ENGN2218 Electronic Systems & Design

Course Outline and Assessment Schedule – Semester 1, 2011 (Last updated: 11-03-2011)

[1] COURSE INFORMATION

1.1 Course Coordinator

Name: Dr. Salman Durrani
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Tel: 56573
Email: salman.durrani@anu.edu.au (please mention 'ENGN2218' in subject)
Web-Site: http://engnet.anu.edu.au/DEpeople/Salman.Durrani/
Drop-in Session: Tuesday 1:00 PM-2:00 PM

1.2 Lab Supervisor

1. Mr. Erasmo Scipione (Tel: 59067) erasmo.scipione@anu.edu.au

1.3 Lab Demonstrators

1. Ms. Mengqiu (Karan) Zhang karan.zhang@cecs.anu.edu.au
2. Mr. Xiaolei (Eric) Hou xiaolei.hou@anu.edu.au
3. Mr. Wayes Tushar u4592844@anu.edu.au
4. Mr. Zubair Khalid zubair.khalid@anu.edu.au
5. Mr. Ali Nasir ali.nasir@anu.edu.au
6. Mr. Dumidu Talagala dumidu.talagala@anu.edu.au
7. Ms. Vasanta Gayatri Chaganti Vasanta.Chaganti@nicta.com.au
8. Mr. Andrew Sutton andrew.sutton@anu.edu.au
9. Mr. Adnan Shah adnan.shah@nicta.com.au
10. Ms. Amy Fu amy.fu@cecs.anu.edu.au
11. Mr. Juan Caneses juan.caneses@anu.edu.au

1.4 Pre-Requisite

1. ENGN1218 Introduction to Electronics

1.5 Text Book

1. Allan R. Hambly, "Electrical Engineering Principles and Applications", 5th edition, Pearson/Prentice Hall, 2011. http://library.anu.edu.au/record=b2442317

   http://www.pearsonhighered.com/hambleyinternational
   (companion website which also contains solutions to selected problems)

1.6 Library Reserve

1. Theodore F Bogart, *Electronic devices and circuits*, 2nd Ed., Merrill Pub. Co., c1990. http://library.anu.edu.au/record=b1763474
2. Richard C. Dorf & James A. Svoboda, Introduction to electric circuits, 7th Ed., John Wiley & Sons, 2006. http://library.anu.edu.au/record=b2274718
3. Microelectronic Circuit Design, 2nd Ed., R. Jaeger, and T. Blalock, McGraw-Hill, 2004. http://library.anu.edu.au/record=b2202651
4. J.R.Cogdell, *Foundations of Electrical Engineering*, 2nd Ed., Prentice Hall, 1996. http://library.anu.edu.au/record=b2153047
5. Thomas Floyd, "Fundamentals of analog circuits", 2nd Ed., Prentice Hall, 2001. http://library.anu.edu.au/record=b2202643

1.7 Web Site

1. http://wattle.anu.edu.au
   It is your responsibility to regularly check the webpage regularly (**at least twice a week**) for course information and announcements.

1.8 Teaching and Learning Activities

	No.	Day	Time	Location
Lectures: (Weeks 1-13)	Lecture 1:	Tuesday	10:00 AM-11:00 AM	CHEM T1 Lecture Theatre
	Lecture 2:	Wednesday	10:00 AM-11:00 AM	CHEM T1 Lecture Theatre
	Lecture 3:	Thursday	10:00 AM-11:00 AM	CHEM T1 Lecture Theatre
Tutorial: (Week 6)	T-G1:	Monday	2:00 PM-3:00 PM	Chem G51A
	T-G2:	Monday	3:00 PM-4:00 PM	Chem G51A
	T-G3:	Tuesday	2:00 PM-3:00 PM	Psyc G5
	T-G4:	Tuesday	3:00 PM-4:00 PM	Psyc G5
	T-G5:	Wednesday	2:00 PM-3:00 PM	CSIT N108
	T-G6:	Wednesday	3:00 PM-4:00 PM	CSIT N108
	T-G7:	Thursday	2:00 PM-3:00 PM	CSIT N108
	T-G8:	Thursday	3:00 PM-4:00 PM	CSIT N108
	T-G9:	Friday	2:00 PM-3:00 PM	CSIT N108
Computer Labs: (Weeks 3,10,13)	C-01:	Monday	2:00 PM-5:00 PM	ChemG51B (CLab1) & ENGNG1 (CLabs 2-3)
	C-02:	Tuesday		ChemG51B (CLab1) & ENGNG1 (CLabs 2-3)
	C-03:	Wednesday		ChemG51B (CLab1) & ENGNG1 (CLabs 2-3)
	C-04:	Thursday		ChemG51B (CLab1) & ENGNG1 (CLabs 2-3)
	C-05:	Friday		ChemG51B (CLab1) & ENGNG1 (CLabs 2-3)
	C-06:	Monday		GeogG1 (CLab1) & ChemG51B (CLabs 2-3)
	C-07:	Tuesday		Bozo 112
	C-08:	Wednesday		Bozo 112
	C-09:	Thursday		Bozo 112
	C-10:	Friday		Bozo 112
Hardware Lab 01*: (Week 4)	H1-G1:	Tuesday	2:00 PM-5:00 PM	Ian Ross Room 105
	H1-G2:	Wednesday		
	H1-G3:	Thursday		
	H1-G4:	Friday		
Hardware Labs 02-05: (Weeks 5,7,11,12)	H-G1:	Monday	2:00 PM-5:00 PM	Ian Ross Room 105
	H-G2:	Tuesday		
	H-G3:	Wednesday		
	H-G4:	Thursday		

*Note: Schedule for HLab01 is affected by Canberra Day public holiday on Monday 14 March.

1.9 Key Course Dates

No.	Date	Description
1.	Week 01:	Sign up for Labs and Tutes
2.	Week 01:	Course Entry Survey available in Wattle
3.	Week 03:	HLab Kit available (see Ljiljana)
4.	Week 05: Thursday 24 Mar, 10am	HLab01 due
5.	Week 06: Thursday 31 Mar, 10am	HLab02 due
6.	Week 07	Mid-Sem Exam to be scheduled
7.	Week 08: Thursday 28 April, 10am	HLab03 due
8.	Week 12: Thursday 26 May, 10am	HLab04 due
9.	Week 13: Thursday 02 June, 10am	HLab05 due
10.	Week 13:	Course Exit Survey available in Wattle

1.10 Tutor Responsibilities

Week	Activity	Location/Time	Monday	Tuesday	Wednesday	Thursday	Friday
1 (21Feb-27Feb)	No tute/lab						
2 (28Feb-06Mar)							
3 (07Mar-13Mar)	**CLab1** BJTs	C-01 to C05	Wayes	Wayes	Wayes	Wayes	Wayes
		C-06 to C10	Karan	Karan	Karan	Karan	Karan
4 (14Mar-20Mar)	**HLab1** BJTs	IR 104 &105 2-5pm	No lab (public holiday)	**Andrew** & Wayes & Amy & Zubair			
5 (21Mar-27Mar)	**HLab2** Op-amp circuits &Comparators	IR 104 &105 2-5pm	Eric & **Wayes** & Amy & Ali				No lab
6 (28Mar-03Apr)	Tutorial	2-4pm	Zubair chemG51A	Wayes Psyc G5	Zubair CSIT N108	Wayes CSITN108	Zubair CSIT N108 (2-3pm)
7 (04Apr-10Apr)	**HLab3** Op-amp xtics & Frequency Response	IR 104 &105 2-5pm	**Eric** & Zubair & Adnan & Ali				No lab
Mid-sem break							
8 (25Apr-01 May)	No tute/lab						
9 (02May-08May)							
10 (09May-15May)	**CLab2** Digital Electronics	C-01 to C05	Vasanta	Vasanta	Vasanta	Vasanta	Vasanta
		C-06 to C10	Karan	Karan	Karan	Karan	Karan
11 (16May-22May)	**HLab4** Digital Electronics	IR 104 &105 2-5pm	**Andrew** & Dumidu & Adnan & Juan				No lab
12 (23May-29May)	**HLab5** 555 Timer	IR 104 &105 2-5pm	**Andrew** & Dumidu & Adnan & Juan				No lab
13 (30May-05Jun)	**CLab3** 555 Timer & DAC	C-01 to C05	Dumidu	Dumidu	Dumidu	Dumidu	Dumidu
		C-06 to C10	Adnan	Adnan	Adnan	Adnan	Adnan

Note:

1. Tutor contact details are given on page 1.
2. CLabs will be marked by the tutor assigned to each lab session, respectively.
3. Hlab1 reports will be marked by Zubair.
4. Hlab2 reports will be marked by Wayes.
5. Hlab3 reports will be marked by Eric.
6. Hlab4 reports will be marked by Andrew.
7. Hlab5 reports will be marked by Adnan.
8. For Hlabs, tutor with the name in bold is the designated senior tutor.

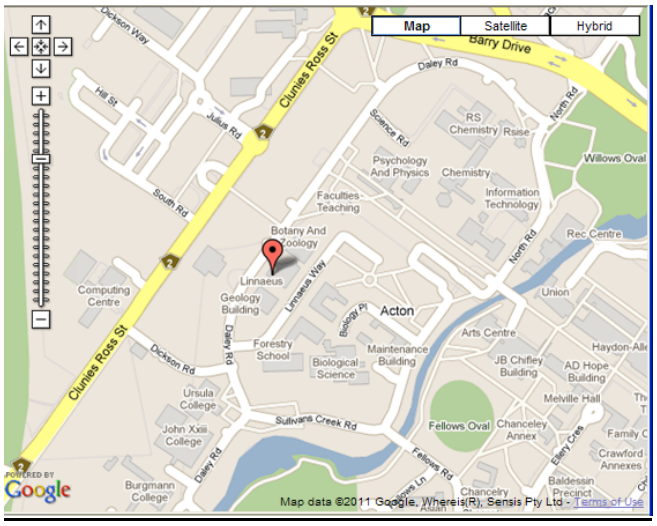
1.11 CLab1 Venues

The following table indicates the various venues for CLabs.

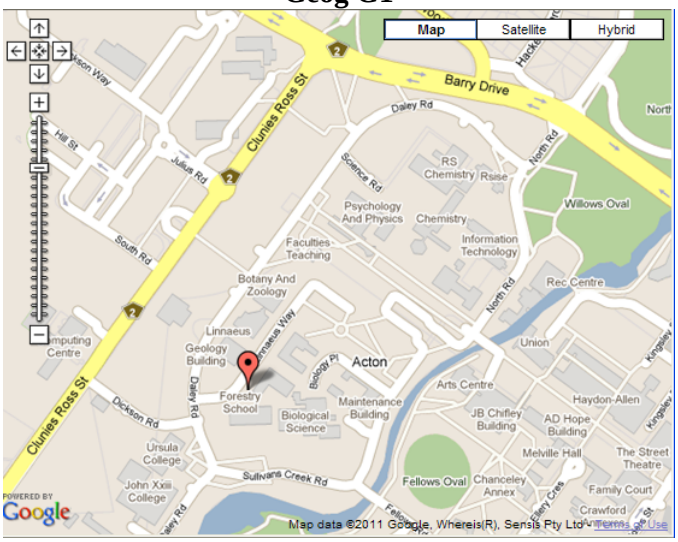
Week	Activity	Time	Monday	Tuesday	Wednesday	Thursday	Friday
3 (07Mar-13Mar)	**CLab1** BJTs	2-5pm	**C01:** ChemG51B	**C02:** ChemG51B	**C03:** ChemG51B	**C04:** ChemG51B	**C05:** ChemG51B
		2-5pm	**C06:** GeogG1	**C07:** BoZo 112	**C08:** BoZo 112	**C09:** BoZo 112	**C10:** BoZo 112
10 (09May-15May)	**CLab2** Digital Electronics	2-5pm	**C01:** ENGN G1	**C02:** ENGN G1	**C03:** ENGN G1	**C04:** ENGN G1	**C05:** ENGN G1
		2-5pm	**C06:** ChemG51B	**C07:** BoZo 112	**C08:** BoZo 112	**C09:** BoZo 112	**C10:** BoZo 112
13 (30May-05Jun)	**CLab3** 555 Timer & DAC	2-5pm	**C01:** ENGN G1	**C02:** ENGN G1	**C03:** ENGN G1	**C04:** ENGN G1	**C05:** ENGN G1
		2-5pm	**C06:** ChemG51B	**C07:** BoZo 112	**C08:** BoZo 112	**C09:** BoZo 112	**C10:** BoZo 112

The following maps indicate the locations of the various venues for CLabs.

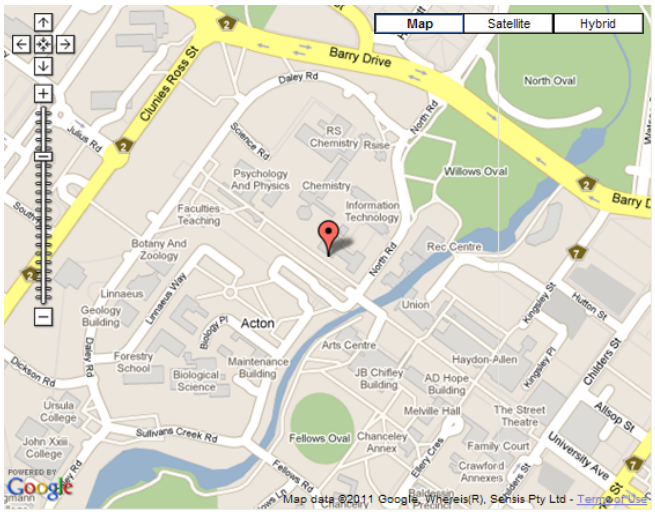
BoZo 112



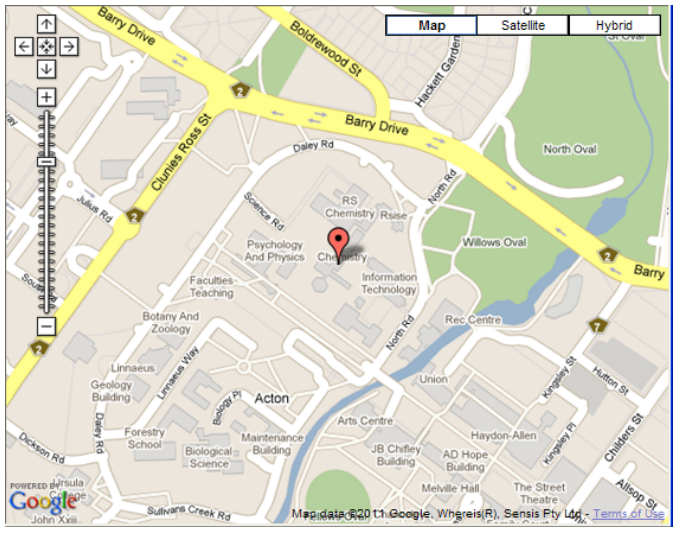
Geog G1



ENGN G1



Chem G51B



[2] COURSE DESCRIPTION

2.1 Course Outline

ENGN2218 Electrical Systems & Design builds directly on ENGN1218 Introduction to Electrical Systems by developing the students' understanding of the principles and operation of advanced electronic circuits and devices (bipolar junction transistor, operational amplifier, filters, digital logic gates, ADC and DAC, 555 Timer and Instrumentation amplifiers). It also emphasizes the importance of modeling the behaviour of complex electronic circuits and devices using systematic mathematical techniques. PSPICE is used extensively in the design, analysis and simulation.
Specific topics include:

- Bipolar Junction Transistors: Basic BJT concepts and circuit models, Common Emitter amplifiers (bias circuits, small-signal & large-signal equivalent circuits), Cascaded amplifiers.
- Op-amp: Op-amp characteristics, closed loop and open loop gains, Schmitt trigger.
- Steady State Sinusoidal Analysis: complex numbers, phasors, impedances, complex power.
- Op-amp Filters: Op-amp characteristics, Transfer functions, Bode Plots, First order active filters (low-pass and high pass).
- Digital Electronics: Number systems, Boolean algebra, Logic gates, Combinational logic circuits, Karnaugh maps, Combinational logic circuit design.
- Special purpose circuits: Analog to Digital Converters (ADC), Digital to Analog Converters (DAC), 555 Timer, Instrumentation Amplifiers.

2.2 Textbook Chapters

The following chapters will be covered from the Hambly textbook:-

- Chapter 13 Bipolar Junction Transistors (except 13.9)
- Chapter 14 Operational Amplifiers (except 14.8,14.9)
- Chapter 05 Steady State Sinusoidal Analysis (except 5.7)
- Chapter 06 Frequency Response and Bode Plots 6.1-6.4
- Chapter 07 Logic Circuits (except 7.6)

Note: Chapters 1,2,3,4.1-4.3,10,14.1-14.4,14.9 were covered in ENGN1218.

2.3 Textbook Questions

After solving the Problem Set questions, the students should solve the following questions from the Hambly textbook (5^{th} edition) for further practice:-

- **Chapter 13**:
  - Example 13.1,13.3–13.8 (see textbook for solutions)
  - Exercise 13.2,13.4,13.9 (solution provided)
  - Problems 13.44 (b), 13.62 (solution provided. compare also with PSPICE)
- **Chapter 14**: (use summing point constraint for all these questions)
  - Exercise 14.3, 14.6 (see textbook for solutions)
  - Example 14.1 (solution provided)
  - Problems 14.34 (answer $A_1 = -4/3$, $A_2 = -8/3$. Hint: write node equations at +ve pin of 1^{st} op-amp and –ve pin of 2^{nd} op-amp. Simplify to get the answer)
- **Chapter 05:**
  - Example 5.4,5.5,5.6,5.7 (see textbook for solutions)
  - Exercise E5.5, E5.6, E5.11 (solution provided)
  - Problems P5.49, P5.55, P5.69 (P5.49 to be solved in tutorial in week 05)
- **Chapter 06**:
  - Example 6.1,6.2 (see textbook for solutions)
  - Exercise 6.3,6.5,6.7,6.10 (solution provided)
  - Problems P6.32, P6.52 (no solution provided)
- **Chapter 07**:
  - Example 7.10,7.11 (see textbook for solutions)
  - Exercise 7.3,7.4,7.17 (solution provided)
  - Problems 7.27,7.28,7.53(a) & (b), 7.56(a) & (b), 7.67 (no solution provided)

2.4 Design Examples

The course contains the following specific design examples:-

1. Design a 1st order active low-pass filter for a particular cut-off frequency (CLab02).
2. Design a digital combinational logic circuit given the problem constraints (Problem Set 11).
3. Design a digital combinational logic circuit using NAND gates to control 7 segment display (HLab04).
4. Design a clock circuit using 555 Timer (CLab03, Problem Set 12)

2.5 Learning Outcomes

Knowledge Base

Having successfully completed this course, students should be able to:-

1. Apply circuit analysis techniques (e.g. Kirchhoff's law's, Thevenin equivalent circuits, Phasors and complex impedances, Transfer functions) to solve electronic circuits.
2. Explain transistor operating modes & analyse operation of basic transistor amplifier circuits.
3. Identify first order filter circuits and draw Bode Plots to determine the frequency response.
4. Explain analogue to digital and digital to analogue conversion techniques and design combinational logic circuits using Karnaugh Maps.
5. Analyse & design electronic circuits for specific applications using op-amps & 555 Timer.

Engineering Ability

Having successfully completed this course, students should be able to:-

6. Explain in simple terms the working of electronic circuits.
7. Select appropriate mathematical techniques to analyze and design electronic circuits.
8. Utilise a systems approach to identify key design parameters and justify choice of particular electronic components.

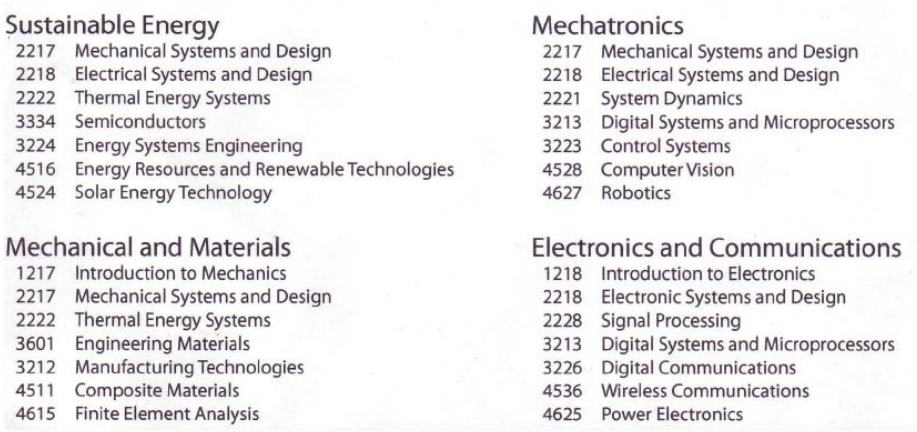
Practical Skills

Having successfully completed this course, students should be able to:-

9. Build circuits and take measurements using electrical measurement devices such as oscilloscope, function generator, digital multimeter, power supply. Compare the measurements with the behavior predicted by mathematic models and explain the discrepancies.
10. Model and optimise the performance of analogue and digital electronic circuits using simulation packages such as PSPICE and DigitalWorks.
11. Read data sheets and circuit diagrams and recognize building blocks such as op-amp circuits, logic gates, amplifiers, filters and timers.
12. Calculate results using scientific calculator (complex mode, base-n mode, engineering mode) in a knowledgeable and confident manner.

2.6 Relationship to BE Majors

1. ENGN2218 is a COMPULSORY course for ALL BE students. It is also formally part of 3 out of the 4 majors.



Sustainable Energy
- 2217 Mechanical Systems and Design
- 2218 Electrical Systems and Design
- 2222 Thermal Energy Systems
- 3334 Semiconductors
- 3224 Energy Systems Engineering
- 4516 Energy Resources and Renewable Technologies
- 4524 Solar Energy Technology

Mechatronics
- 2217 Mechanical Systems and Design
- 2218 Electrical Systems and Design
- 2221 System Dynamics
- 3213 Digital Systems and Microprocessors
- 3223 Control Systems
- 4528 Computer Vision
- 4627 Robotics

Mechanical and Materials
- 1217 Introduction to Mechanics
- 2217 Mechanical Systems and Design
- 2222 Thermal Energy Systems
- 3601 Engineering Materials
- 3212 Manufacturing Technologies
- 4511 Composite Materials
- 4615 Finite Element Analysis

Electronics and Communications
- 1218 Introduction to Electronics
- 2218 Electronic Systems and Design
- 2228 Signal Processing
- 3213 Digital Systems and Microprocessors
- 3226 Digital Communications
- 4536 Wireless Communications
- 4625 Power Electronics

[3] ASSESSMENT

There are FOUR components to the assessment for this course:

No.	Component	Marks
1.	Computer Labs	6.0% (3 Computer Labs: each worth 2.0%)
2.	Hardware Labs	25% (5 Hardware Labs, each worth 5%)
3.	Mid Semester Exam	19%
4.	Final Exam	50%
Note:	To sit on the Final Exam, students must **attend and submit report for** 4 out of 5 HLabs.	

3.1 Mid-Semester Exam

Syllabus

The Mid-semester exam topics include:

1. Lectures: 1-9, 14,15,19
2. Problem Sets : 1,2,5
3. Text Book Chapters: 13.1-13.8 and 5.1-5.6
4. Mid-semester exam assesses BJT (Lectures 1-9, Problem Sets 1, 2) and Steady State Sinusoidal Analysis (Lectures 14,15,19, Problem Set 5).
5. Op-amps are NOT assessable in mid-semester exam.
6. Steady State Sinusoidal Analysis (Lectures 14,15,19, Problem Set 5) is assessable in both mid-semester and final exams.

Learning Outcomes Assessed: 1,2,6,7,12

Weighting: 19%

Date: Week 08: **Wednesday 27 April, 2011, 5:45 PM – 8:00 PM**

Exam Structure

1. The Mid-semester exam will consist of 4 questions, each worth 10 marks. It will be marked out of 40 and scaled.
2. ONE question will be taken from the *Problem Sets/Lectures* with changes in numerical values. The question wording may be modified as required.
3. A further TWO questions will be similar in nature and difficulty to the *Tutorial*/*Problem Set/Lecture/Selected Textbook Questions*.
4. Mid-semester exam will have a question part requiring solution of a 2 x 2 complex system (see Problem Set 5, Q2 & covered in Tutorial).

Marking Criteria

Each question is worth 10 marks. Parts of the question carry the number of marks indicated. You must explain and show all steps taken to arrive at your answer. The clarity and precision of your explanations and answers will be taken into account when marking. All plots/sketches must be appropriately labeled. You must always indicate the units of all physical quantities. This examination is worth 19% of the final mark. It will be marked out of 40 and scaled.

Permitted Materials

1. A4 page (one sheet) with hand-written notes on both sides.
2. Calculator (Memory cleared for programmable calculators).

Past Exam Papers

Past examination papers (ENGN 2218 & ENGN2211) are not available from the library. Sample examination questions will be made available via Wattle before the mid-semester exam. Some exam questions will be taken from Lecture and Problem Set questions as outlined above.

3.2 Final Exam

Syllabus

The Final exam topics include:

1. Lectures: 10-35
2. Problem Sets : 3-14
3. Text Book Chapters: 5.1-5.4, 6.1-6.4, 7.1-7.5, 14.1-14.7, Additional 555 Timer, DAC/ADC Handouts

Note: BJTs are NOT assessable in Final exam.

Learning: 1,3,4,5,6,7,8,12

Outcomes Assessed

Weighting 50%

Tentative Date Final exam period

Exam Structure

1. The Final exam will consist of 5 questions, each worth 15 marks. It will be marked out of 75 and scaled.
2. ONE question will be taken from the *Problem Set*s with changes in numerical values. The question wording may be modified as required.
3. A further TWO questions will be similar in nature and difficulty to the *Problem Set/Lecture/Selected Textbook Questions*.

Marking Criteria Each question is worth 15 marks. Parts of the question carry the number of marks indicated. You must explain and show all steps taken to arrive at your answer. The clarity and precision of your explanations and answers will be taken into account when marking. All plots/sketches must be appropriately labeled. You must always indicate the units of all physical quantities. This examination is worth 50% of the final mark. It will be marked out of 75 and scaled.

Permitted Materials

1. A4 page (one sheet) with hand-written notes on both sides.
2. Calculator (Memory cleared for programmable calculators).

Past Exam Papers Past examination papers (ENGN2218 & ENGN2211) are not available from the library. A sample final exam paper will be made available via Wattle before the final exam. Some exam questions will be taken from Lecture and Problem Set questions as outlined above.

3.3 Computer Laboratories

Description There are four computer laboratories that support the hardware laboratories:

1. CLabs 1, 3 are based on PSPICE.
2. CLab 2 is based on PSPICE and DigitalWorks.

Learning Outcomes Assessed 1,2,3,4,5,6,7,8,10

Weighting 6% (2% each)

Due Dates No due dates. The lab reports will be marked during the lab.

Lab Signup

1. Sign up (via Wattle in WEEK 01) for ONE of the ten CLab groups.
2. Schedule for CLab01 is affected by Canberra Day public holiday on Monday 8 March.
3. An upper limit of **18 or 15 students per lab group** will apply.
4. Each student will perform the lab individually and attend labs only at those times during designated lab weeks.

Pre-Lab

1. Preliminary preparation for the laboratories is essential. Read the *Pre-Lab* section BEFORE coming to the CLab.
2. Most CLabs require theoretical calculations for some steps. Students are strongly advised to complete them before coming to the lab. Otherwise students may run the risk of not being able to finish the lab in time.
3. Students are strongly encouraged to complete part or all of the CLab prior to coming to the lab. This way you can use the lab time productively to ask the tutor for help if anything is unclear to you. Note that the reports can only be marked during the lab-time.

Lab Time Complete the *Lab Tasks* section DURING lab time and prepare the lab report.

Lab Reports

1. Reports will be prepared by every student DURING the lab.
2. A semi-formal CLab report is expected (See sample CLab report provided with CLab01 Handout).
3. For typed lab reports, use 11 point font (Times New Roman or Arial) and all page borders must be at least 1 inch. The figures must be appropriately labeled and referenced in the report. The first page must clearly show the Student Name, University ID and Lab number.

Assessment Criteria Each lab report is marked out of 10 marks. The report will be assessed taking into account the following:-

1. completion of tasks outlined in the CLab manual,
2. theoretical calculations (where requested in the lab manual) and
3. observations/explanations (where requested in the lab manual).

Attendance Policy

1. Students must attend their CLab group as reports will only be marked during the lab time.
2. Students may be allowed to attend a different CLab group *ONLY in special circumstances AND if permission is sought in advance*.

3.4 Hardware Laboratories

Description There are five hardware laboratories

Learning Outcomes Assessed 1,2,3,4,5,6,7,8,9,10,11

Weighting 25% (5% each)

Due Dates Reports are due in ENGN2218 submission box at 10am on Thursday in the week following the HLab i.e.

1. HLab01 due week 05: Thursday 24 Mar, 10am
2. HLab02 due week 06: Thursday 31 Mar, 10am
3. HLab03 due week 08: Thursday 28 Apr, 10am
4. HLab04 due week 12: Thursday 26 May, 10am
5. HLab05 due week 13: Thursday 02 June, 10am

Lab Signup

1. Sign up (via Wattle in WEEK 01) for ONE of the four HLab01 groups AND ONE of the four HLab02-05 groups
2. An upper limit of **42 students per lab group** will apply.
3. Each student will attend labs only at those times during designated lab weeks.
4. Experiments are conducted by teams of 2 students. *It is expected that the composition of the teams is maintained for the 5 hardware experiments.*

Lab Kit Every student must obtain a lab kit from Ljiljana Argy, Student Administrator (in WEEK 03). Cost $35/- (see details in Wattle).

Pre-Lab Preliminary preparation for the laboratories is essential. Read the *Pre-Lab* section BEFORE coming to the CLab.

Lab Time Complete the Procedure section DURING lab time. The Lab tutor will make a note that all procedure steps and measurements have been completed during lab time.

Lab Reports

1. Reports will be prepared by every student AFTER completing the lab.
2. A proper HLab report is expected including:-
    a. main circuit diagrams
    b. relevant observations/explanations (where requested in the lab manual),
    c. theoretical calculations/analysis (where requested in the lab manual)
    d. measured results,
    e. answers to Evaluation & Review Questions.
    f. No formal introduction or aims or conclusions are required.
3. HLab reports should be limited to a maximum of 12 pages (typically 10 pages). Reports in excess of 12 pages will have additional pages removed and the report then marked. For typed lab reports, use 11 point font (Times New Roman or Arial) and all page borders must be at least 1 inch. The figures must be appropriately labeled and referenced in the report. The first page must clearly show the Student Name, University ID and Lab number.

Assessment Criteria Each lab report is marked out of 10 marks. The report will be assessed taking into account the following:-

1. discussion of the results and/or measurements,

2. theoretical calculations and observations/explanations (where requested in the lab manual at individual lab tasks),
3. answers to the evaluation and review questions and
4. standard of the lab report as outlined above.

Regrading The marked reports will be returned back to the students. There are occasionally small mistakes made in the lab report grading. If a grading mistake is clear (such as incorrect addition of marks) then you can contact the tutor to correct your marks. The tutor contact details are given in the first page of this document.

Late Submission Policy Late reports will be accepted but will undergo the following penalty:

1. All reports submitted after 10 am on the due date will be reduced by 1 mark for the report per day, including weekends.
2. The lab report may be marked at a later date without a late submission penalty only in special exceptional circumstances AND if permission is sought in advance.

Plagiarism

1. Students are encouraged to discuss the lab questions with their lab partner and with each other. However the generated figures and the report submitted must be your own work.
2. Any occurrence of plagiarism will be subject to the College policy on Plagiarism (see Engineering Undergraduate Handbook page 36, section 7.2.4 in Course Documents folder).

Attendance Policy

1. Any student absent from their HLab will receive a 0 mark.
2. To sit on the Final Exam, students must **attend and submit report for** 4 out of 5 HLabs.
3. The late submission & attendance policies will be strictly enforced for fairness to all.

Marked Report Collection

1. Marked HLab reports will be available according to the following timetable:
   a. Marked HLab1 reports can be picked up during HLab3 in week 7.
   b. Marked HLab2 and 3 reports can be picked up during HLab4 in week 10.
   c. Marked HLab4 and 5 reports can be picked up on Thursday 9 June (Chem T1, 11-12).
2. Please make sure you use the HLab cover sheet provided and fill in your group number and identify the day you performed the lab. This will help the tutors in sorting marked reports and assist in returning them.
3. All lab reports not picked up during the allocated times will be disposed off (placed in the recycled paper bins) at the end of the week.

3.5 Tutorial

Learning Outcomes Assessed 1,7,12

Weighting

1. Some parts in the mid-semester will be similar in nature and difficulty to the tutorial questions.
2. Mid-semester exam will have a question requiring solution of a 2 x 2 complex system (see Problem Set 5, Q2).

Signup

1. Sign up (via Wattle in WEEK 01) for ONE of the nine Tute groups.
2. An upper limit of **20 students per tute group** will apply.

Description Problem solving and learning to use complex mode on scientific calculator based on group discussion and interaction with the tutor.

Note If you forget which Tutorial/HLab/CLab/ group you have signed up for, click on “Participants” in the Course menu on ENGN2218 wattle homepage and scroll down to your name. You will see the groups listed in front of your name.

[4] TEACHING & LEARNING ACTIVITIES

4.1 Lecture Recordings and Notes

1. Please make sure to attend all lectures. For the benefit of students, I will endeavour to record all my lectures. Please note that sometimes there are unexpected local hardware problems and the lecture recording equipment does not work properly. In addition the DLD recording system can get overloaded especially in the first few weeks of semester. Such problems, which are beyond my control, can result in a lecture not being recorded. I will report any such problems to DOI who are responsible for the equipment in lecture theatres. Students can also report these issues by visiting https://doihelpdesk.anu.edu.au .
2. The lecture notes will generally be posted on the course web site after each lecture.
3. For some course topics, pre reading material and scanned pages from textbook will be made available at the start of each week.

4.2 Problem Sets

1. At the start of each week, Problem Sets covering the course material will be prepared and posted on the course web-site. The solutions to the Problem Sets will be posted at the end of each week.
2. The Problem Sets are assessable as follows:
    a. ONE question each in the Mid Semester and Final Exams will be taken from the *Problem Sets* with changes in numerical values. The question wording may be modified as required.
    b. A further TWO questions in both the Mid Semester and Final Exams will be similar in nature and difficulty to the *Problem Set/Lecture/Selected Textbook Questions*.

4.3 Software Packages

PSPICE (9.1 student version) and DigitalWorks software packages are required for this course and are available on all Info Commons computers. Students can also download a copy from the Labs folder.

Please note the following regarding PSPICE:-

1. When a PSPICE schematics file (*.sch extension) is executed, it creates a number of additional files. In Wattle, only the *.sch files are made available for download in zip format.
2. An introduction to PSPICE video demo movie (*.avi file) is available in Wattle labs page.

The following (optional) software packages are also available on all Info Commons computers:

1. Matlab 2007b (for numerical calculations)
2. Microsoft Visio 2003 (due to ANU licensing restrictions, Visio 2003 is available only on the 20 PCs in the Law G17 computer lab. Law G17 has the same software as the Engineering lab)
3. Latex (Winedt and MikTex)
4. Note that the Problem Sets in this course are typeset using Latex and the majority of the figures are drawn using Visio and/or Matlab.

4.4 Feedback and Evaluation

Your constructive feedback is welcome throughout the course.

I have set up the following anonymous feedback surveys via Wattle:-

1. ENGN2218 Entry Survey (available Week 01)
2. ENGN2218 Exit Survey (available Week 13).

In addition, the course will be formally evaluated via ANU Student Evaluations of Learning and Teaching (ANUSELT). A link to the online evaluation will be sent to each students' email account by "ANU Students Evaluation" around Week 10 or 11 (May 2011).

[5] TENTATIVE COURSE SCHEDULE

Week	Lectures	Textbook	ProbSets	Labs/Tute	To Do
1 (21Feb-27Feb)	L01 Intro to ENGN2218 L02 Intro to BJT Lecture cancelled			No Labs in Weeks 1-2	Sign Up for labs and Tute **Entry Survey**
2 (28Feb-06Mar)	L03 BJT Characteristics L04 BJT Bias Circuits L05 BJT Voltage Divider Bias Circuit	**BJT** Chapter 13 (13.1–13.8)	**P01** BJT Bias Circuits		Solve P01
3 (07Mar-13Mar)	L06 BJT AC Circuits L07 BJT Equivalent Circuits L08 BJT CE Amplifiers		**P02** BJT Amplifier Circuits	**CLab1** BJTs	Solve P02 Attend CLab **Buy HLabKit**
4 (14Mar-20Mar)	L10 Intro to Op-amp L11 Comparators (Schmitt Trigger) L12 Op-amp Theory	**Opamps** Chapter 14 (14.1–14.8) See also handout	**P03** Op-amp Circuits **P04** Comparators	**HLab1** BJTs	Solve P03 Solve P04 Attend HLab
5 (21Mar-27Mar)	L13 Op-amp Characteristics L14 Phasors and Impedances L15 Phasor Circuit Analysis	**Steady State Sinusoidal Analysis** Chapter 05 (5.1–5.6)	**P05** Phasors and Impedances	**HLab2** Op-amp Comparators	Solve P05 Attend HLab HLab1 due
6 (28Mar-03Apr)	L16 Op-amp Frequency response L17 RC Filter Circuits L18 Op-amp Filters	**Filters** Chapter 6 (6.1–6.4)	**P06** Filter Circuits	**Tute** Phasors & Impedances	Attend Tute Solve P06 HLab2 due
7 (04Apr-10Apr)	Problem Set 06 L19 Power in AC circuits L09 Cascaded Amplifiers L20 Summary & Mid Sem Exam		**P07** Op-amp Freq. Response	**HLab3** Op-amp xtics & Frequency Response	Solve P07 Attend HLab Pickup Hlab1 reports
Mid-Sem Break					

1. All HLab reports are due 10am on Thursday in ENGN2218 Assignment Box.
2. Marked HLab1 reports can be picked up during HLab3 in week 7.
3. All CLabs will be marked during the lab.
4. Red color indicates assessment item due that week.

Week	Lectures	Textbook	ProbSets	Labs/Tute	To Do
8 (25Apr-01May)	Public Holiday L21 Digital Circuits L22 Number Systems & Logic Gates	**Digital Electronics** Chapter 7 (7.1–7.5)	**P08** Digital Electronics		Solve P08 HLab3 due
9 (02May-08May)	L23 Boolean Algebra L24 BJT Switch L25 SOP Implementation		**P09** Boolean Algebra		Solve P09
10 (09May-15May)	L26 Karnaugh Maps L27 Combinational Circuits L28 Seven Segment Display		**P10** Karnaugh maps **P11** Combinational Logic Circuits	**CLab2** Digital Electronics & Opamps	Solve P10 , P11 Attend CLab
11 (16May-22May)	L30 Intro to 555 Timer L31 555 Multivibrators L32 Binary weighted input DAC	**555 Timer** See handout **ADC & DAC** See handout **Instrumentation** 14.8 & handout	**P12** 555 Timer	**HLab4** Digital Electronics	Solve P12 Attend HLab Pickup Hlab2 & Hlab3 reports
12 (23May-29May)	L33 Ladder DAC L34 ADC Circuits L35 Instrumentation		**P13** DAC	**HLab5** 555 Timer	Solve P13 Attend HLab HLab4 due
13 (30May-05Jun)	L29 Complement Arithmetic L36 Summary & Final Exam		**P14** Instrumentation Op-amps	**CLab3** 555 Timer & DAC	Solve P14 Attend CLab HLab5 due **Complete Exit Survey**
Final Exam					

1. All HLab reports are due 10am on Thursday in ENGN2218 Assignment Box.
2. Marked HLab2 and 3 reports can be picked up during HLab4 in week 10.
3. Marked HLab4 and 5 reports can be picked up on Thursday 9 June (Chem T1, 11-12).
4. All CLabs will be marked during the lab.
5. Red color indicates assessment item due that week.