

**NORTHERN MICHIGAN UNIVERSITY**  
**Department of Electronics**  
**Fall Semester 1996**

**ET 210: DISCRETE SEMICONDUCTORS (4 credits)**

Lecture: JC 106W Monday, Tuesday, Wednesday 8:00AM

Laboratory: JC 111W Thursday 8:00AM

Instructor: Bob Laurie

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Office Hours: Monday 11AM-Noon, 1PM-3PM; Tuesday 11AM-Noon, 3PM-4PM;  
Wednesday 11AM-Noon, 1PM-3PM; Thursday 5PM-6PM and by arrangement.

Course Summary

This course will explore basic semiconductor devices and their application in electronic circuits. The major electronic devices covered are diodes, bipolar transistors, field effect transistors, thyristors, and voltage regulators. Power supplies, amplifiers, and other electronic circuits will be designed using these semiconductor devices. This is the second in a sequence of foundation electronics classes. ET110 is the prerequisite.

Books

*Paynter's Introductory Electronic Devices & Circuits*, 3rd Ed., 1994, Prentice-Hall.

Paynter, Robert, *Lab Manual - Introductory Electronic Devices*, 3rd Ed., 1994, Prentice Hall

Grades

Scores received from exams, quizzes, and lab reports will be used to compute final grades. The point values and grading scale are described below. I encourage students to study together and will not curve scores. Class attendance is mandatory. Quizzes cannot be made up, unless a valid documented reason is provided.

| SCORES:    |       | SCALE: (% of points) |                |
|------------|-------|----------------------|----------------|
| Quizzes    | 60    | A 93 - 100           | C 73 - 76      |
| Exam 1     | 100   | A- 90 - 92           | C- 70 - 72     |
| Exam 2     | 100   | B+ 87 - 89           | D+ 67 - 69     |
| Final Exam | 130   | B 83 - 86            | D 63 - 66      |
| Laboratory | 110   | B- 80 - 82           | D- 60 - 62     |
| Total      | = 500 | C+ 77 - 79           | F 59 and below |

Laboratory

A lab report is required for each lab. The lab report should contain an objective section, procedure section, discussion section with diagrams, and a conclusion section. Grading will be 80% objective (results, explanations, conclusions) and 20% subjective (neatness, clarity, conciseness, extra work). The lab report is due one week after the lab is assigned. If the lab report is late, 10% will be deducted for each workday late. Lab attendance is mandatory. You will receive a zero for the lab if you are absent, unless a valid documented reason is provided.

**NOTICE:** If you have a need for disability-related accommodations or services, please inform the Coordinator of Disability Services in the Disability Services Office at 405 Cohodas (Tel: 227-1550). Reasonable and effective accommodations and services will be provided to students if requests are made in a timely manner, with appropriate documentation, in accordance with federal, state, and university guidelines.

## ET 210 Course Schedule - Fall Semester 1996

| Date:  | Topics:   | Read Before Class:   |
|--------|---|----------------------|
| Aug 26 | Solid State Physics - Atoms and Doping                    |                      |
| Aug 27 | Junctions and Biasing                                     | 1.0 to 1.4           |
| Aug 28 | Diodes: Ideal, Practical, and Complete                    | 2.0 to 2.4           |
| Aug 29 | No Lab  |                      |
| Sep 3  | Diodes: Considerations, Data Sheets, and Zeners           | 2.5 to 2.8           |
| Sep 4  | Diodes: Light Emitting and Testing                        | 2.9 to 2.10          |
| Sep 5  | LAB: Exercise 2 - Diode Characteristics                   | Ex 1 Dis. Only, Ex 2 |
| Sep 9  | Transformers and Rectifiers                               | 3.0 to 3.3           |
| Sep 10 | Bridge Rectifiers and Filters                             | 3.4 to 3.6           |
| Sep 11 | Regulators and Power Supplies                             | 3.7 to 3.9           |
| Sep 12 | LAB: Exercise 4 - Diode Rectifier Circuits                | Ex 4                 |
| Sep 16 | Clippers and Clampers                                     | 4.0 to 4.3           |
| Sep 17 | Bipolar Junction Transistors                              | 6.0 to 6.3           |
| Sep 18 | Curves and Testing  | 6.4 to 6.7           |
| Sep 19 | LAB: Exercise 9 - BJT Current and Voltage Characteristics | Ex 9                 |
| Sep 23 | DC Load Line and Base Bias                                | 7.0 to 7.2           |
| Sep 24 | Emitter Bias  | 7.3                  |
| Sep 25 | Voltage Divider Bias                                      | 7.4                  |
| Sep 26 | LAB: Exercise 12 - Voltage Divider Bias                   | Ex 12                |
| Sep 30 | Feedback Bias   | 7.5                  |
| Oct 1  | Introducing Amplifiers                                    | 8.0 to 8.5           |
| Oct 2  | Review  | Study                |
| Oct 3  | *** EXAM 1 ***  | Study                |
| Oct 7  | Common Emitter Amplifiers and Gain                        | 9.0 to 9.4           |
| Oct 8  | Loading and Swamped Amplifiers                            | 9.5 to 9.6           |
| Oct 9  | h Parameters and Troubleshooting                          | 9.7 to 9.8           |
| Oct 10 | LAB: Exercise 16 - Small Signal CE Amplifier              | Ex 16                |
| Oct 14 | Emitter Follower Amplifier                                | 10.0 to 10.3         |
| Oct 15 | Darlington and Common Base Amplifiers                     | 10.4 to 10.6         |
| Oct 16 | AC Load Line and RC Class A Amplifiers                    | 11.0 to 11.2         |
| Oct 17 | LAB: Exercise 19 - Emitter Follower                       | Ex 19                |
| Oct 21 | Class B Amplifiers  | 11.4                 |
| Oct 22 | Class AB Amplifiers and Other Class AB Amplifiers         | 11.5 to 11.6         |
| Oct 23 | Heat Sinks and Field Effect Transistors Introduction      | 11.7, 12.0-12.1      |
| Oct 24 | LAB: Exercise 21 - Class AB Amplifiers                    | Ex 21                |
| Oct 28 | Field Effect Transistor Bias                              | 12.2                 |
| Oct 29 | JFET Common Source Amplifier                              | 12.3                 |
| Oct 30 | JFET Other Amplifiers and Applications                    | 12.4 to 12.6         |
| Oct 31 | LAB: Exercise 24 - JFET Transconductance Curves           | Ex 24                |
| Nov 4  | MOSFETs   | 13.0 to 13.3         |
| Nov 5  | More MOSFETs and Applications                             | 13.4 to 13.7         |
| Nov 6  | Review  | Study                |
| Nov 7  | *** EXAM 2 ***  | Study                |
| Nov 11 | Amplifier Frequency Response                              | 14.0 to 14.1         |
| Nov 12 | BJT Amplifier Frequency Response                          | 14.2                 |
| Nov 13 | JFET Amplifier High Frequency Response                    | 14.3                 |
| Nov 14 | LAB: Exercise 31 - Amplifier Bandwidth and Roll-off Rates | Ex 31                |
| Nov 18 | Thyristors: SUS and SCR                                   | 20.0 to 20.2         |
| Nov 19 | Diacs and Triacs  | 20.3                 |
| Nov 20 | Unijunction Transistor and Opto-devices                   | 20.4 and 20.6        |
| Nov 21 | LAB: Exercise 45 - Silicon Controlled Rectifiers          | Ex 45                |
| Nov 25 | Solid State Switching                                     | 19.1                 |
| Nov 26 | Switching Practical Considerations                        | 19.2                 |
| Dec 2  | Series Voltage Regulators                                 | 21.0 to 21.2         |
| Dec 3  | Other Voltage Regulators                                  | 21.3 to 21.5         |
| Dec 4  | Final Review  | Study                |
| Dec 5  | LAB: Exercise 48: IC Voltage Regulator                    | Ex 48                |
| Dec 9  | *** FINAL EXAM ***  | 8:00am to 9:50am     |