in particular through module theory over the group algebra KG

KG -module structure on V

Problems to overcome:

- ① Maschke's theorem not true \rightsquigarrow not every representation is semisimple!
- ② Character theory has major deficiencies! E.g. $\chi_\rho(1_G)$ only gives $\deg(\rho)$ modulo p .
 \rightsquigarrow Have to replace characters by "better" functions! \rightsquigarrow the "Brauer characters"