[1] **Aims**

1. To acquaint students with modern applications and implementation of analogue electronics.
2. To develop in students the ability to
   a. conduct an engineering design project.
   b. self-learn.
   c. present lab demonstrations.
   d. function as an effective team member and give objective feedback to peers.
   e. manage information and communicate via written report.

[2] **Selection of Topic**

1. What do you currently know about analogue electronics?
2. What analogue electronics application particularly interests you?
3. How will you research analogue electronics topics?
4. How much will the components cost? (use $30/student as a rough maximum figure).
5. Does the application involve ADC/DAC, op-amp or 555 Timer?

The table at the end of this document provides (incomplete) list of relevant analogue electronics projects at various levels. This may assist you in selecting and researching your topic.

[3] **Groups**

Students may work in groups of up to 3 people. It is the responsibility of group members to ensure that all members participate in a fair and equitable manner. In general, all members of a group will receive the same mark, though this may be moderated in cases of poor participation. Any difficulties should be resolved early in the semester.

[4] **Assessment**

The “ENGN3227 Tutorial: Electronics Project” comprises 25% of overall assessment. It is comprised of the following individual components:

1. Project Report: 15 Marks
2. Lab Demonstration: 10 Marks (Presentation: 5 Marks + Circuit Performance: 5 Marks)

The following criteria applies to the overall marking of the project:

1. Level of understanding, analysis and technical details.
2. Creativity/originality of design implementation.
3. Actual circuit operation during lab demonstration.
4. Matching of measured outcomes with the initial design specifications.
5. Use of PSPCE/MATLAB in the design

[5] **Due Dates**

<table>
<thead>
<tr>
<th>No.</th>
<th>Week</th>
<th>Due Date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>05</td>
<td>Wed 16 Aug</td>
<td>Project plan due.</td>
</tr>
<tr>
<td>2</td>
<td>11</td>
<td><strong>Fri 06 Oct</strong></td>
<td>Last date for submitting EAGLE PCB design files to Ian McRobert.</td>
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<td></td>
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<td>PCB Ordering: <strong>Tue Oct 10</strong>. PCB delivery: <strong>Tue 17 Oct</strong>.</td>
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<tr>
<td>3</td>
<td>12</td>
<td><strong>Tue 24 Oct, 10 am</strong></td>
<td>Project Report due (ENGN3227 submission box).</td>
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<tr>
<td>4</td>
<td>12</td>
<td><strong>Tue 24 Oct, 4 pm</strong></td>
<td>Deadline for Electronic Submission.</td>
</tr>
<tr>
<td>5</td>
<td>13</td>
<td>Thur Oct26</td>
<td>Lab demonstrations (schedule to be announced later)</td>
</tr>
</tbody>
</table>
[6] Two Page Topic Description

The first page should specify:
1. the analogue electronics project you wish to implement.
2. names of group members and the responsibilities of each member.
3. the context in which the technology is used.
4. design specifications and relevant theory to be used.
5. Up to 3 key references.

The second page (& if required third page) should list:
1. Block diagram of the overall implementation
2. Detailed circuit diagram(s) for implementation.
3. List of components and total estimated cost.

[7] What is expected in the report?

1. Up to 10 pages in length (excluding appendix).
2. Quality professional standard presentation using word processor.
3. Clear discussion of the analogue electronics application and its context. Should be comprehensible to a non-technical person.
4. Justification of selected design and design criteria.
5. Clear discussion of how analogue electronics or related theory is used in the application. Should be comprehensible to other students in the class.
6. All source material must be fully acknowledged and documented. Students are reminded of the University’s plagiarism policy: copying of material from books, magazines, internet or anywhere else is strictly prohibited. What you write must be in your own words.

Suggested Report format is as follows:-
1. Title
2. Abstract
3. Introduction/Background
4. Theory/Design
5. Implementation
6. Results
7. Conclusion
10. Appendix C: EAGLE PCB Layout design. (optional)

Groups must also submit the following by email or by bringing the files on USB:
1. A pdf or doc copy of Final report
2. All Matlab/Pspice/DigitalWorks files.
3. EAGLE files.
4.Datasheets and any relevant technical detail

The deadline for email submission is 4 pm Tuesday: 24 Oct.
[8] What is expected in the lab demonstration?

1. 15 min duration.
   a. 5-7 min demonstration and
   b. 5-10 mins for interactive discussion and questions
   c. More interactive than a formal presentation
2. What is the goal of your project?
3. How did you achieve your design?
   a. Indication of use of design tools: Matlab/Pspice/DigitalWorks
4. PCB design and demonstration of circuit performance.
   a. “Sell your design” by highlighting potential applications.
5. Suitable material to support the demonstration:
   a. Printouts
      i. Block diagrams
      ii. Circuit diagrams
      iii. PCB diagrams
      iv. Measured Results
      v. Key Design Equations
      vi. Key DataSheet pages
   b. Laptop (e.g. for computer demo).

Sign-up sheet for lab demonstration will be posted on ENGN 3rd year Notice Board on 9 am Monday 16 October.

[9] Use of Scheduled Tutorial Time

This is up to you. It can provide a minimum amount of contact among group members. I will be available for consultation during these times. Here is what I recommend:

- Weeks 2 – 4
  o form groups
  o discuss possible topics and methods for research
  o discuss technical issues
- Weeks 5 – 11
  o In-depth research of topic
  o Lab and PCB implementation
  o Preparation of report and lab demonstration

[10] Project Lab Time

R104 Engineering lab will be available for ENGN3227 students on Friday 2-5 pm from Week 6 onwards. Students can test their circuit implementations during this time. Department Lab administrator will be available during this time to assist with any student enquiries.


Some ideas for projects, to get you started thinking, are given below:

<table>
<thead>
<tr>
<th>Electronics</th>
<th>Instrumentation &amp; Control</th>
<th>Telecommunications</th>
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<tbody>
<tr>
<td>1. Analysis (how does it work?) of a power supply (switching) for 12V 50W halogen bulbs.</td>
<td>12. Sensing and measurement (e.g. sound, temperature, torque, pressure, pH, light level, relative humidity, capacitance, frequency).</td>
<td>15. Basic modulation/demodulation (e.g. AM, PM or FM) telecommunication circuits: See Floyd textbook.</td>
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<tr>
<td>3. Voltage controlled oscillator (VCO).</td>
<td>14. Medical circuits &amp; processing of bioelectric potentials, e.g. heart rate monitor, recording data from joggers, providing audible indications of measurable parameters for blind persons.</td>
<td>17. DS/CDMA transmitter and receiver.</td>
</tr>
<tr>
<td>4. Automatic Gain Control (AGC).</td>
<td>15. Basic modulation/demodulation (e.g. AM, PM or FM) telecommunication circuits: See Floyd textbook.</td>
<td>18. OFDM transmitter and receiver.</td>
</tr>
<tr>
<td>7. Digital clock circuit (e.g. 6 digit stopwatch) or digital counting circuit (e.g. using 555 Timer to cycle through digits 0-9).</td>
<td>18. OFDM transmitter and receiver.</td>
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<td>8. Music synthesizer/ Multitone Signal Generator (e.g. for use in conjunction with mobile phone ring-tones).</td>
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<td>10. Infrared transmitter and receiver e.g. used in remote controls.</td>
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<td>11. Wireless remote control circuit (to turn on and turn off a remote LED).</td>
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