Instructor. Dr. Gregory P. Starr—I consider myself to be a shadetree mechanic who learned some math; I have always been fascinated with things that move (that’s why I’m not a civil engineer). My office is ME 423, 277-6298; MTTC 242, 272-7156, email address starr@unm.edu, office hours generally 11:00 - 1:00 MWF.

Goal of Course. Modern mechanical systems are increasingly being controlled by digital electronics, yet many mechanical engineering programs have not incorporated this topic into the curriculum. Also, ABET has recently emphasized the importance of design in engineering education. The LEGO Robot Competition is a course which addresses the integration of digital electronics and mechanical design, along with software development, real-time control, testing and evaluation, and working on a team.

Textbook. We are very fortunate that Robotic Explorations—A Hands-On Introduction to Engineering has finally been published. Fred Martin, the author, is the man most responsible for the pioneering LEGO robot course at MIT. Additional documentation will be on my website.

Mailing List. A UNM mailing list (LEGO-L) exists for this course. I will email announcements, etc., so you should subscribe by sending a message to: listserv@list.unm.edu, leave the Subject field blank. In the body of message type (with no other text): subscribe LEGO-L Firstname Lastname

Once the subscribe request is approved, a notification will be emailed to the person.

Topics. In roughly chronological order:

- **Electronic Assembly Techniques.** Soldering; component types and polarity; component marking and mounting. In contrast to previous years, we will NOT be assembling the Handy Boards from discrete components. There was just too much trouble with non-functioning boards! So you miss that part of the LEGO Robot “experience”...

- **Handy Board Architecture.** Discussion of the features and connections on the Handy Board. Introduction to Interactive-C and the associated development environment.

- **LEGO Design.** Fundamental LEGO lengths and the key to building structures with integrity; LEGO gearing design including spur, planetary, and worm gear drives; chain drives.

- **Motors.** DC motors, ratings and specifications, measuring motor torque, speed-torque relationships, pulse-width modulation drive; Servo motors, their control and application.

- **Sensors.** Sensors as transducers; sensor inputs on the single-board computer, including analog and digital inputs; infrared optical sensors and interface hardware and software; incremental encoders and interface hardware and software; sensor calibration; importance of well-constructed cables and connectors.

- **Robot Control.** Basic control methods, including open-loop and feedback control; characteristics of proportional and integral control actions and their effect of robot guidance; sensor reliability and the importance of redundancy.

- **Robot Software.** Software design principles, use of separately-compiled modules and run-time linking of code; tutorial on the Interactive C package and its differences from ANSI C; multi-tasking; use of assembler-language code modules.

Grading Policy. A students’s grade in the course is based on weekly individual and team reports, their team’s final report, and peer evaluation by fellow team members.

- **Weekly Reports.** An individual report is due each Friday. Individual reports summarize that team member’s activity during the week, and their plans for the next week. There will also be team presentations, which may include informal demonstrations of their robot’s functionality. The team presentations will usually be videotaped.

- **Milestones.** Periodic milestones are required of each team, ensuring that the project will be completed on schedule.

- **Final Report.** A final report is required of each team, with documentation of all steps of their project, both hardware and software.