LEARNING MODULE DESCRIPTION

**GENERAL INFORMATION**

 • Module title: **Algebra**

 • Term: **summer 2016**

 • Duration: **30 hours** of lectures and **30 hours** of practical classes

 • ECTS: **5**

 • Module lecturer: **prof. dr. hab. Wojciech Gajda**

 • E-mail: gajda@amu.edu.pl

 • Language**: English**

**DETAILED INFORMATION**

 • Module aim (aims) **to introduce students to selected topics and notions of advanced algebra which are basic tools in various fields of mathematics, e.g., in number theory and in algebraic geometry.**

 • Pre-requisites in terms of knowledge, skills and social competences (where relevant): **We assume that students passed lower algebra courses including Algebra 1 and Linear Algebra 1 (in Polish) or equiavalents.**

**READING LIST**

 M.Artin, *Algebra,* 2nd. edition, Pearson 2010.

 D.Dummit, R.Foote, *Abstract Algebra,* 2nd edition, 2006.

 M.Atiayh, I.MacDonald, *Introduction to Commutative Algebra,* 3rd edition, Prentice Hall 2000.

 N.Jacobson, *Basic Algebra I, II, 2nd edition,* Dover Publs. 2009.

 S.Lang, *Algebra,* 3rd edition, Springer Verlag 2002.

 P.Grillet, *Abstract Algebra,* Springer 2007.

 B.van der Wandern, *Moderne Algebra I, II,* Springer Verlag 1931.

 T.Hungerford, *Algebra,* Springer 1980.

 S.Mac Lane, *Categories for the working mathemtician,*  Springer Verlag 1971.

**SYLLABUS:**

Week 1: Repetitions in group theory: quotient groups, isomorphisms theorems, group actions on sets and Cayley theorem.

Week 2: Class equation, p-groups, theorems of Cauchy and three theorems of Sylow

Week 3: Applications of Sylow theorems, classification of groups of small order, simple groups

Week 4: Direct products of groups, finitely generated abelian groups

Week 5: Nilpotent and solvable groups

Week 6: Repetitions in ring theory: ideals and quotient rings, isomorphism theorems, Chinese reminder theorem, Euclidean domains (ED), principle ideal domains (PID)

Week 7: Unique factorization domains (UFD)

Week 8: Introduction to theory of modules

Week 9: Modules over PIDs

Week 10: Modules over PIDs (ctn)

Week 11: Noetherian domains

Week 12: Noetherian domains (ctn)

Week 13: Discrete valuation domains

Week 14: Dedekind domains

Week 15: Dedekind domains.