**Syllabus for Math 842**
**Applied Algebra Methods in Wireless Communication**
**Spring 2013**

**Instructor:** Shamgar Gurevich, 317 VV.
**TA:** Jon Lima.
**Time and Location:** Lectures: VAN VLECK B129, 01:00 PM - 02:15 PM, TR
**Office Hours:** Tuesdays 11am–1pm.
**Texts:** Course notes.
**Grading:** Team project (three people in a team).

**Topics:**

1. **Problems and Solutions.**
   - GPS.
   - Radar.
   - Communication.
2. **Channel Model:**
   - Delay, Doppler, Multipath, Noise.
   - Doppler Shift vs. Scaling.
   - Complex Attenuation.
3. **Sampling and Interpolation:**
   - D-to-A.
   - A-to-D.
   - Cyclic Prefixing.
   - Reduction to Digital Problems.
4. **Programing.**
   - Solving GPS using pseudo random vectors.
   - CPU and Fast Fourier Transform.
   - Noise and Integration.
5. **Fast GPS (CPU):**
   - Sketch of the Cross Method Solution.
   - Heisenberg Group and Representations.
   - Commuting Operators and Chirp Sequences Construction.
6. **Programing:**
   - Cross Method for Fast GPS.
7. **Communication:**
   - CDMA - Poor Capacity.
   - OFDM - Static Users.
   - Communication with Localized functions.
8. **Programing:**

- Communication Protocols.

9. **Radar:**
   - Car Radar Problem.
   - Sketch of the Cross Method Solution.
   - Resolving the Radar Ambiguity.
10. **Programing:**
    - Solution to Radar Problem.
11. **Projects Presentations.**

**Good Luck!**