

# EET ??? – ??? (THEORY)

NAME: \_\_\_\_\_

Last update 4 Jul 2020

| Session | Topic                           | Prep.   | Part. | Comments |
|---------|---------------------------------|---------|-------|----------|
| 01      | Intro, policies, FERPA releases | – – – – |       |          |
| 02      |                                 |         |       |          |
| 03      |                                 |         |       |          |
| 04      |                                 |         |       |          |
| 05      |                                 |         |       |          |
| 06      |                                 |         |       |          |
| 07      |                                 |         |       |          |
| 08      |                                 |         |       |          |
| 09      |                                 |         |       |          |
| 10      |                                 |         |       |          |
| 11      | ORAL PRESENTATIONS              |         |       |          |
| 12      | EXAM                            |         |       |          |

| Session | Topic              | Prep. | Part. | Comments |
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| 13      |                    |       |       |          |
| 14      |                    |       |       |          |
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| 21      |                    |       |       |          |
| 22      |                    |       |       |          |
| 23      | ORAL PRESENTATIONS |       |       |          |
| 24      | EXAM               |       |       |          |

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|---------|--------------------|-------|-------|----------|
| 25      |                    |       |       |          |
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| 35      | ORAL PRESENTATIONS |       |       |          |
| 36      | EXAM               |       |       |          |

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| 37      |                    |       |       |          |
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| 48      | EXAM               |       |       |          |

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| 49      |                    |       |       |          |
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| 58      |                    |       |       |          |
| 59      | ORAL PRESENTATIONS |       |       |          |
| 60      | EXAM               |       |       |          |

**Essential information about this course:**

- Learning to independently digest technical information and solve novel problems is more important than learning electrical and electronic theory. To develop these skills we will *read* extensively to learn general principles, *write* in a Theory Journal to document and consolidate our understanding of those principles, and *practice* solving problems using those principles.
- This is a theory course, *but it is not lecture-based*. Pre-class reading/journaling assignments replace lecture, while class time is spent discussing the text and solving related problems.
- Late arrival to class, failing to summarize the assigned reading in your own words, and/or unattempted problems will result in point deductions.
- Half of your course grade comes from “oral presentations” where you solve problems in full view of classmates and instructor just like during a technical job interview.
- Half of your course grade comes from written “mastery exams” where every question must be correctly answered to pass. Multiple re-tries are allowed on different exam versions, but only the first exam’s score counts toward your course grade.
- You should budget a minimum of 12 hours per week for this course, approximately 4 hours in-class and 8 hours out-of-class preparation.
- Successful students (1) prioritize their study time, (2) test themselves on upcoming oral presentation and written exam topics, (3) and master principles rather than memorize procedures.

## Values

This educational program exists for one purpose: to empower you with a comprehensive set of knowledge, skills, and habits to unlock opportunities in your chosen profession. The following values articulate personal attitudes guaranteed to fulfill this purpose, and the principles upon which this program is designed. They embody what I like to call a *strong learning ethic*, similar to a strong work ethic but applied to the learning process rather than a job.

**Ownership** – you are the sole proprietor of your education, of your career, and to a great extent your quality of life. No one can force you to learn, make you have a great career, or grant you a fulfilling life – these accomplishments are possible only when you accept responsibility for them.

**Responsibility** – *ensuring* the desired outcome, not just *attempting* to achieve the outcome. Responsibility is how we secure rights and privileges.

**Initiative** – independently recognizing needs and taking responsibility to meet them.

**Integrity** – living in a consistently principled manner, communicating clearly and honestly, applying your best effort, and never trying to advance at the expense of others. Integrity is the key to trust, and trust is the glue that binds all relationships personal, professional, and societal.

**Perspective** – prioritizing your attention and actions to the things we will all care about for years to come. Never letting short-term concerns eclipse the long-term.

**Humility** – no one is perfect, and there is always something new to learn. Making mistakes is a symptom of living, and for this reason we need to be gracious to ourselves and to others.

**Safety** – assessing hazards and avoiding unnecessary risk to yourself and to others.

**Competence** – your ability to consistently and independently apply knowledge and skill to the solution of practical problems. Competence includes the ability to verify the appropriateness of your solutions and the ability to communicate so that others understand how and why your solutions work.

**Diligence** – exercising self-discipline and persistence in learning, accepting the fact there is no easy way to absorb complex knowledge, master new skills, or overcome limiting habits. Diligence in work means the job is not done until it is done *correctly*: all objectives achieved, all documentation complete, and all root-causes of problems identified and corrected.

**Community** – your actions impact other peoples' lives, for good or for ill. Conduct yourself not just for your own interests, but also for the best interests of those whose lives you affect.

**Respect** is the acknowledgment of others' intrinsic capabilities, responsibilities, and worth. Everyone has something valuable to contribute, and everyone deserves to fully *own* their lives.

## EET Program Learning Outcomes

- (1) **COMMUNICATION and TEAMWORK** – Accurately communicate ideas across a variety of media (oral, written, graphical) to both technical and non-technical audiences; Function effectively as a member of a technical team.
- (2) **SELF-MANAGEMENT** – Arrive on time and prepared; Work diligently until the job is done; Budget resources appropriately to achieve objectives.
- (3) **SAFE WORK HABITS** – Comply with relevant national, state, local, and college safety regulations when designing, prototyping, building, and testing systems.
- (4) **ANALYSIS and DIAGNOSIS** – Select and apply appropriate principles and techniques for both qualitative and quantitative circuit analysis; Devise and execute appropriate tests to evaluate electronic system performance; Identify root causes of electronic system malfunctions.
- (5) **PROBLEM-SOLVING** – Devise and implement solutions for technical problems appropriate to the discipline.
- (6) **DOCUMENTATION** – Interpret and create technical documents (e.g. electronic schematic diagrams, block diagrams, graphs, reports) relevant to the discipline.
- (7) **INDEPENDENT LEARNING** – Select and research information sources to learn new principles, technologies, and/or techniques.

## Course description

This course explores ??? theory. Mastery-style written exams guarantee attainment of conceptual learning outcomes, while oral presentations and Socratic dialogue demonstrate communicative learning outcomes.

## Course learning outcomes

- Compute voltages and currents in ???, ???, and ??? circuits given schematic diagrams, component values, and other circuit parameters. (Addresses Program Learning Outcomes 4, 6)
- Compute component values necessary to achieve stated performance goals in ???, ???, and ??? circuits. (Addresses Program Learning Outcomes 4, 6)
- Design and sketch simple ???, ???, and ??? circuits to meet stated functional requirements. (Addresses Program Learning Outcomes 4, 5, 6)
- Articulate and apply technical principles related to ??? theory as requested by a critical audience. (Addresses Program Learning Outcomes 1, 2, 4, 6, 7)
- Identify probable faults in ???, ???, and ??? circuits given schematic diagrams and reported symptoms. (Addresses Program Learning Outcomes 5, 6)

## Theory session 01

### Introduction, course policies, and FERPA releases (brief)

- Welcome and brief introductions
- Course organization: Each semester has a *Theory* course, an *Experiments* course, and a *Projects* course
- Theory course: Examine pages 1-2, session 02, discuss inverted instruction (no lecture – students do preparatory homework before class and spend class time in dialogue and solving problems), discuss grading (50% from Oral Presentations, 50% from written exams, deductions for missing Theory Journal entries and for unattempted problems).
- Experiments course: Examine page 1, examine Experiment 01 page, examine Troubleshoot 36 page, discuss format (students develop their own hypotheses and procedures, graded based on rigor of work), discuss grading (25% for experiments, 75% for troubleshooting).
- Projects course: Examine page 1, discuss format (first project lasts all semester, other projects for shorter terms), examine each project's first page.
- Summary statement: From now until you graduate the focus will be on what makes you the most valuable in your chosen career; all other concerns are subordinate to that. I am asking for your best effort, and you will always have mine.
  - FERPA release forms (optional for students to sign)
- Homework: Prepare for theory course session 02 (do all the preparatory work shown on the Session 02 page before arriving to class tomorrow!), and read the policy pages for each course
  - Book-mark <https://ibiblio.org/kuphaldt/socratic/model>, the *Modular Electronics Learning Project* web page containing all course documents, tutorials, and problem sets you will need in these courses
  - Book-mark <https://ibiblio.org/kuphaldt/socratic/model/calendar.html>, our semester calendar showing dates for theory sessions, special events, and all-lab project sessions
  - Collect all you need from the Required Tools, Supplies, and Software list (contained in each course document)
  - Read requirements for theory session 11 (first Oral Presentations) so you may prepare
  - Read requirements for theory session 12 (first Exam) so you may prepare

|  |
|--|
| <b>Introduction, course policies, and FERPA releases</b> (time permitting) |
|--|

- MS-Windows software downloads: Notepad++ is fast and easy ; NGSPICE requires unpacking a zip file and saving the unzipped files/folders ; WSL is fast but complicated.
- First introductory activity: everyone gives answers to question “*What are your goals in this course, in this academic program, and in your chosen career?*” including the instructor.
- Read and discuss the “Required Tools, Supplies, and Software” page.
- Explore and bookmark the online website *Modular Electronics Learning Project* (ModEL) where most of your study materials reside. This site also hosts documents for each of the courses in this program.
- Explore the offline collection of files called *EETREF* where you will find datasheets, application notes, tutorials, and other useful documents shared with permission by manufacturers who wrote them. Sometimes these documents will be assigned as preparatory reading in lieu of or in addition to ModEL learning modules. Feel free to copy the EETREF collection from the school’s computers to your own.
- Read and discuss the calendar. This maps days of the week to course Sessions.
- Read and discuss the daily schedule. This maps courses to weekdays and times.
- Read and discuss the FERPA release form given to you by the instructor. If you elect to sign this form, it gives permission for the instructor to release all academic performance records to employers.
- Discuss semesterly tour, and possible tour locations.
- Discuss preferred methods of contact, and how we may continue learning during unexpected school closures.

**Forms provided by the instructor for today’s session:**

- This Theory course (printed from cover page through Theory Session 2)
- Semester calendar
- Daily time-block (“zone”) schedule
- FERPA release form
- First page of concurrent Experiments course
- First page of concurrent Projects course

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## Theory session 02

**Source text** – ??? learning module

**URL** – [https://ibiblio.org/kuphaldt/socratic/model/mod\\_???.pdf](https://ibiblio.org/kuphaldt/socratic/model/mod_???.pdf)

Complete the following *prior to* the scheduled session with your instructor:

### Theory Session Expectations:

Send your Theory Journal entry documenting your original thoughts and questions on the reading, as well as your solutions for assigned problems, to the instructor before class begins. Session grading is based on good-faith effort: the minimum expectation being an honest and documented attempt to understand all portions of the assigned reading and to solve every assigned problem. Expect the instructor to question your answers – even when correct – and always challenge you to reason from first principles.

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### Theory session 03

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## Theory session 04

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## Theory session 05

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## Theory session 06

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## Theory session 07

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## Theory session 08

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## Theory session 09

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## Theory session 10

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## Theory session 11

### Oral Presentations

Today's class session will consist of oral presentations made to the entire group. Each presentation will be time-limited, be graded on technical accuracy, and be followed by constructive criticism from the audience. When you are chosen to present, you will have a brief period of time to gather your thoughts and set up for your presentation.

A format proven to work well is that all students in the class are given a unique problem to solve, and 15 minutes of time to independently devise solutions. These 15-minute periods are closed-book and closed-note just like written exams. After that 15-minute period, the instructor collects all the papers (each with the student's name written on top) and gives each student 10 minutes to present their solution before the entire class while everyone else observes.

*Your instructor will not provide answers to you prior to or during the presentation;* you are solely responsible for any research, experimentation, and other actions necessary to adequately prepare for your presentation. If you inquire for help, the instructor may clarify what you will need to present on, and/or point you toward specific resources (e.g. "Try setting up a SPICE simulation", "Try building a test circuit on your breadboard", "Find and read the datasheet(s)", "Research application notes written on this topic", etc.), but do not expect them to give you answers or check your work because by this point in time you will have studied the necessary concepts to verify results for yourself, or at least to know where to go to find verification.

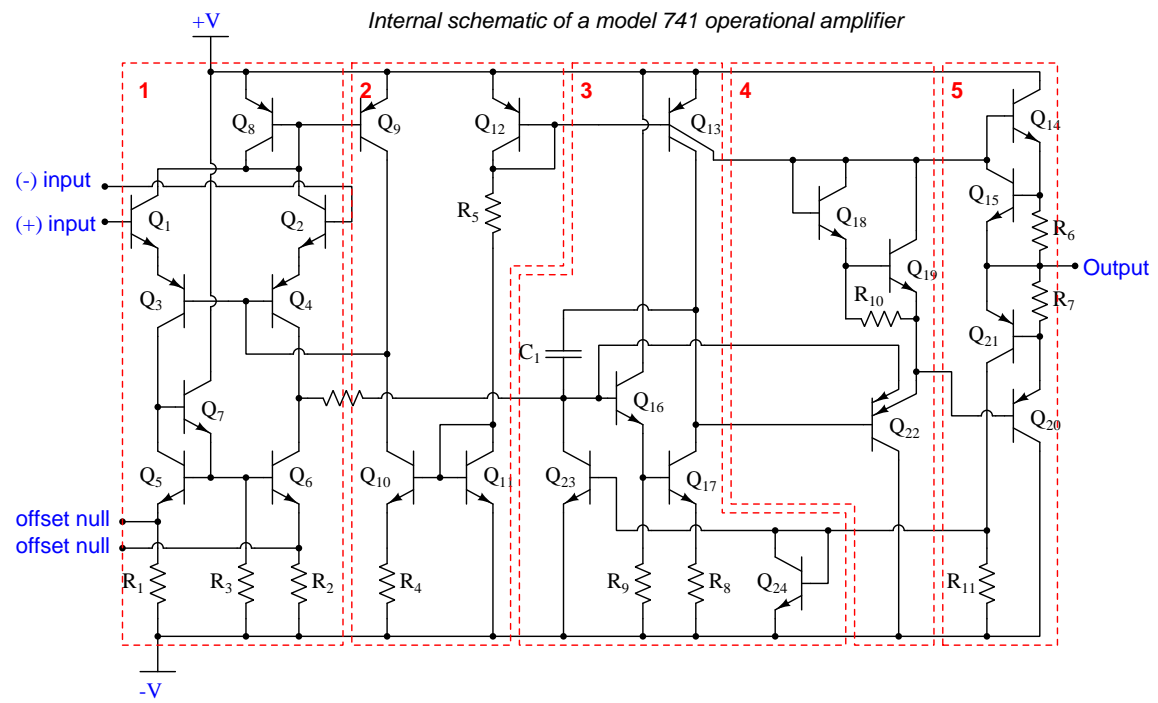
During your presentation the instructor and audience members are free to pose questions relevant to the graded objectives for your assigned problem. This may be done for the simple purpose of clarifying an unclear answer, or to probe for misconceptions.

The benefits of this exercise include honing your independent research skills, reinforcing your foundational knowledge of electronics, gaining confidence speaking to groups, and preparation for job interviews where being able to articulate your knowledge and solve realistic problems before a critical audience sets you apart from lesser-qualified candidates.

Each student will thoroughly explain the function of a system documented in schematic form, the schematic diagrams of multiple systems shown on the following page(s), and the particular system being randomly chosen from the following list. No student will know which system is theirs to explain until it is their turn to present, which means all students should be prepared to explain *every one* of the systems documented:

- System 1
- System 2
- System 3
- System 4
- System 5
- System 6

You are to regard your audience as technically adept (i.e. assuming everyone in attendance is familiar with the technical concepts and language; "skilled in the art").



## Theory session 12

The written exam will consist of the following types of questions and their *related principles*:

- (Question #1) ???.  
???
- (Question #2) ???.  
???
- (Question #3) ???.  
???
- (Question #4) ???.  
???
- (Question #5) ???.  
???
- (Question #6) ???.  
???
- (Question #7) ???.  
???
- (Question #8 – REVIEW) ???  
???, ??, ???
- (Question #9 – REVIEW) ???  
???, ??, ???

## Theory session 13

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*Your instructor will not provide answers to you prior to or during the presentation;* you are solely responsible for any research, experimentation, and other actions necessary to adequately prepare for your presentation. If you inquire for help, the instructor may clarify what you will need to present on, and/or point you toward specific resources (e.g. "Try setting up a SPICE simulation", "Try building a test circuit on your breadboard", "Find and read the datasheet(s)", "Research application notes written on this topic", etc.), but do not expect them to give you answers or check your work because by this point in time you will have studied the necessary concepts to verify results for yourself, or at least to know where to go to find verification.

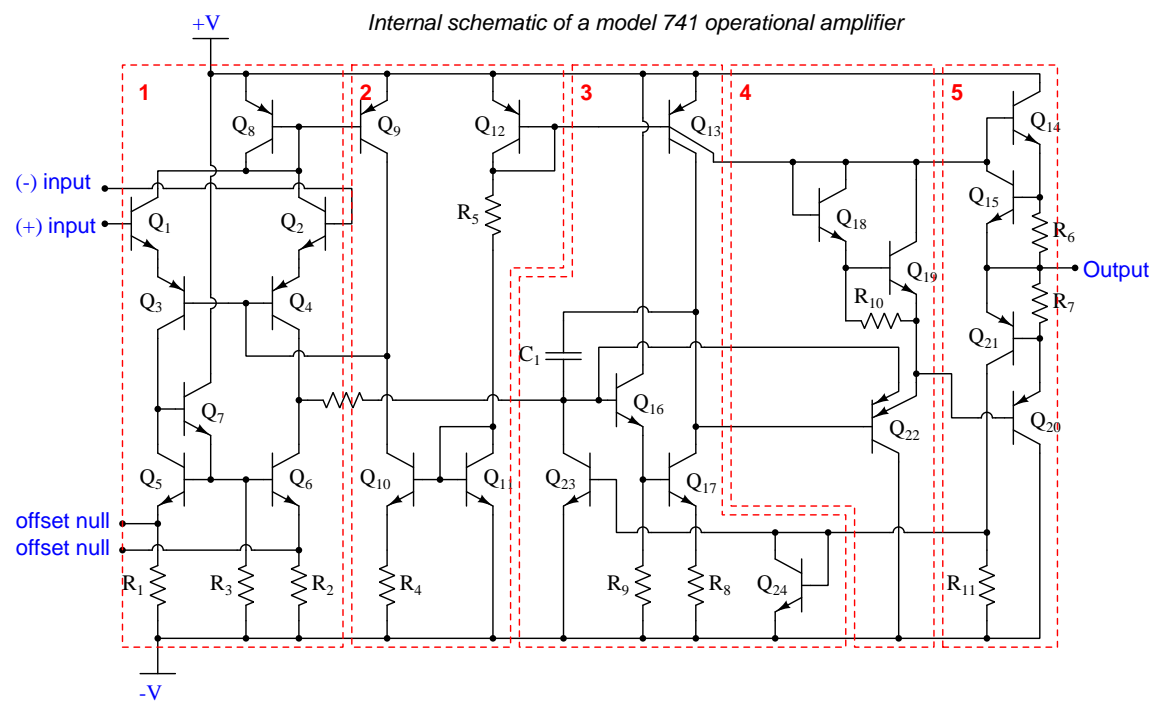
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Each student will thoroughly explain the function of a system documented in schematic form, the schematic diagrams of multiple systems shown on the following page(s), and the particular system being randomly chosen from the following list. No student will know which system is theirs to explain until it is their turn to present, which means all students should be prepared to explain *every one* of the systems documented:

- System 1
- System 2
- System 3
- System 4
- System 5
- System 6

You are to regard your audience as technically adept (i.e. assuming everyone in attendance is familiar with the technical concepts and language; "skilled in the art").



## Theory session 24

The written exam will consist of the following types of questions and their *related principles*:

- (Question #1) ???.  
???
- (Question #2) ???.  
???
- (Question #3) ???.  
???
- (Question #4) ???.  
???
- (Question #5) ???.  
???
- (Question #6) ???.  
???
- (Question #7) ???.  
???
- (Question #8 – REVIEW) ???  
???, ??, ???
- (Question #9 – REVIEW) ???  
???, ??, ???



## Theory session 25

**Source text** – ??? learning module

**URL** – [https://ibiblio.org/kuphaldt/socratic/model/mod\\_???.pdf](https://ibiblio.org/kuphaldt/socratic/model/mod_???.pdf)

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## Theory session 26

**Source text** – ??? learning module

**URL** – [https://ibiblio.org/kuphaldt/socratic/model/mod\\_???.pdf](https://ibiblio.org/kuphaldt/socratic/model/mod_???.pdf)

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file wt\_0002

## Theory session 27

**Source text** – ??? learning module

**URL** – [https://ibiblio.org/kuphaldt/socratic/model/mod\\_???.pdf](https://ibiblio.org/kuphaldt/socratic/model/mod_???.pdf)

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file wt\_0002

## Theory session 28

**Source text** – ??? learning module

**URL** – [https://ibiblio.org/kuphaldt/socratic/model/mod\\_???.pdf](https://ibiblio.org/kuphaldt/socratic/model/mod_???.pdf)

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file wt\_0002

## Theory session 29

**Source text** – ??? learning module

**URL** – [https://ibiblio.org/kuphaldt/socratic/model/mod\\_???.pdf](https://ibiblio.org/kuphaldt/socratic/model/mod_???.pdf)

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## Theory session 30

**Source text** – ??? learning module

**URL** – [https://ibiblio.org/kuphaldt/socratic/model/mod\\_???.pdf](https://ibiblio.org/kuphaldt/socratic/model/mod_???.pdf)

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## Theory session 31

**Source text** – ??? learning module

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## Theory session 32

**Source text** – ??? learning module

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### Theory session 33

**Source text** – ??? learning module

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## Theory session 34

**Source text** – ??? learning module

**URL** – [https://ibiblio.org/kuphaldt/socratic/model/mod\\_???.pdf](https://ibiblio.org/kuphaldt/socratic/model/mod_???.pdf)

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file wt\_0002

## Theory session 35

### Oral Presentations

Today's class session will consist of oral presentations made to the entire group. Each presentation will be time-limited, be graded on technical accuracy, and be followed by constructive criticism from the audience. When you are chosen to present, you will have a brief period of time to gather your thoughts and set up for your presentation.

A format proven to work well is that all students in the class are given a unique problem to solve, and 15 minutes of time to independently devise solutions. These 15-minute periods are closed-book and closed-note just like written exams. After that 15-minute period, the instructor collects all the papers (each with the student's name written on top) and gives each student 10 minutes to present their solution before the entire class while everyone else observes.

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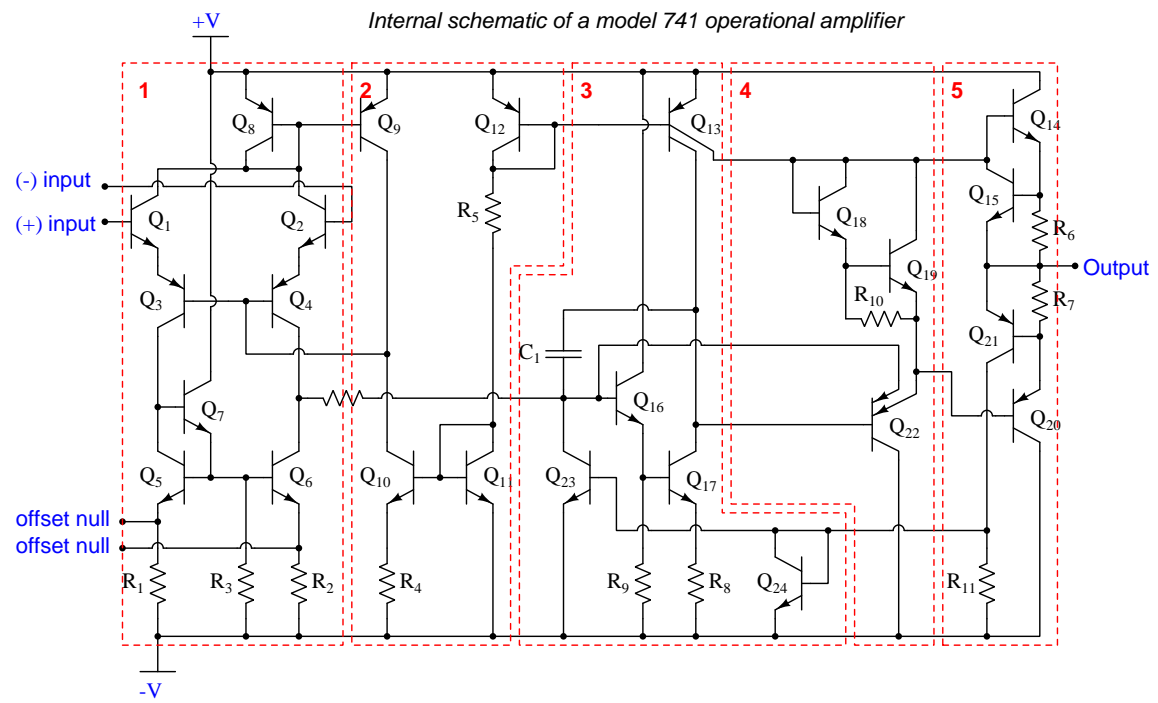
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You are to regard your audience as technically adept (i.e. assuming everyone in attendance is familiar with the technical concepts and language; "skilled in the art").



## Theory session 36

The written exam will consist of the following types of questions and their *related principles*:

- (Question #1) ???.  
???
- (Question #2) ???.  
???
- (Question #3) ???.  
???
- (Question #4) ???.  
???
- (Question #5) ???.  
???
- (Question #6) ???.  
???
- (Question #7) ???.  
???
- (Question #8 – REVIEW) ???  
???, ??, ???
- (Question #9 – REVIEW) ???  
???, ??, ???

## Theory session 37

**Source text** – ??? learning module

**URL** – [https://ibiblio.org/kuphaldt/socratic/model/mod\\_???.pdf](https://ibiblio.org/kuphaldt/socratic/model/mod_???.pdf)

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## Theory session 38

**Source text** – ??? learning module

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## Theory session 39

**Source text** – ??? learning module

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## Theory session 40

**Source text** – ??? learning module

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## Theory session 41

**Source text** – ??? learning module

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## Theory session 42

**Source text** – ??? learning module

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**Source text** – ??? learning module

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file wt\_0002

## Theory session 44

**Source text** – ??? learning module

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file wt\_0002

## Theory session 45

**Source text** – ??? learning module

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file wt\_0002

## Theory session 46

**Source text** – ??? learning module

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file wt\_0002

## Theory session 47

### Oral Presentations

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During your presentation the instructor and audience members are free to pose questions relevant to the graded objectives for your assigned problem. This may be done for the simple purpose of clarifying an unclear answer, or to probe for misconceptions.

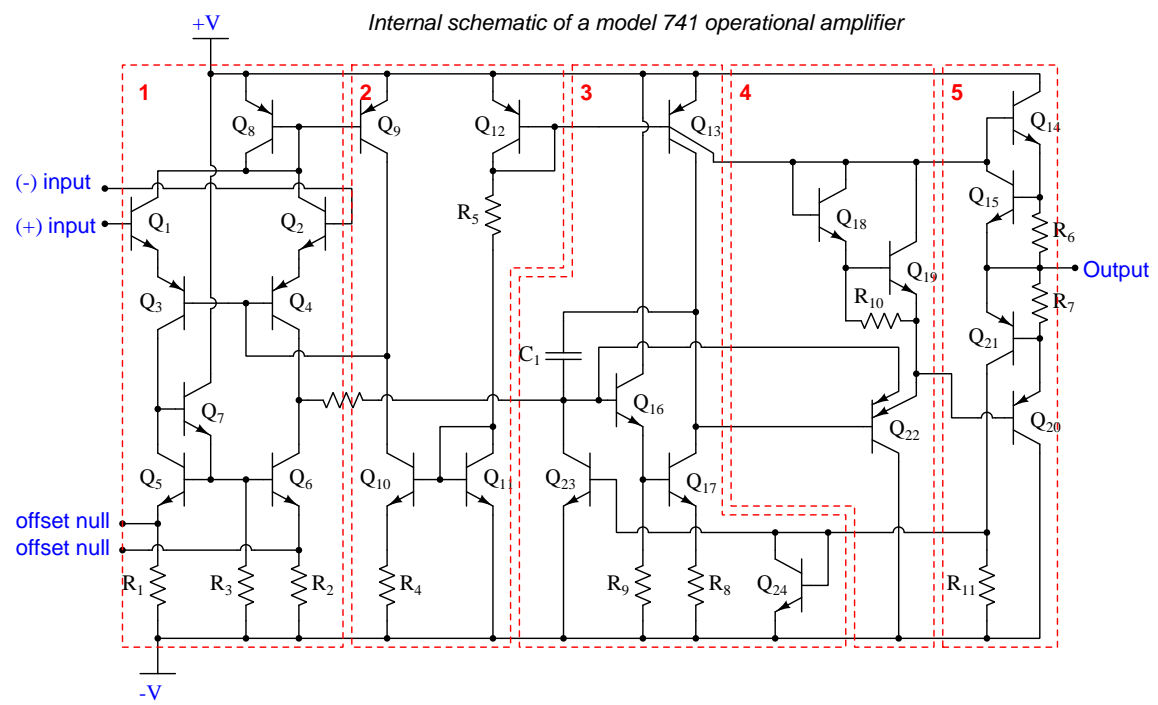
The benefits of this exercise include honing your independent research skills, reinforcing your foundational knowledge of electronics, gaining confidence speaking to groups, and preparation for job interviews where being able to articulate your knowledge and solve realistic problems before a critical audience sets you apart from lesser-qualified candidates.

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- System 3
- System 4
- System 5
- System 6

You are to regard your audience as technically adept (i.e. assuming everyone in attendance is familiar with the technical concepts and language; "skilled in the art").





## Theory session 48

The written exam will consist of the following types of questions and their *related principles*:

- (Question #1) ???.  
???
- (Question #2) ???.  
???
- (Question #3) ???.  
???
- (Question #4) ???.  
???
- (Question #5) ???.  
???
- (Question #6) ???.  
???
- (Question #7) ???.  
???
- (Question #8 – REVIEW) ???  
???, ??, ???
- (Question #9 – REVIEW) ???  
???, ??, ???

## Theory session 49

**Source text** – ??? learning module

**URL** – [https://ibiblio.org/kuphaldt/socratic/model/mod\\_???.pdf](https://ibiblio.org/kuphaldt/socratic/model/mod_???.pdf)

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file wt\_0002

## Theory session 50

**Source text** – ??? learning module

**URL** – [https://ibiblio.org/kuphaldt/socratic/model/mod\\_???.pdf](https://ibiblio.org/kuphaldt/socratic/model/mod_???.pdf)

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file wt\_0002

## Theory session 51

**Source text** – ??? learning module

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file wt\_0002

## Theory session 52

**Source text** – ??? learning module

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file wt\_0002

## Theory session 53

**Source text** – ??? learning module

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file wt\_0002

## Theory session 54

**Source text** – ??? learning module

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file wt\_0002



## Theory session 55

**Source text** – ??? learning module

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file wt\_0002

## Theory session 56

**Source text** – ??? learning module

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file wt\_0002

## Theory session 57

**Source text** – ??? learning module

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file wt\_0002

## Theory session 58

**Source text** – ??? learning module

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Complete the following *prior to* the scheduled session with your instructor:

### Theory Session Expectations:

Send your Theory Journal entry documenting your original thoughts and questions on the reading, as well as your solutions for assigned problems, to the instructor before class begins. Session grading is based on good-faith effort: the minimum expectation being an honest and documented attempt to understand all portions of the assigned reading and to solve every assigned problem. Expect the instructor to question your answers – even when correct – and always challenge you to reason from first principles.

file wt\_0002

## Theory session 59

### Oral Presentations

Today's class session will consist of oral presentations made to the entire group. Each presentation will be time-limited, be graded on technical accuracy, and be followed by constructive criticism from the audience. When you are chosen to present, you will have a brief period of time to gather your thoughts and set up for your presentation.

A format proven to work well is that all students in the class are given a unique problem to solve, and 15 minutes of time to independently devise solutions. These 15-minute periods are closed-book and closed-note just like written exams. After that 15-minute period, the instructor collects all the papers (each with the student's name written on top) and gives each student 10 minutes to present their solution before the entire class while everyone else observes.

*Your instructor will not provide answers to you prior to or during the presentation;* you are solely responsible for any research, experimentation, and other actions necessary to adequately prepare for your presentation. If you inquire for help, the instructor may clarify what you will need to present on, and/or point you toward specific resources (e.g. "Try setting up a SPICE simulation", "Try building a test circuit on your breadboard", "Find and read the datasheet(s)", "Research application notes written on this topic", etc.), but do not expect them to give you answers or check your work because by this point in time you will have studied the necessary concepts to verify results for yourself, or at least to know where to go to find verification.

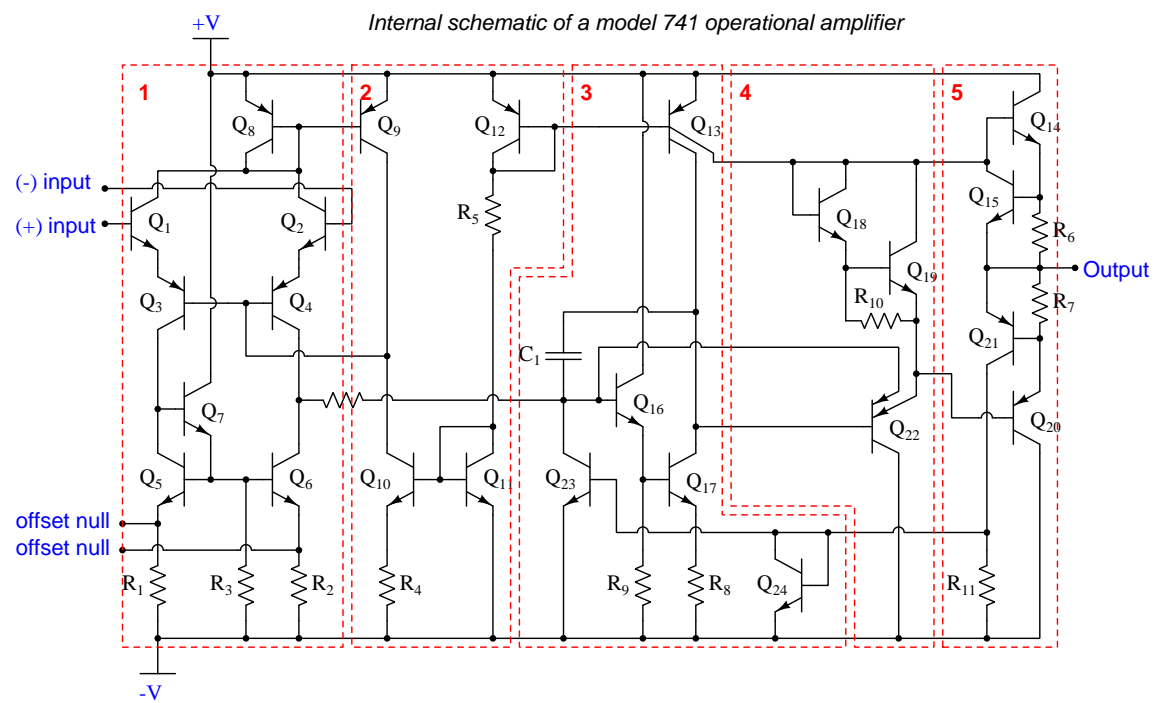
During your presentation the instructor and audience members are free to pose questions relevant to the graded objectives for your assigned problem. This may be done for the simple purpose of clarifying an unclear answer, or to probe for misconceptions.

The benefits of this exercise include honing your independent research skills, reinforcing your foundational knowledge of electronics, gaining confidence speaking to groups, and preparation for job interviews where being able to articulate your knowledge and solve realistic problems before a critical audience sets you apart from lesser-qualified candidates.

Each student will thoroughly explain the function of a system documented in schematic form, the schematic diagrams of multiple systems shown on the following page(s), and the particular system being randomly chosen from the following list. No student will know which system is theirs to explain until it is their turn to present, which means all students should be prepared to explain *every one* of the systems documented:

- System 1
- System 2
- System 3
- System 4
- System 5
- System 6

You are to regard your audience as technically adept (i.e. assuming everyone in attendance is familiar with the technical concepts and language; "skilled in the art").



## Theory session 60

The written exam will consist of the following types of questions and their *related principles*:

- (Question #1) ???.  
???
- (Question #2) ???.  
???
- (Question #3) ???.  
???
- (Question #4) ???.  
???
- (Question #5) ???.  
???
- (Question #6) ???.  
???
- (Question #7) ???.  
???
- (Question #8 – REVIEW) ???  
???, ??, ???
- (Question #9 – REVIEW) ???  
???, ??, ???