Course Outline

ECE 3670 – Electronics 3E

**IMPORTANT NOTICE – In-Person Laboratories**

This course will be delivered using online lectures and in-person laboratories. **Students are required to pre-screen themselves** before travelling to campus for their laboratory and must not attend the campus if they are experiencing any COVID-19 symptoms or if they have been in contact with someone who has tested positive for COVID-19.

In addition, the University requires that **all students must be fully vaccinated** (first dose by Sept 22nd, second dose by October 31st). As well, **students must wear a face mask** at all times while attending the laboratory and in all common indoor spaces on campus, or whenever social distancing can not be maintained. For further information, please visit the UofM COVID-19 Resources website ([https://umanitoba.ca/coronavirus/recovery](https://umanitoba.ca/coronavirus/recovery)).

**Course Objectives**

As a continuation of ECE 2160 Electronics 2E, the objectives of this course are for students to learn to both analyze and design fundamental electronic circuits, and to explore their practical applications.

**Course Content**

The following topics will be covered:

- MOSFETs
- Differential Amplifiers: Common-mode vs. differential mode, common-mode rejection ratio, small-signal and large-signal operation, input/output characteristics, non-ideal characteristics, active load, frequency response.
- Single-stage IC Amplifiers: BJT, biasing, high-frequency response, large-signal transfer characteristics, follower circuits, paired transistors, current mirror.
- Feedback: Theory, feedback topologies, examples of feedback circuits, circuit characteristics improvement using feedback.
- Oscillators: Loop-gain criteria, Wien-Bridge oscillators, tank circuit/tuned circuit oscillators, crystal oscillators, multi-vibrators, timers.
- Power Amplifiers: Classification, some common configurations, detailed class B power amplifiers.
- Digital Circuits: Inverter characteristic, noise margins, loading and fan-out, power dissipation.

**Textbook**


**Other References**


**Academic Integrity**

Students are expected to conduct themselves in accordance with the highest ethical standards of the Profession of Engineering and evince academic integrity in all their pursuits and activities at the university. As such, in accordance with the General Academic Regulations on Academic Integrity, students are reminded that plagiarism or any other form of cheating in examinations, term tests, assignments, projects, or laboratory reports is subject to serious academic penalty (e.g. suspension or expulsion from the faculty or university). A student found guilty of contributing to cheating by another student is also subject to serious academic penalty.
Learning Outcomes
1. Analyze and design differential amplifiers.
2. Analyze and design single stage amplifiers.
3. Analyze and design feedback and oscillators.
4. Analyze and design power amplifiers.
5. Analyze digital circuits.

Expected Competency Levels

<table>
<thead>
<tr>
<th>Component</th>
<th>Value (%)</th>
<th>Method of Feedback</th>
<th>Learning Outcomes Evaluated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quizzes (best 4 of 5)</td>
<td>10</td>
<td>S</td>
<td>1, 2, 3, 4, 5</td>
</tr>
<tr>
<td>Laboratories + Project</td>
<td>20</td>
<td>F, S</td>
<td>1, 2, 3, 4, 5</td>
</tr>
<tr>
<td>Term Test(1)</td>
<td>30</td>
<td>F, S</td>
<td>1, 2, 3, 4, 5</td>
</tr>
<tr>
<td>Final Examination(1)</td>
<td>40</td>
<td>S</td>
<td>1, 2, 3, 4, 5</td>
</tr>
</tbody>
</table>

* The midterm and final will include approximately 50% design problems (DE).
* Method of Feedback: F - Formative (written comments and/or oral discussion), S - summative (numerical grade)

Evaluation

The final course grade will be determined from a student's performance on assignments, in laboratories (including a design project), and on examinations. Students must receive a minimum of 50% on the final examination in order to be eligible to receive a passing grade. Students who are unable to write the mid-term exam for medical (or other acceptable) reasons are allowed in the mid-term and final exams. Students must complete all the laboratories in order to be eligible to receive a passing grade.

CEAB Graduate Attributes Assessed

PA.3 – Analyzes and solves complex engineering problems.
DE.2 – Uses an appropriate design process that considers all relevant factors (i.e., health & safety risks; standards; economic, environmental, cultural and societal considerations).

Retention of Student Work

Students are advised that copies of their work submitted in completing course requirements (i.e. assignments, laboratory reports, project reports, test papers, examination papers, etc.) may be retained by the instructor and/or the department for the purpose of student assessment and grading, and to support the ongoing accreditation of each Engineering program. This material shall be handled in accordance with the University’s Intellectual Property Policy and the protection of privacy provisions of The Freedom of Information and Protection of Privacy Act (Manitoba). Students who do not wish to have their work retained must inform the Head of Department, in writing, at their earliest opportunity.
## Requirements and Regulations

- Attendance at lectures and laboratories is essential for successful completion of this course. Students must satisfy each evaluation component in the course to receive a final grade.

- It is the responsibility of each student to contact the instructor in a timely manner if he or she is uncertain about his or her standing in the course and about his or her potential for receiving a failing grade. Students should also familiarize themselves with the University’s General Academic Regulations, as well as Section 3 of the Faculty of Engineering Academic Regulations dealing with incomplete term work, deferred examinations, attendance and withdrawal.

- No programmable devices or systems (such as calculators, PDAs, iPods, iPads, cell phones, wireless communication or data storage devices) are allowed in examinations unless approved by the course instructor.

- Students should be aware that they have access to an extensive range of resources and support organizations. These include Academic Resources, Counselling, Advocacy and Accessibility Offices as well as documentation of key University policies e.g. Academic Integrity, Respectful Behaviour, Examinations and related matters.

## Copyright Notice

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### Grading Scale

<table>
<thead>
<tr>
<th>Letter</th>
<th>Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>A+</td>
<td>95–100</td>
</tr>
<tr>
<td>A</td>
<td>85–94</td>
</tr>
<tr>
<td>B+</td>
<td>80–84</td>
</tr>
<tr>
<td>B</td>
<td>70–79</td>
</tr>
<tr>
<td>C+</td>
<td>65–69</td>
</tr>
<tr>
<td>C</td>
<td>55–64</td>
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<tr>
<td>D</td>
<td>45–54</td>
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<tr>
<td>F</td>
<td>&lt; 45</td>
</tr>
</tbody>
</table>

Note: These boundaries represent a guide for the instructor and class alike. Provided that no individual student is disadvantaged, the instructor may vary any of these boundaries to ensure consistency of grading from year-to-year.