

UMCP PHYS 485 and 685 Syllabus Fall 2015

Professor

Daniel P. Lathrop

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Teaching Assistant

Ruben Rojas

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Course Emphasis

Physics 485/685 are courses in modern electronics with an emphasis on hands-on laboratory work and topics that are useful as career skills.

Lecture meets Monday and Friday 2-2:50 p.m. in Room PHYS 0405.

There is one laboratory section each week on Wednesday in Room PHYS 3321 nominally from 1-4:50 p.m. A student ID card swipe is necessary for access to the laboratory area.

Textbooks/Manuals

Required

- 1) *Building Scientific Apparatus*, Forth Edition, Moore, Davis and Coplan, Cambridge University Press, 2009.
- 2) *Physics 485/685 Laboratory Manual*, Department of Physics, University of Maryland at College Park, Spring 2009 Edition. Available online.

Recommended references

- 1) *The Art of Electronics*, Second Edition, Horowitz and Hill, Cambridge, 1989.
- 2) *CMOS Cookbook*, D. Lancaster, Howard W. Sams and Co., 1997
- 3) *Lancaster's Active Filter Cookbook*, D. Lancaster, Butterworth-Heinemann, 1996.
- 4) *IC Op-Amp Cookbook*, W. G. Jung, McMillan Computer Publications, 1986.
- 5) *A Practical Introduction to Electronic Circuits*, Second Edition, M. H. Jones, Cambridge, 1985.
- 6) *Scientists Must Write, A guide to better writing for scientists, engineers, and students*, Second Edition, Robert Barrass, Routledge, 2003

Laboratory Notebooks

Each student should obtain a bound laboratory notebook in which all data and descriptive information about each experiment is to be recorded in pen not pencil. The laboratory notebook should have a table of contents on the first page (added to over time) to aid in locating the different experiments. It should be possible to reconstruct the experiment from the information in the laboratory notebook. Errors should be crossed out with a single line rather than erased or obliterated. Often an incorrect calculation or circuit will contain information that

is useful later on. The laboratory experiments for Wednesday will routinely be discussed in class on Monday, and it is recommended that the laboratory notebook be brought to lecture. The laboratory experiments are flexible by design allowing students latitude in pursuing individual interests. Descriptions of the experiments are given in the Laboratory Manual along with data sheets for the devices used in the experiments. Operation manuals for all the laboratory equipment are available in the laboratory.

PHYS 485/685 Laboratory Reports

Format will be discussed in lecture.

Grades

The semester grade for the course will be determined in the following way:

PHYS 485

| | |
|--------------------------|-----|
| Lab reports | 60% |
| Participation in lecture | 10% |
| Homework | 15% |
| Project | 15% |

PHYS 685

| | |
|-----------------------------------|-----|
| Lab reports | 55% |
| Participation in lecture | 10% |
| Homework | 10% |
| Project (by design more advanced) | 15% |
| Linkedin page content | 10% |

PRELIMINARY LECTURE SCHEDULE

PHYS 485/685 tentative schedule

Week

| | | |
|--------|--|-----------------------------|
| 31-Aug | Overview / passives | |
| 7-Sep | Passives and how LRC permeates all physical systems | |
| 14-Sep | Diodes | |
| 21-Sep | Transistors | |
| 28-Sep | FETS, MOSFETS, IGBTs | |
| 5-Oct | Op amps | |
| 12-Oct | Soldering, smoke and mirrors, how things fail (when the smoke comes out) | |
| 19-Oct | Houston we have a problem (debugging strategies) | |
| 26-Oct | Grounds | |
| 2-Nov | Discrete logic | |
| 9-Nov | Arduino | |
| 16-Nov | Sensors | temperature, magnetic field |
| 23-Nov | Sensors and photonics | optical, particle |
| 30-Nov | Actuators | solenoids, motors |
| 7-Dec | Actuators | Magnetic, pneumatic |
| 14-Dec | No Final | |