Course Syllabus

Mec E 460 Senior Design Project

Section: Lec B1, Winter Term 2012.
Lecture Room: NREF 2-001. Time: Wednesday & Friday, 9:00 - 9:50 AM
Department of Mechanical Engineering, University of Alberta

Instructors
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Lectures
Wednesday & Friday 9:00 – 9:50 AM NRE 2-001

Design Project Teams
- Mec E 460 students are responsible for forming their own teams and ranking, in order of preference, five design projects from the list of available project proposals posted on the course website.
- Design teams of four to five Mec E members are strongly encouraged!
- Teams contemplating groups of three should be aware of the significant additional workload incurred by small project teams.
- A forum is available on the 460 EClass site to facilitate team and project selection.
- If a student is unable to join a design group please email the course coordinator by Wednesday, 18 January, 2012 indicating your name and four project choices.

Project Review Meetings
- Regularly scheduled project meetings will be held weekly with one of our 460 design instructors except for the following days/weeks:
  - Public holidays: Feb 20, Apr 6, and Apr 8
  - Reading week (1 week): Feb 21-24.
  - Final Phase (2 weeks): Apr 2-13.
- Project meetings are typically planned for 1 hour. However, if the student group and the instructor have completed the agenda, 30 minutes sessions are allowed.
• Project meetings are student led and intended to provide time with an instructor whose role is that of mentor, advisor, technical consultant & coach rather than project supervisor.

**Course Evaluation**
The course deliverables are all written, visual or oral works. There are no examinations.

**Mark Allocation & Project Due Dates**

<table>
<thead>
<tr>
<th>Mark Allocation &amp; Project Due Dates</th>
<th>Percentage</th>
<th>Due Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attendance – Lectures &amp; Design Meetings</td>
<td>5%</td>
<td>Throughout Term</td>
</tr>
<tr>
<td>Project Selection Letter of Intent</td>
<td>5%</td>
<td>5:00 PM - 13 Jan 2012</td>
</tr>
<tr>
<td>Phase 1 - Design Specification &amp; Project Plan</td>
<td>15%</td>
<td>5:00 PM - 03 Feb 2012</td>
</tr>
<tr>
<td>Phase 2 - Conceptual Design Report</td>
<td>30%</td>
<td>5:00 PM - 09 Mar 2012</td>
</tr>
<tr>
<td>Phase 3 - Detail Design Report</td>
<td>30%</td>
<td>5:00 PM - 5 Apr 2012</td>
</tr>
<tr>
<td>Design Conference (Oral Presentation)</td>
<td>10%</td>
<td>8 AM to 5 PM – 14 Apr 2012</td>
</tr>
<tr>
<td>Final Design Poster (Hard Copy)</td>
<td>Y/N</td>
<td>8:00 AM 14 Apr 2012</td>
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<tr>
<td>Final Design Poster (Electronic Copy)</td>
<td>5%</td>
<td>5:00 PM 14 Apr 2012</td>
</tr>
<tr>
<td>Design Conference (Presentation Electronic Copy)</td>
<td>Y/N</td>
<td>5:00 PM – 14 Apr 2012</td>
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**Nota Bene (N.B.)**

Our progressive marking scheme is intended to credit design teams who apply and demonstrate knowledge gained during the course of the project. (This is a good thing!)
Project Selection Letter of Intent Deliverable 5%

- Recommended effort is 10 hr/person, estimate range is 8-12 hr/person.
- Standard, one page business format letter addressed to the course coordinator

- Identify all design team members
  o First & Last Names
  o Student ID Number
  o University email addresses

- Clearly identify your team’s top five project choices in order of preference.
  (Best Bet - Choose projects of interest to your team)

- Historically, teams choosing projects of interest have a richer and more satisfying design experience than those who try to pick the easy ones! All projects are what you make of them - easy or challenging. Seemingly “easy” projects at the outset are not necessarily the least technically challenging. **Bottom line** - it’s really tough to identify the “easy” projects!

- Indicate acceptance of IP ownership provisions specified by the client. Please note that your acceptance of these provisions is binding and cannot be renegotiated at the end of term!

- Clearly indicate a minimum of four project review meeting times/days of the week that are convenient for your team. Design instructors will choose from among these options to schedule weekly design meetings which start the week of **18 Jan 2012**.

- Projects will be allocated based on project ranking and electronic file submission time stamp (first come - first served).

- **REALLY IMPORTANT TIP!** - Design teams are **STRONGLY** encouraged to contact project sponsors during the first week of class in order to learn more about the project before submitting letters of intent. We can’t stress this enough - the more you know before launching your project, the better the outcome!

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To allow time for all teams to contact project sponsors, Letters of Intent will be accepted between 12:00pm and 5:00pm on Friday 13 Jan 2012.

- Early submissions (i.e. before 12:00.00.000 PM) will not be considered.

Submit PDF file to our Mec E 460 EClass assignments page.

PLEASE use a rational file naming convention, and refer to page 13
Phase 1 - Design Specification & Project Plan Deliverables 15%

- Recommended effort is 18.5 hr/person, estimate range is 16-25 hr/person.
- Cover Letter (10%)
  - Standard letter of transmittal addressed to the project client
  - Description of the material being submitted
  - Estimated time and cost to complete the project
  - Professional, concise, informative . . . should reflect your own professionalism
  - Include all the teaching members in the “cc” list and make your group advisor as the first one for recognizing his/her involvement

- Design Specification Report (15%)
  - 1000 words max – not including figure text, tables, charts, graphs, etc.
  - please show report body word count in table of contents
  - Design objective statement – clearly define the overarching project goal
  - Summarize and discuss key design specifications, requirements and constraints. Industrial design, human factors, ergonomics design, social, ethical, legal & sustainability factors must be considered.
  - Address the business side of the equation
    - How many gizmo’s does your client want? Need? Potential Sales?
    - Chat with your client about ballpark costs, i.e. less than $10M? $1M, $100k, $25k, etc.
    - If designing a system or machine – define & document preliminary ROI expectations, i.e. after investing $500,000 in a widget making machine what payout does your client expect?
  - Manufacturing and material selection considerations
  - Table of governing or potentially applicable design standards & regulations
  - This report should be written for an intelligent reader (your client) who may or may not have technical training

- Design Specification Matrix (40%)
  - Tabulate design requirements & constraints using concise engineering language
  - Identify and document safety/regulatory requirements, client “must have” and client “nice to have’s”, design specifications, environmental guidelines, etc. that apply or potentially apply to your project.
  - Include a reference beside any potentially applicable design standards & regulations
  - Identify and document design requirements suggested by the design team
  - Define the relative importance of each design requirement by consulting w/client
  - Size, weight, color, load conditions, design standards, speed, reach, cost, etc. should appear in this matrix (reference example design spec matrix)
  - Qualitative and quantitative design specifications are required, yet be a quantitative as possible (ie. Don’t just say light weight, give a number.)
  - Feel free to organize your spec matrix as you see fit by using appropriate sub-headings
  - If a particular requirement is not obvious please explain in the Design Specification Report section

- Project Management (35%)
  - Complete online Liquid Planner (LP) video tutorials
  - Practice collaboration & project management skills using the web app LP
  - Use “yellow sticky” schedule developed in class to create a dynamic LP project schedule
  - Create a baseline schedule to track subsequent time expenditures
  - Keep detailed timesheets of design/engineering hours logged against the project
  - Update task descriptions and time estimates regularly as your understanding of the project develops.
  - Track engineering/design costs throughout the project
  - Invite your client to join and participate in managing the project
  - Provide engineering cost estimate using following standard rates:
    - Junior Engineer / Industrial Designer: $90 per hour
    - Intermediate Engineer: $150 per hour
  - Review the schedule and perform a “gut” check. Is it reasonable? Achievable?
We are looking for engagement with the entire project management process and experience, not the “right” answers. Give it whirl, be fearless, try it out, experiment, explore . . . learn! We expect your project schedule to change . . . they always do!

Helpful Tips, Comments, Suggestions

The purpose of this “phase” is to ensure the design team and client achieve a common understanding of the design problem, objective, specs and scope of work. Research is required to fully understand the client’s business, product requirements, industrial design factors and existing or competing technology. This design phase is concerned with clearly and comprehensively defining the problem and developing preliminary performance specifications. While somewhat counterintuitive, this is the key design stage that defines subsequent project success!


Ideation or conceptual design exploration can be done during phase 1 providing that your intent is improving your understanding of the fundamental design requirements. Focus on uncovering and defining the essential elements of WHAT is to be designed. The embodiment of the design (the HOW) may be explored here but avoid delving too deeply into conceptual ideas before you have a CLEAR understanding of WHAT your client is trying to ACHIEVE/DO/ACCOMPLISH/SELL/ETC.

Avoid “target lock” or getting married to an idea too early in the design cycle – this invariably causes heartache, male pattern baldness, and quite possibly “the yips” later in the project!

Overall project success is determined by the quality and quantity of work done during phase 1! High performing design teams spend a significant amount of time researching, defining and documenting as much information regarding the client’s project needs and wants.

Please submit Phase 1 report in PDF format using the Mec E 460 eClass submission page.

PHASE 1 DUE: 5:00pm – Friday, 03 February, 2012.

Thank You!
Phase 2 - Conceptual Design Deliverables 30%

- Recommended effort is 35 hr/person, estimate range is 30-50 hr/person.
- Cover Letter (Y/N)
- Executive Summary (5%)
  - 1 page, 350 word maximum summary of the conceptual design
  - This executive summary is intended to provide practice for writing the final detail design report summary.
  - **Blazing Hot Tip** - Prepare a draft executive summary before writing the main report. Revise the executive summary while finalizing the report. Conduct a final editing pass and proof before submitting. Avoid writing the first/final draft at 3:00 am in the morning!

- Conceptual Design Report (30%)
  - 2500 word max not including figure text, tables, charts, graphs, etc. (this is intended to preserve your sanity and ours; keeping within the count helps us to mark ‘em quicker!)
  - Please show report body word count in table of contents
  - **Brief** summary of design problem, client needs, background info relevant to understanding the concepts presented – highlight project changes and new information discovered during this phase
  - Description of three design concepts (make appropriate use of graphics/3D CAD models/etc)
  - Summarize key design analyses performed to validate each concept
    - Use the calculation format as a guideline for presenting analysis summaries
  - Preliminary product / manufacturing cost analysis
    - Budget pricing is an essential component of this phase and is required to help the client make business decisions
    - Avoid reporting cost estimates as $67,891.38! (Round to reasonable value)
    - Commercial/industry/real world cost estimates please
  - Concise project schedule summary - highlight areas where the plan and reality diverged
  - Please remember to **recommend** one concept or, if required, logical combinations of concepts for further development in Phase 3

- Design Evaluation Matrix (15%)
  - Update design spec matrix as required (add concept evaluation columns)
  - Update and document specifications, requirements, constraints, safety/regulatory requirements, client “must have” and “nice to have’s”, environmental guidelines, social and ethical considerations, etc. that apply or potentially apply to your project that were uncovered during phase 2
  - Strike out specifications/requirements/constraints that no longer apply
  - Evaluate three conceptual designs using Pugh’s/decision matrix method
  - Clearly identify the best concept that will be recommended to your client for further development

- Project Management (5%)
  - Record actual work required to complete Phase 2 conceptual design (use LP timesheets)
  - Demonstrate consistent, regular engagement with the project management process
  - Graphically summarize; baseline (original), actual and projected design costs ($) /work (hours) to date
  - Refine your phase 3 schedule estimate by updating/adding task descriptions, time estimates, dependencies, etc.

- Conceptual Design Diagrams, Sketches and Solid Modeling (15%)
  - General Arrangement/Layout 3D model or sketches for each concept
  - Technical/Process Schematics (if applicable to the design)
  - Block Process Diagrams (if applicable to the design)
  - Sufficient 3D CAD models is required to explain how it works
  - No drawings are required at this time unless necessary to explain function
Phase 2 - Conceptual Design Deliverables Cont’d

- Conceptual Design Calculations (25%)
  - Please use the \textit{standard calculation format} presented in class and outlined on our eClass site for \textbf{ALL} engineering analyses (classical hydraulic, MathCad, Excel, CFD, FEA, etc.)
    - Remember that as engineers we do calculations for the project record – not ourselves!
    - Neatly organized and formatted calculations are easy to follow resulting in quicker review and accurate error checking (the converse is true)
  - Provide sufficient analysis to prove viability of conceptual designs
  - FEA and simulations are not required at this time
  - Submit all calculations in PDF format in a report appendix
  - NOTA BENE: Only engineering analysis presented in standard format will be evaluated

- Self-Evaluation (5%)
  - Complete and submit a “what the heck did I really learn during phase 2” survey

Comments
The conceptual report shall describe three viable design solutions and \textbf{recommend} one for further development. Each concept should be supported with sufficient calculations to establish the degree of viability. In consultation with the client a Design Evaluation Matrix is used to evaluate and select the best concept for further development. The report should \textbf{clearly indicate} what solution the design team is recommending for further development in the detail design phase of the project.

\begin{center}
\textbf{Please submit the Conceptual Design Report (PDF) & Solid Model Files (Zip) using the Mec E 460 eClass assignment submission page.}

\textbf{PHASE 2 DUE: 5:00pm – Friday, 09 March, 2012.  Thank You!}
\end{center}
Phase 3 – Detailed Design Deliverables 30%

- Recommended effort is 30 hr/person, estimate range is 25-45 hr/person.
- Cover Letter (Y/N)
- Executive Summary (Y/N)
- Design Report (25%)
  - 2500 word max not including figure text, tables, charts, graphs, etc. (this is intended to preserve your sanity and ours; keeping within the count helps us to “mark ’em quicker”!)
    - please show report body word count in table of contents
  - Incremental description of final design (design highlights, operation)
  - Summarize critical detailed design analysis, identify critical design regions
  - Summarize product / manufacturing cost analysis - is the product / project economically feasible?
  - Brief summary of engineering design cost & schedule (highlight differences)
  - Liberal use of illustrations, schematics, charts, tables, etc. is encouraged
  - Summarize all industrial design considerations uncovered during the design project.
  - Summarize future works, other research and development effort required in order to complete the engineering project
  - Briefly summarize, for the client’s benefit, how industrial design, human factors, ergonomics, social, ethical, legal & sustainability considerations influenced the final design.
  - Appendices
- Design Compliance Matrix (10%)
  - Update design spec matrix (additions, deletions, amendments)
  - Remove conceptual design evaluation columns
  - Add final design compliance column – report quantitative or qualitative specifications achieved, safety/regulatory requirements satisfied, client “must have” and “nice to have’s” met, and environmental, social and ethical factors considered
  - Obtain client approval of the final design compliance
- Project Management (5%)
  - Record actual work required to complete Phase 3 conceptual design (use LP timesheets)
  - Remember that regular engagement and learning are rewarded over seeking the “right” answer(s)!
    - Priorities often change throughout an engineering design project – show evidence that you grappled with this reality.
    - Graphically summarize; original, actual and projected design/engineering costs ($) /work (hours) for phase 3 as well as the entire project.
- Detailed Design Calculations (25%)
  - Include only calculations carried out in this phase to prove function and safety of the design
  - Include only updated conceptual design calculations
  - Include additional detailed design calculations for new systems/sub-systems
  - Please use the format presented in class and outlined on our eClass site for ALL engineering analyses (classical handraulic, MathCad, Excel, CFD, FEA, etc.)
    - Engineers do calculations for the project record
    - Neatly organized and formatted calculations are easy to follow resulting in quicker review and accurate error checking (the converse is also true)
    - Design calculations presented using the standard format will be evaluated
  - Where necessary, selected computer aided engineering techniques (FEA, CFD, MathCAD, etc) can be used but should be sensitive to the time and resources required. Certain analysis can be identified as future works or research and development opportunities of the client.

Phase 3 – Detailed Design Deliverables Cont’d

- Detailed Design Drawings (30%)
  - Final General Assembly Drawing (complete with top level BOM)
  - Detailed Sub-Assembly Drawings (complete with appropriate BOM)
• Selected detailed manufacturing part drawings (Limited to 5 key in-house part drawings. Complete with material specification, heat treatment, etc.)
• Final technical/process schematics (if updated)
• Final block process diagrams (if updated)
• Purchased parts (fasteners, gears, snap rings, motors, etc.) shall be modeled and specified in the Bill of Materials [BOM]
• Standard drawing title blocks and BOM should be used for drawings. Indicate "Modeled by", "Drawn by", and "Checked by" in the title blocks. The drawing package should also include a drawing tree, showing the logical structure of the complete drawing package and which specific drawings were actually completed (the rest can be labeled “to be available” - TBA).
• Submit CAD models (assembly, part & drawing files) in a ZIP file

Comments
The detailed design report is intended to convey the essential elements of the final design. This report should provide an overview of how the device or system functions and how it satisfies client requirements and design specifications. Include succinct descriptions of key systems and/or subsystems and explain their function within the context of the overall design. Liberal use of graphics, schematics, 3D models and drawings will aid in conveying design intent and should be included within the report.

Appendices (drawings, design calculations, data sheets, etc.) in PDF format should be submitted with the report. **Key bit to remember: the report should make sense without direct reference to the appendices.**

**DELIVERABLES**

* **Detailed Design Phase Report and Drawing Files (PDF)**

* **Native CAD Assembly, Component & Drawing Files (ZIPPED)**

Use our Mec E 460 EClass assignment submission page

Design artifacts, models, prototypes, etc. are most welcome! We would like to showcase your work.

**PHASE 3 DELIVERABLES DUE: 5:00pm – Thursday, 5 April, 2012**

Thank You!
Attendance – Lectures & Weekly Design Meetings 5%

- Recommended effort is 32 hr/person.
- Designers are encouraged to attend weekly lectures and team meetings. Sharing and challenging ideas, posing questions and active engagement are essential elements of successful engineering design; not only here, within the safe confines of University, but also out in the industrial hinterland!
- Each individual team member shall be responsible for documenting their own attendance at our lectures and weekly design meetings.
- When the project is concluded each design team member will attest to their own attendance record (integrity is what you do when no one is looking!)
- 5% of the overall course grade will be allocated to attendance and engagement using a simple linear relationship
- Please note that individual grades could differ between team mates depending on attendance & engagement
Final Design Poster Deliverable 5%

- Recommended effort is 5 hr/person, estimate range is 3-7 hr/person.
- 24 inch x 36 inch poster (A1 size)
- Visually appealing, graphical representation of the design solution
- Use graphic design techniques found in high quality technical advertisements
- Should convey form, function, technical and marketing/cost information
- Use a combination of illustrations, charts, short sentences/paragraphs to convey the design problem, specifications and solution
- Poster templates in various formats will be provided on the course website. Please note that the templates are intended to save you time! You are NOT restricted to the use of any one template; you are most welcome to create your own!
- Teams are encouraged to print A & B size proofs before submitting for wide format printing
- All posters will be displayed during the oral design presentations scheduled for Saturday
- Each team is responsible for printing and posting a hard copy of the design poster by 8:00am on presentation day (Saturday 14 April, 2012)
- Please leave your posters up at the end of the day - we will collect them for review and evaluation

**eCopy**

*Please submit PDF copies and native graphics files (.ai, .ppt, .cdr, etc.) using Mec E 460 EClass assignment submission page*

**FINAL POSTER eCopy DUE: 5:00pm – Saturday, 14 April, 2012**

**Hardcopy Printing**

*PDF poster files received by 4:00pm Wednesday 11 April, 2012 will be printed internally by Mec E using an HP Wide Format Printer at no cost to you. Posters will be available for pick up by noon Friday 13 April, 2012 at the latest.*

*Teams electing to use commercial printing services will be responsible for payment*

**Poster Hanging**

*Each team is responsible for hanging their poster by 8:00am – Saturday, 14 April 2012. Rolling poster boards & pins will be made available.*

Thank You!
Design Conference (Oral Presentation) Deliverable 10%

- Recommended effort is 14.5 hr/person, estimate range is 10-18 hr/person.
- 20 minute presentation & 5 minute question period
- Presentation should convey the essential design problem, objectives, requirements, specifications, industrial design factors, social, ethical, legal & sustainability factors, design solution & critical technical analysis in an interesting, accessible format
- Some animations are useful but not always necessary, careful this is where the estimated time can go beyond your budgeted time!
- Target audience: intelligent, technically trained, not experts nor familiar with the subject matter
- Presentations are open to the public – clients, colleagues, friends & families are most welcome!
- A catered lunch will be provided by the Department of Mechanical Engineering.
- Posters will be on display throughout the day near the presentation theatres.
- Public Q & A poster sessions are held during coffee breaks & lunch.
- Two design presentation sessions will run concurrently throughout the day.
- Academic and industry judges will evaluate the design presentations.

Design Conference: Saturday, 14 April, 2012 - 8:00am to 5:00pm

eCopy Deliverable - submit PowerPoint files using Mec E 460 eClass assignment page

DUE: 5:00pm – Saturday, 14 April, 2012
Electronic Submission of All Deliverables

(Important – Please Read This Bit Carefully)

- All deliverables (reports, drawings, calculations, etc.) shall be submitted **ELECTRONICALLY** as Adobe PDF files. Native CAD part, assembly & drawings should be submitted as ZIP files.

- Use PDF binder function to organize & bind individual PDF files into logical sections of a **SINGLE** report document. Organize and format the report so that it can be accessed electronically or printed by the client.

- Use Adobe’s Bookmark feature to create an electronic table of contents (TOC) in addition to the standard printable TOC.

- Design teams are responsible for scanning and converting all paper documents (calculations, tech data sheets, etc.) to PDF format. (150 dpi works well for text only and hand calculations, higher resolution may be required for images - experiment early to establish appropriate resolution)

- Use appropriate scan resolution to manage document file size - experiment with scan resolution to establish practical limits. Document scanners are available in Mec E computer labs 3-26 & 4-19

- Adobe Acrobat Pro is available in computer labs 3-3, 3-26 & 4-19 for document conversion and organization.

- Please use the Mec E 460 eClass assignment submission page to submit electronic files.

- Electronic file nomenclature
  - **Uniquely** identify the phase, project title, group and deliverable
  - Examples:
    - Ph_1_Report_Mars_Space_Drill_DOPY.pdf
      - where “DOPY” are the initials of each team member’s last name
    - Ph_2_Report_ARVP_Torpedo_Launcher_Team_XRay.pdf

- Files submitted with generic titles (i.e., Report.pdf, GANTT.pdf, Calculation.pdf, etc.) will be viewed very dimly indeed and risk being **punted**!

- Report documents may be re-submitted within the allowed submission window if amendments are required. Please indicate the revision level in the file name, {ie. **Phase 2 Bottle Jack BDFG - Report Rev 2.pdf**} and ensure that the revised copy is submitted by deadline.

**ONE HOUR MERCY RULE...**

- Electronic submissions are due at 5:00 PM on the prescribed day. In the event that part of the deliverable was forgotten, buggered up in the original submission, or otherwise needs to be updated, you may re-submit the report up to 6:00 PM on the due date.

- The intent of the grace period is not to provide extra work time; rather it is intended to allow for the correction of stress induced brain farts that inevitably occur when rushing to make a design/engineering delivery! Honour system applies! (i.e. our honour)
Mec E 460 Course Outline

Academic & Professional Integrity

Mechanical engineering students are expected to conduct themselves in accordance with University Policy Guidelines as well as the APEGGA Code of Ethics.

COOPERATIVE & COLLABORATIVE WORK
Mec E 460 is a collaborative project course and students are expected and encouraged to cooperate and share information! Design teams may cooperate to develop, conduct and share experimental data where relevant. Copying, without direct attribution or acknowledgement, another team’s design analysis, reduced data, calculations, drawings, illustrations, tables, charts, and reports without proper attribution is not acceptable engineering practice. Don’t present other’s work as your own, reference it!

UNIVERSITY POLICY GUIDELINES
Policy about course outlines can be found in 23.4(2) of the University Calendar (GFC 29 SEP 2003)

The University of Alberta is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the Code of Student Behaviour (online at www.ualberta.ca/secretariat/appeals.htm) and avoid any behavior which could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University. (GFC 29 SEP 2003)

APEGGA GUIDELINES

CODE OF ETHICS (established pursuant to section 19(1)(j) of the Engineering, Geological and Geophysical Professions Act)

Preamble
Professional engineers, geologists and geophysicists shall recognize that professional ethics is founded upon integrity, competence, dignity and devotion to service. This concept shall guide their conduct at all times

Rules of Conduct
1. Professional engineers, geologists and geophysicists shall, in their areas of practice, hold paramount the health, safety and welfare of the public and have regard for the environment.

2. Professional engineers, geologists and geophysicists shall undertake only work that they are competent to perform by virtue of their training and experience.

3. Professional engineers, geologists and geophysicists shall conduct themselves with integrity, honesty, fairness and objectivity in their professional activities.

4 Professional engineers, geologists and geophysicists shall comply with applicable statutes, regulations and bylaws in their professional practices.

5 Professional engineers, geologists and geophysicists shall uphold and enhance the honour, dignity and reputation of their professions and thus the ability of the professions to serve the public interest.