MTH 301 - GROUP THEORY

SEMESTER 1, 2016-17

November 10, 2016

General information

Classroom: L11, LHC
Schedule: Mon, Thu : 10:00 - 10:55 PM & Tue: 5:00 - 6:00 PM
Webpage: `http://home.iiserb.ac.in/~kashyap/MTH 301/mth301.html`

Contact information:

Instructor: Dr. Kashyap Rajeevsarathy
Office: Academic Building 1, Room 314
Office hours: Fri, 10:00 - 11:00 AM
E-mail: `kashyap@iiserb.ac.in`

Topics

- Definition of group, basic properties, examples (Dihedral, Symmetric, Groups of Matrices, Quaternion Group, Cyclic, Abelian Groups)
- Homomorphisms, Isomorphisms, subgroups, subgroup generated by a set, subgroups of cyclic groups
- Review of Equivalence relations, Cosets, Lagrange's theorem, Normal subgroup, Quotient Group, Examples, Isomorphism theorems, Automorphisms
- Group actions, orbits, stabilizer, faithful and transitive actions, centralizer, normalizer, Cayley's theorem, Action of the group on cosets

- Conjugation, Class equation, Cauchy's theorem, Applications to p-groups, Conjugacy in S_n
- Sylow theorems, Simplicity of A_n and other applications
- Direct products, Structure of Finite abelian groups
- Semi-Direct products, Classification of groups of small order
- Normal series, Composition series, Solvable groups, Jordan-Hölder theorem, Insolvability of S_5
- (If time permits) Lower and upper central series, Nilpotent groups, Basic commutator identities, Decomposition theorem of finite nilpotent groups

Suggested books

1. I. N. Herstein, Topics in Algebra, 2nd Edition, Wiley, 2006
2. T. W. Hungerford, Algebra, Springer Verlag, 2005
3. M. Artin, Algebra, Prentice-Hall of India, 1994
4. D. S. Dummit, R. M. Foote, Abstract Algebra, 2nd Edition, Wiley
5. J. Rotman, A First Course in Abstract Algebra : With Applications, Prentice Hall
6. J. Rotman, An Introduction to Theory of Groups, Springer GTM, 1999
7. H. Kurzweil, B. Stellmacher, The Theory of Finite Groups, Springer Universitext, 2004
8. M. Suzuki, Group Theory I, Springer GMW 247

Homework policy

- Homework assignments will be due every other week. The problems to be turned in and the due dates will be posted on the course webpage. So it is your responsibility to regularly check the course webpage for any updates.

- If you must miss the class on a due date, try turning in your assignment in advance or have some one else turn it in for you.
- Problems written should be legible and must clearly indicate the steps used to arrive at the solution.

Quiz and exam policy

- Up to two quizzes may be administered during the course of the semester - one before the midterm and another before the final. The syllabus for the quizzes with be announced in class.
- The schedule for the midterm and final exams will be as per the academic calendar.
- The topics for the midterm exam will be announced in class in due course. However, the final exam will be comprehensive with more emphasis on topics that will be discussed after the midterm exam.
- No books, notes, or electronic devices of any kind may be used during exams.
- When graded exams or quizzes are returned, please check them carefully for any grading errors. All grading issues should be brought to my attention as soon as possible. Note that your scores are not renegotiable after the final grades are submitted.
- Do not make travel plans that might prevent you from taking any scheduled exam or quiz. If you have a verifiable reason why you cannot be present at an exam, you must contact me in advance to make an alternative arrangement.

Grading Scheme:

A total of 100 percentage points will be distributed as follows:

- Homework - 20 %
- Midterm - 30 %
- Final Exam - 50 %