DEVRY INSTITUTE OF TECHNOLOGY
ELECTRONIC DEVICES EET225

INSTRUCTOR: Tom Wheeler (Office Room 208) 941-0430 x5211
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TEXT: Boylestad and Nashelsky
Electronic Devices and Circuit Theory (8th Ed., Prentice Hall)

CREDIT HOURS: 5.0

Major Course Topics

I. Diodes, diode circuits, voltage regulation, power supplies.

II. Bipolar transistors. BJT bias design. Small-signal bipolar amplifiers (CE, CB, CC).

III. Field effect transistors. FET bias design, small-signal FET amplifiers.

IV. Special devices: 4-Layer (SCR, TRIAC), others (UJT)

This course introduces the student to solid-state electronic design. Topics include diodes, simple power supplies, zener diode regulators, bipolar and FET biasing and small signal design, and 4-layer devices such as SCRs. Methods of design for common solid-state circuits are covered with emphasis on troubleshooting. Simulation software is used to assist development.

ATTENDANCE

Daily class attendance is required. *You are responsible for the material presented in all class sessions, regardless of your presence or absence.* Absence of more than 8 class sessions is cause for dismissal from the course, with a grade of F. You are expected to be on time for every class meeting. If you will not be able to make it to class on time, please call the instructor in advance to make arrangements.

HOMEWORK

Homework is due at the beginning of class (xx00 UTC). *Late homework is not accepted unless mitigating circumstances are present*. If this is the case, bring documentation (court papers, note on doctor's letterhead, etc.) Homework carries the weight of one major exam (100 points) in the course. Failure to do homework will do severe damage to your grade. (UTC = Universal Coordinated Time, or Standard World Time.)

Homework will be kept in a 3-tab folder, with the latest assignment in front. Your name and the course number must appear on the front of the folder.

Homework Performance Standards

- For problems involving calculations, <u>all work must be shown</u>. If a numerical answer is obtained without doing a calculation, state clearly that this is the case. For example: "By inspection, the potential is <u>25 Volts</u>."

- When showing work for numerical problems, all defining equations will be stated first. The last step in the problem will be substitution of values into the equations. For example:

  Given V = 20V and R = 5 Ohms, find the current I.

  $I = \frac{V}{R}$ (Comment: The defining equation, Ohm's law, is stated.)

  $I = \frac{20V}{5\Omega} = \underline{\underline{4A}}$ (Comment: Note that units are clearly displayed for the answer.)

- When a numerical answer is given, it must be <u>boxed</u> or <u>underlined</u> and have <u>correct units</u> attached.

- **No credit will be given for any problems that have not been worked according to these instructions, or any additional instructions given by the instructor.**

- If the homework problem involves a circuit, the circuit must be drawn as part of the homework solution. If the homework solution is a *designed circuit*, each component in the circuit diagram must have a standard value.

- Photocopies of work are unacceptable. Only originals will be accepted. It is suggested that you make a photocopy for yourself before turning in any work.

- All work will be completed on ONE SIDE of the paper only.

- The homework solutions are intended as an example of proper work. You can access them from the instructor's web site.

All work in this course must be directly turned into the instructor. No work will be accepted in Room 208.

GRADING

There are 3 major exams, an unspecified number of quizzes given at random intervals, various homework assignments, and a final examination given in the 15th week of the course. Your grade will be determined as follows:

2 Highest Major Exams	200 points (100 points per exam, two best exams)
Quizzes/Homework	100 points (treated as a percentage)
Final Exam	150 points
	450 points total for course

NOTE: There is one "drop test." The lowest grade from the three major exams is not counted. Only one examination will be dropped during the term. All students must take the final exam.

DETERMINATION OF LETTER GRADE FOR THIS COURSE:

90 - 100 %	A
80 - 89 %	B
70 - 79 %	C
60 - 69 %	D
< 60 %	FAIL

PLAGIARISM AND OTHER FORMS OF CHEATING

Copying the work of another, and claiming it to be your own is plagiarism. This includes (but is not limited to) copying others homework, copying from a lab manual or textbook, or collusion. The minimum penalty for cheating in any form is a grade of zero for the element involved; in some cases, failure of the course and/or expulsion from the Institute will also result. *All cases of misconduct will be documented and forwarded to Student Services for disciplinary consideration*. The DeVry Student Handbook contains complete information on this topic.

MISCELLANEOUS INFORMATION

EMERGENCY PROCEDURES - Each classroom has a plaque (located near the door) with instructions for evacuation in the event of an emergency. The instructor will remain in charge of your class group should the situation arise.

FOOD or DRINK are not allowed in the classrooms and labs at DeVry.

READING ASSIGNMENTS

NOTE: Chapter numbers refer to the course textbook. It is expected that the material will be read before attending class.

UNIT I

DIODES	Ch 1, pp. 1-47
DIODE APPLICATIONS	Ch 2, pp. 55-113

UNIT II

BIPOLAR JUNCTION TRANSISTORS (BJTs)	Ch 3, pp. 131-158
BJT DC BIASING	Ch 4, pp. 163-231
BJT MODELING	Ch 7, pp. 355-381
BJT SSAMPS	Ch 8, pp. 389-446

UNIT III

FIELD-EFFECT TRANSISTORS (FETs)	Ch 5, pp. 245-282
FET DC BIASING	Ch 6, pp. 289-344
FET SSAMPS	Ch 9, pp. 461-512

UNIT IV

4 LAYER DEVICES	Ch 20, pp. 923-960

EET-225 Homework #1
Sr. Professor Wheeler

Instructions: This homework must be turned in within a flat 3-tab paper folder (no three-ring binders will be accepted). Answers must be written very neatly or typed. Use complete sentences when answering all questions. Where a problem involves a circuit, you must redraw the circuit as part of the solution, showing all indicated voltages and currents on the circuit diagram. Box or underline all final answers and show all work (see syllabus for example of homework standards).

1. What is a *diode*? Draw a diagram showing the construction of a semiconductor diode.

2. What material is most commonly used for constructing diodes? Why?

3. What are the majority carriers in P and N type silicon?

4. Explain the difference between conventional and electron current. Which is used in engineering?

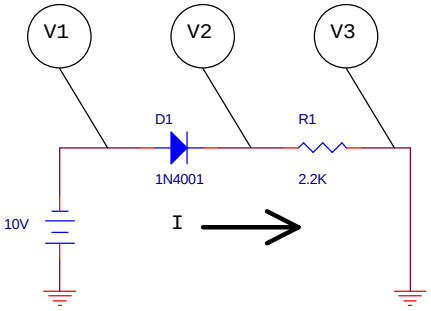
5. Draw the schematic diagram of a diode. What is the *ideal behavior* of a diode?

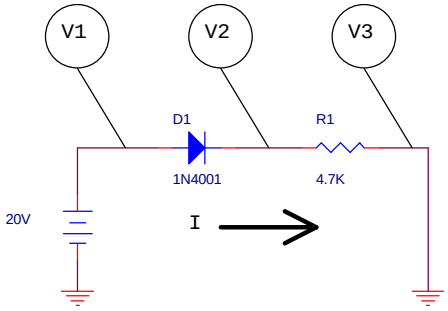
6. Explain the conditions necessary for a diode to be (a) Forward-Biased and (b) Reverse-Biased.

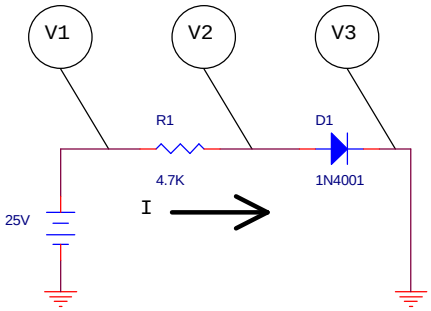
7. Draw a characteristic curve for a typical silicon diode, labeling the following clearly on the graph: (a) Knee; (b) Cutoff; (c) Active area slope

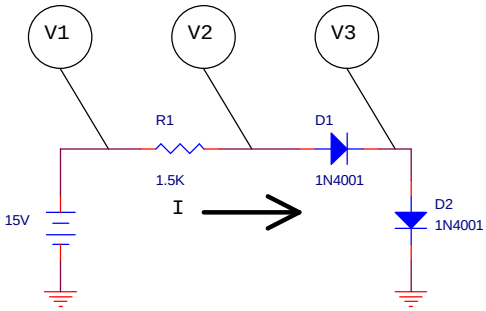
8. What is the knee voltage for these diode types?
   a) Silicon
   b) Germanium
   c) Gallium Arsenide
   d) Schottky (Hot Carrier)

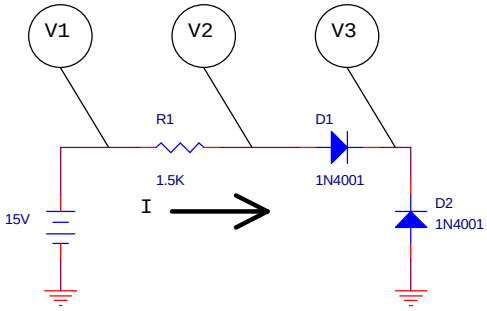
9. Calculate the currents and voltages for each circuit shown below. State clearly whether the diode(s) are in conduction or cutoff.

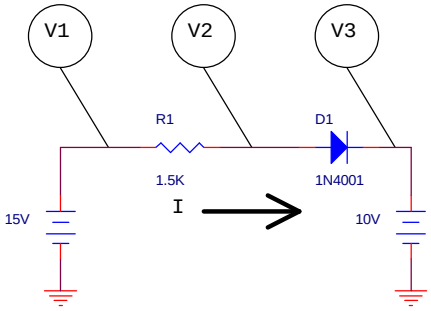










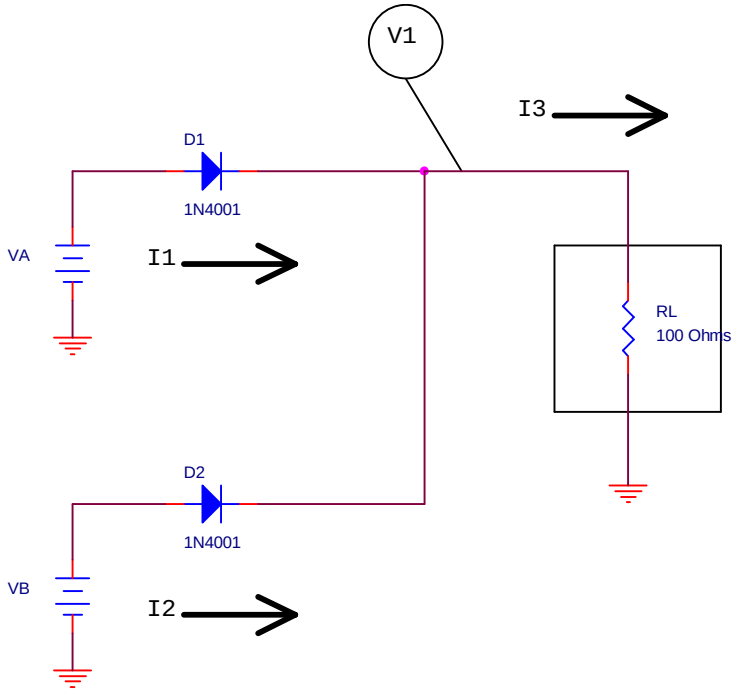


10. Below is an interesting diode circuit that will let a device be powered from either the "A" or "B" battery, depending on which battery is the strongest. Calculate the voltage V1 and all currents in the circuit under the following conditions:

a) VA = 10 V, VB = 0 V

b) VA = 10 V, VB = 15 V

c) VA = 0 V, VB = 10 V



TERMINAL COURSE OBJECTIVES

At the completion of this course, the student will be able to ...

1. Analyze and design diode switching and power supply circuits.
2. Design simple unregulated power supplies using diodes, transformers, and capacitor filters.
3. Design Zener diode regulator circuits.
3. Design and analyze BJT switching circuits.
4. Design and analyze BJT and FET small-signal amplifiers.
5. Design and analyze SCR, UJT, and TRIAC switching circuits.