Concepts

- K-algebra, group algebra
- module, module homomorphism, kernel and image, submodule, factor module, finitely generated submodule, cyclic module, simple module, direct sum and direct product, direct summand
- basic concepts of category theory: objects, morphisms, epimorphism, monomorphism, isomorphism, product, coproduct
- K-dual of an A-module as a module, and the duality functor D
- $\mathrm{Hom}_R(M, N)$ as an Abelian-group or a vector space
- free modules, projective and injective modules
- quasi-cyclic group as a $\mathbb{Z}$-module
- composition series
- Jacobson radical
- semisimple module and ring
- nilpotent (one-sided) ideal
- radical of a module
- graph algebra, Loewy diagram
- local module, local ring
- ascending and descending chain condition
- split morphism
- irreducible morphism
- top and socle of a module
- Auslander–Reiten graph

Theorems

- Characterisation of free modules
- Projectivity of free modules, direct sums or direct summands of projectives
- 3 equivalent condtions for the projectivity of a module Ⓑ
- Projective modules in Mod-$\mathbb{Z}$ and in Mod-A
- Injectivity of direct products or direct summands of injective modules
- 2 equivalent conditions for the injectivity of a module Ⓑ
- Baer's criterion
- Injectivity and divisibility of Abelian groups
- Injective modules in Mod-$\mathbb{Z}$ and in Mod-A
- Every Abelian group can be embedded into an injective Abelian group Ⓑ
- Product and coproduct, epimorphism and monomorphism in module categories
- Decomposition of the regular module
- Jordan–Hölder Theorem
- 3 equivalent conditions for the semisimplicity of modules Ⓑ
- Submodule, factor module, direct sum of semisimple modules are semisimple
- Semisimplicity of a ring (2 equ. conditions)
- Characterization of the Jacobson radical (4 equivalent conditions)
- Wedderburn–Artin Theorem
- Radical of an A-module
- Krull–Schmidt Theorem
- Fitting Lemma
- 3 equivalent conditions for a module to be local
- The locality of an indec. projective A-module Ⓑ
- Indecomposable projective and simple A-modules
- Irreducible morphisms are either monomorphism or epimorphisms
- Irreducible morphisms going to projectives Ⓑ or from injectives
- Bounded component of the Auslander–Reiten graph
- Harada–Sai Lemma Ⓑ