

The following Motions and Documents were considered by the GFC Academic Planning Committee at its Wednesday, April 13, 2022 meeting:

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Agenda Title: **Proposed Termination of the Graduate Certificate in Teaching and Learning in Higher Education**

CARRIED MOTION:

THAT GFC Academic Planning Committee recommend that General Faculties Council approve the termination of the Graduate Certificate in Teaching and Learning in Higher Education in the Faculty of Education.

FINAL Item 4

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Agenda Title: **Proposal from the Faculty of Engineering to create the Canadian Underground Infrastructure Innovation Centre (CUIIC)**

CARRIED MOTION:

THAT GFC Academic Planning Committee, acting with delegated authority from General Faculties Council, approve the establishment of the Canadian Underground Infrastructure Innovation Centre (CUIIC) as an academic institute at the University of Alberta.

FINAL Item 6

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Agenda Title: **Proposed Bachelor of Biomedicine Dual Degree, Faculty of Medicine and Dentistry and Wenzhou Medical University**

CARRIED MOTION:

THAT the GFC Academic Planning Committee recommend that the Board of Governors approve the proposed Bachelor of Biomedicine Dual Degree as set forth in the attachments, and for implementation upon final approval.

FINAL Item 7

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FINAL Item No. 4

**Governance Executive Summary**  
**Action Item**

<b>Agenda Title</b>	<b>Proposed Termination of the Graduate Certificate in Teaching and Learning in Higher Education</b>
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**Motion**

THAT GFC Academic Planning Committee recommend that General Faculties Council approve the termination of the Graduate Certificate in Teaching and Learning in Higher Education in the Faculty of Education.
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**Item**

Action Requested	<input checked="" type="checkbox"/> Approval <input type="checkbox"/> Recommendation
Proposed by	Douglas Gleddie, Associate Dean, Faculty of Education
Presenter(s)	Douglas Gleddie, Associate Dean, Faculty of Education Brooke Milne, Vice-Provost and Dean, FGSR

**Details**

Office of Administrative Responsibility	Provost and Vice-President (Academic)
The Purpose of the Proposal is ( <i>please be specific</i> )	To seek approval for the termination of the Teaching and Learning in Higher Education Graduate Certificate.
Executive Summary ( <i>outline the specific item – and remember your audience</i> )	The Graduate Certificate in Teaching and Learning in Higher Education (GCTLHE) has never been launched and therefore has no active students. The certificate does not meet the current needs of the field (post-secondary instructors), namely, a focus on educational development. In order for the certificate to meet these needs we would need to do a major change/ restructuring which would need to go through university governance and be approved by the ministry. Given that we are uncertain about the demand for such a restructured certificate, we would prefer to utilize the new Graduate Certificate in Educational Studies to pilot a revised program if we feel there is a need. Therefore, the GCTLHE is redundant.
Supplementary Notes and context	< <i>This section is for use by University Governance only to outline governance process.</i> >

**Engagement and Routing** (Include meeting dates)

Consultation and Stakeholder Participation (parties who have seen the proposal and in what capacity)  <For information on the protocol see the <a href="#">Governance</a>	<u><b>Those who are actively participating:</b></u> <ul style="list-style-type: none"> <li>• Faculty members from the higher education area</li> </ul>
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Item No. 4

<a href="#">Resources section Student Participation Protocol</a> >	<p><b><i>Those who have been consulted:</i></b></p> <ul style="list-style-type: none"> <li>As the program has never launched, the termination has been approved by the faculty members in the area, the Director of the Professional Learning Unit, the Associate Dean, Graduate Studies and the Dean (October 21, 2021).</li> </ul>
<p>Approval Route (Governance) (including meeting dates)</p>	<p>GPST - January 24, 2022            PRC - February 2, 2022            FGSR Council - February 23, 2022            GFC Programs Committee - March 17, 2022            GFC Academic Planning Committee - April 13, 2022            General Faculties Council - May 2, 2022</p>

**Strategic Alignment**

<p>Alignment with <i>For the Public Good</i></p>	<p>Build: Objective 1, Strategy 1-3; Objective 4, Strategy 1            Experience: Objective 7, Strategy 1&amp;3; Objective 10, Strategy 1&amp;2            Excel: Objective 12, Strategy 1; Objective 14, Strategy 1-4            Engage: Objective 16, Strategy 1; Objective 17, Strategy 2            Sustain: Objective 20, Strategy 1</p>			
<p>Alignment with Core Risk Area</p>	<p>Please note below the specific institutional risk(s) this proposal is addressing.</p> <table border="1"> <tr> <td> <input checked="" type="checkbox"/> Enrolment Management  <input checked="" type="checkbox"/> Faculty and Staff  <input type="checkbox"/> Funding and Resource Management  <input type="checkbox"/> IT Services, Software and Hardware  <input type="checkbox"/> Leadership and Change  <input type="checkbox"/> Physical Infrastructure         </td> <td> <input checked="" type="checkbox"/> Relationship with Stakeholders  <input checked="" type="checkbox"/> Reputation  <input type="checkbox"/> Research Enterprise  <input type="checkbox"/> Safety  <input checked="" type="checkbox"/> Student Success         </td> </tr> </table>		<input checked="" type="checkbox"/> Enrolment Management <input checked="" type="checkbox"/> Faculty and Staff <input type="checkbox"/> Funding and Resource Management <input type="checkbox"/> IT Services, Software and Hardware <input type="checkbox"/> Leadership and Change <input type="checkbox"/> Physical Infrastructure	<input checked="" type="checkbox"/> Relationship with Stakeholders <input checked="" type="checkbox"/> Reputation <input type="checkbox"/> Research Enterprise <input type="checkbox"/> Safety <input checked="" type="checkbox"/> Student Success
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<p>Legislative Compliance and jurisdiction</p>	<p>General Faculties Council            Graduate Academic Affairs Council (Education)            Faculty of Graduate Studies &amp; Research            GFC Programs Committee</p>			

Attachments

1. GCTLHE program-termination
2. Original Formal letter of Approval 2009 (For Background)
3. CONDENSED Ed Policy Std PBC to GC 11.22.2018 (For Background)

Prepared by: Douglas Gleddie, Associate Dean (dgleddie@ualberta.ca)

## Proposal Template: Program Termination

Use this template for proposals to terminate ministry-approved programs or specializations. Institutions should:

- ensure that submission content is concise. Any additional information may be appended;
- indicate “not applicable” when questions are not relevant to a particular proposal; and
- ensure that applicable supporting documents are attached to the proposal.

### SECTION A: PROPOSAL INFORMATION

Fill in the table below:

<b>Institution</b>	<b>University of Alberta</b>
<b>Program Name</b>	<b>Graduate Certificate</b>
<b>Specialization Name</b>	Teaching and Learning in Higher Education.
<b>Credential Awarded</b>	<b>Graduate Certificate</b>
<b>Proposed effective date of termination</b>	<b>July 1, 2022</b>

a. Confirm whether (check applicable box(es)):	<input type="checkbox"/> This termination proposal was preceded by a ministry-approved suspension period. <input type="checkbox"/> This termination proposal was not preceded by a ministry-approved suspension period. <input checked="" type="checkbox"/> No active students remain in the program. <input type="checkbox"/> Active program students remain in the program
b. If this proposal was preceded by a suspension, attach approval letter.	<ul style="list-style-type: none"> <li>•</li> </ul>
c. If this proposal was not preceded by a suspension, explain why ministry approval for a suspension was not sought prior to requesting a termination.	<ul style="list-style-type: none"> <li>• The certificate has never been launched.</li> </ul>
d. If not preceded by suspension, indicate when students were last admitted into the program/specialization.	<ul style="list-style-type: none"> <li>• There have never been any students in the certificate program.</li> </ul>
<b>Reviewer’s Comment:</b>	

### SECTION B: RATIONALE

a. Identify reason(s) for termination with supporting evidence (e.g., low student demand, declining labour market demand, institutional capacity, provincial priorities, etc.).
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The rationale is that the certificate does not meet the current needs of the field (post secondary instructors), namely, a focus on educational development. In order for the certificate to meet these needs we would need to do a major change/restructuring of the certificate which would need to go through university governance and be approved by the ministry. Given we are uncertain about the demand for such a restructured certificate, we would prefer to utilize the new Graduate Certificate in Educational Studies to pilot a revised program if we feel there is a need. Therefore, the GCTLHE is redundant.

b. Provide specific information about which internal governance body approved the termination, and provide date of approval.

- The Governance approval pathway is:
  - PRC
  - Programs Committee
  - APC
  - GFC
  - BLRSEC

**Reviewer's Comment:**

### SECTION C: ACCESS

a. Identify student access considerations and risks for the Alberta Adult Learning System (include information about related programs or other avenues available to students to prepare for careers/employment and/or further educational opportunities).

- None anticipated.

b. If this program or specialization is unique in the province, describe the consultation(s) undertaken within the Alberta Adult Learning System to investigate the feasibility of program/specialization transfer.

- The faculty members responsible for the program (Drs. Wimmer and Kanuka) were consulted and agreed with the decision to terminate the program. As well, consultations were held with the Director of the Professional Learning Unit (Dr. Key, who would have administered the program), the Associate Dean, Graduate (Dr. Gleddie) and the Dean (Dr. Tupper). Since the program had never been launched, no student consultations were possible or necessary.

c. Briefly describe the consultation process that occurred with students at your institution regarding this programming change.

- There are no students in the program.

**Reviewer's Comment:**

### SECTION D: IMPACT

a. Briefly describe the consultation process that occurred with other stakeholders (e.g., advisory committees, regulatory bodies, employers, etc.) affected by this programming change.

<ul style="list-style-type: none"> <li>● Consultation was done with program faculty who have knowledge of the field and relevant needs. As the program was never launched there are limited stakeholders.</li> </ul>
<p>b. Briefly describe plans for communicating the termination decision to stakeholders, particularly regulatory bodies (if applicable) and other institutions within the Alberta Adult Learning System.</p> <ul style="list-style-type: none"> <li>● We will ensure that notice of termination is on our Faculty website and will take appropriate measure to remove it from the calendar.</li> </ul>
<p>c. Briefly describe plans for reallocation of resources previously used for this program/specialization and identify budget and staffing impacts.</p> <ul style="list-style-type: none"> <li>● We will look at revising curriculum and meeting the needs of the field through the Graduate Certificate in Educational Studies.</li> </ul>
<p><b>Reviewer's Comment:</b></p>

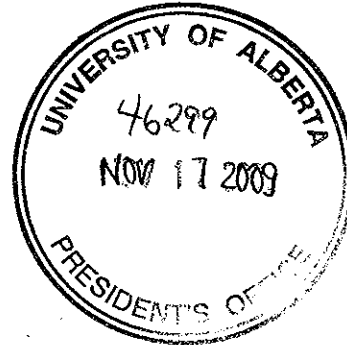
**SECTION E: OTHER CONSIDERATIONS**

<p><b>Other considerations</b></p>
<p>a. Please indicate if there are additional factors you would like the ministry to consider when reviewing this proposal.</p> <ul style="list-style-type: none"> <li>● None.</li> </ul>
<p><b>Reviewer's Comment:</b></p>

<p><b>RECOMMENDATION (FOR DEPARTMENT USE)</b></p>
<p><b>Recommendation(s):</b></p>
<p><b>Rationale for Recommendation:</b></p>
<p><b>Reviewer(s):</b></p>
<p><b>Date Completed:</b></p>

November 13, 2009

Dr. Indira V. Samarasekera, O.C.  
President and Vice-Chancellor  
University of Alberta  
3 - 1 University Hall  
Edmonton, Alberta T6G 2J9



Dear Dr. Samarasekera:

Advanced Education and Technology has completed its review of the University of Alberta's (U of A) proposal for a new Post-Baccalaureate Certificate program with a specialization in Teaching and Learning in Higher Education, which reflects the priorities identified in the U of A's recent Institutional Access Plan. I am pleased to provide approval for this program effective July 1, 2009.

The Post-Baccalaureate Certificate program is subject to the department's Key Performance Indicators and Learner and Enrolment Reporting System practices. The program also falls under the Tuition Fee Regulation and is eligible for designation for student financial support. Consistent with your proposal, the department will not provide additional funds in support of the program's implementation. Funding for the proposed program will be reallocated from existing budgets within University Teaching Services for the University Teaching Program and the New Professor Teaching Program. In approving this proposal, I also wish to advise that each student who completes the program will generate a total program FLE of 0.500.

I appreciate the U of A's commitment to providing Albertans with programs that will enhance their educational and career opportunities. If you have any questions regarding this approval, please contact Dr. Dean Wood, Director, Post-secondary Programs/EPE, at (780) 427-5631 or by e-mail at [dean.wood@gov.ab.ca](mailto:dean.wood@gov.ab.ca).

Please accept my best wishes for the successful implementation of the Post-Baccalaureate Certificate program with a specialization in Teaching and Learning in Higher Education.

Yours truly,

A handwritten signature in black ink, appearing to read "A Trimbee".

Annette Trimbee  
Deputy Minister

cc: Mr. Brian Heidecker  
Chair, Board of Governors

Killam Centre for Advanced Studies  
2-29 Triffo Hall Edmonton AB Canada T6G 2E1  
Tel: 780.492.2816 / Fax: 780.492.0692  
www.gradstudies.ualberta.ca

**2019-2020 University of Alberta Proposed Calendar Graduate Program Changes: Name change for Post-Baccalaureate Certificates to Graduate Certificate to conform with the 2018 Alberta Credential Framework.**

Current	Proposed
<p><b>Graduate Programs</b></p> <p><b>Educational Policy Studies [Graduate]</b></p> <p><b>General Information</b> The Department of Educational Policy Studies offers master's and doctoral programs in the following specialized areas of study: Adult, Community and Higher Education; Educational Administration and Leadership; Indigenous Peoples Education; and Social Justice and International Studies in Education as well as a <del>post-baccalaureate</del> certificate in Teaching and Learning in Higher Education. [...]</p> <p><b>Graduate Program Requirements</b></p> <p><b>Certificates (Educational Policy Studies) [Graduate]</b></p> <p><b>Free-Standing <del>Post-Baccalaureate</del> Certificates</b></p> <p><b>Entrance Requirements</b> Applicants to <del>Post-Baccalaureate</del> Certificates must meet the general admission requirements of the Faculty of Graduate Studies and Research (see <a href="#">Admission</a>) and are subject to regulations for certificates specified in <a href="#">Regulations of the Faculty of Graduate Studies and Research</a>.</p> <p><b>Program Requirements</b> The <del>Post-Baccalaureate</del>-Certificates normally require ★9 in graduate courses. [...]</p> <p><b>Length of Program</b> There is no residence requirement for the <del>Post-Baccalaureate</del> Certificates program. Normally, the <del>Post-Baccalaureate</del> Certificates must be completed within four years.</p>	<p><b>Graduate Programs</b></p> <p><b>Educational Policy Studies [Graduate]</b></p> <p><b>General Information</b> The Department of Educational Policy Studies offers master's and doctoral programs in the following specialized areas of study: Adult, Community and Higher Education; Educational Administration and Leadership; Indigenous Peoples Education; and Social Justice and International Studies in Education as well as a <b>graduate</b> certificate in Teaching and Learning in Higher Education. [...]</p> <p><b>Graduate Program Requirements</b></p> <p><b>Certificates (Educational Policy Studies) [Graduate]</b></p> <p><b>Free-Standing <b>Graduate</b> Certificates</b></p> <p><b>Entrance Requirements</b> Applicants to <b>Graduate</b> Certificates must meet the general admission requirements of the Faculty of Graduate Studies and Research (see <a href="#">Admission</a>) and are subject to regulations for certificates specified in <a href="#">Regulations of the Faculty of Graduate Studies and Research</a>.</p> <p><b>Program Requirements</b> The <b>Graduate</b> Certificates normally require ★9 in graduate courses. [...]</p> <p><b>Length of Program</b> There is no residence requirement for the <b>Graduate</b> Certificates program. Normally, the <b>Graduate</b> Certificates must be completed within four years.</p>



**Post-Baccalaureate Certificate in Teaching and Learning in Higher Education (★9)**

This **Post-Baccalaureate** Certificate in Teaching and Learning in Higher Education is to provide academic staff, graduate students and postdoctoral fellows with the opportunity to complete a formal and externally recognizable program in the theories, practice (design, development and delivery) and assessment of teaching and learning in higher education.

[...]

**Graduate Certificate in Teaching and Learning in Higher Education (★9)**

This **Graduate** Certificate in Teaching and Learning in Higher Education is to provide academic staff, graduate students and postdoctoral fellows with the opportunity to complete a formal and externally recognizable program in the theories, practice (design, development and delivery) and assessment of teaching and learning in higher education.

[...]

Justification: In the new Alberta Credential Framework 2018, the credential of Post-Baccalaureate Certificate is now an undergraduate level certificate. At the graduate level, what was formerly called Post-Baccalaureate Certificate is now Graduate Certificate.

FINAL Item No. 6

**Governance Executive Summary**  
**Action Item**

<b>Agenda Title</b>	<b>Proposal from the Faculty of Engineering to create the Canadian Underground Infrastructure Innovation Centre (CUIIC)</b>
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**Motion**

THAT GFC Academic Planning Committee, acting with delegated authority from General Faculties Council, approve the establishment of the Canadian Underground Infrastructure Innovation Centre (CUIIC) as an academic institute at the University of Alberta.

**Item**

Proposed by	Walter Dixon, Associate Vice-President (Research and Priority Initiatives) and Chair, Centres and Institutes Committee (CIC)
Presenter(s)	Dr Ali Bayat, Professor, Department of Civil and Environmental Engineering, and Dr Ania Ulrich, Interim Chair, Department of Civil and Environmental Engineering

**Details**

Office of Administrative Responsibility	Vice-President (Research and Innovation)
The Purpose of the Proposal is <i>(please be specific)</i>	To bring forward the proposal from the Faculty of Engineering to create the Canadian Underground Infrastructure Innovation Centre (CUIIC) for discussion and approval by APC under the authority of the UAPPOL Academic Centres and Institutes Establishment <a href="#">Procedure</a> .
Executive Summary <i>(outline the specific item – and remember your audience)</i>	<p>The attached proposal outlining the proposed creation of the CUIIC as an academic centre has been generated in the Department of Civil and Environmental Engineering. It has been reviewed by the Interim Dean in the Faculty of Engineering and the Centres and Institutes Committee, and the proposal is being forwarded to APC with the CIC's recommendation that the Centre be approved.</p> <p>CUIIC will expand and build on existing initiatives within the University of Alberta and across Canada, including CETT (Consortium of Engineering Trenchless Technologies at the U of A) and CATT (Centre for Advancement of Trenchless Technologies at the University of Waterloo), as well as the NSERC Associate Industrial Research Chair in Underground Construction. Its vision is to be a world class hub for research, innovation and education in underground infrastructure.</p> <p>CUIIC will build on the past success of CETT and CATT (both organizations will cease operations) to bring together multiple stakeholders across Canada and develop sustainable solutions for underground infrastructure. This will position the University of Alberta at the forefront of research in underground infrastructure in Canada and make the U of A an international hub for innovation in this sector.</p>
Supplementary Notes and context	<This section is for use by University Governance only to outline governance process.>

**Engagement and Routing** (Include proposed plan)

Item No. 6

<p>Consultation and Stakeholder Participation</p>	<ul style="list-style-type: none"> <li>• Interim Dean, Faculty of Engineering</li> <li>• Director of the Centre for Advancement of Trenchless Technologies (CATT), University of Waterloo</li> <li>• Centres and Institutes Committee</li> <li>• GFC Academic Planning Committee (APC)</li> </ul>
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**Strategic Alignment**

<p>Alignment with <i>For the Public Good</i></p>	<p>Goal: EXCEL</p> <p>Objective 11 - Advance the University of Alberta's reputation for research excellence by pursuing fundamental and original questions and ideas, pushing the frontiers of knowledge, inspiring creative experimentation, driving innovation, and advancing society.</p>			
<p>Alignment with Core Risk Area</p>	<p>Please note below the specific institutional risk(s) this proposal is addressing.</p> <table border="1"> <tr> <td> <input type="checkbox"/> Enrolment Management  <input checked="" type="checkbox"/> Faculty and Staff  <input type="checkbox"/> Funding and Resource Management  <input type="checkbox"/> IT Services, Software and Hardware  <input type="checkbox"/> Leadership and Change  <input type="checkbox"/> Physical Infrastructure                 </td> <td> <input checked="" type="checkbox"/> Relationship with Stakeholders  <input checked="" type="checkbox"/> Reputation  <input checked="" type="checkbox"/> Research Enterprise  <input type="checkbox"/> Safety  <input type="checkbox"/> Student Success                 </td> </tr> </table>		<input type="checkbox"/> Enrolment Management <input checked="" type="checkbox"/> Faculty and Staff <input type="checkbox"/> Funding and Resource Management <input type="checkbox"/> IT Services, Software and Hardware <input type="checkbox"/> Leadership and Change <input type="checkbox"/> Physical Infrastructure	<input checked="" type="checkbox"/> Relationship with Stakeholders <input checked="" type="checkbox"/> Reputation <input checked="" type="checkbox"/> Research Enterprise <input type="checkbox"/> Safety <input type="checkbox"/> Student Success
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<p>Legislative Compliance and Jurisdiction</p>	<p>Post-Secondary Learning Act (PSLA)                  UAPPOL Centres and Institutes Policy                  UAPPOL Academic Centres and Institutes Establishment Procedure                  UAPPOL Academic Centres and Institutes Operation Procedure                  GFC Academic Planning Committee Terms of Reference</p>			

1. Attachment 1 (pages 1-108) – Proposal to Create the Canadian Underground Infrastructure Innovation Centre (CUIIC) as an Academic Centre at the University of Alberta

Prepared by: Katharine Moore, Office of the Vice-President (Research and Innovation),  
[katharine.moore@ualberta.ca](mailto:katharine.moore@ualberta.ca)

# Proposal to Establish New Academic Centre Canadian Underground Infrastructure Innovation Centre

Department of Civil and Environmental Engineering, Faculty of Engineering  
March 23, 2022 (Revised Version)




## University of Alberta Template for Proposals to Establish New Academic Centres and Institutes

Proposers will complete and submit this template to the Office of the Provost for approval in accordance with UAPPOL Policy. This template may be used in two ways:

- 1) As a cover document attached to a completed proposal which has already been approved by the University for submission for external funding. In this case, the template must present the academic arguments for establishing an academic centre or institute, and provide required information that is absent from the original proposal.
- 2) As an expandable template to be completed. In this case, the completed template may be up to 8 to 10 pages in length (not including letters of support or other appendices relevant to the proposal).

Before developing a proposal and completing this template, please contact the Office of the Provost to discuss the scope of the proposed initiative and to discuss steps for review under the UAPPOL Centres and Institutes Policy, as well as associated procedures for academic centres and institutes – [www.uappol.ualberta.ca](http://www.uappol.ualberta.ca).

1.	<b>Faculty Dean Signature</b>	
	Signature: 	Date: 03/29/2022
2.	<b><u>Name of the Proposed Centre or Institute</u></b>	
	Canadian Underground Infrastructure Innovation Centre (CUIIC)	
3.	<b><u>Academic Justification for Establishment of a Centre or Institute</u></b>	
	<p>A formal planning process was undertaken for the establishment of the Canadian Underground Infrastructure Innovation Centre (CUIIC) since November 2021. This process was structured around a series of meetings with leading stakeholders across Canada with an active interest in underground infrastructure, including the Director of the Consortium of Engineered Trenchless Technologies (CETT) at the University of Alberta, and the Director of the Centre for Advancement of Trenchless Technologies (CATT) at the University of Waterloo. The outcome of this series of meetings is summarized in this proposal, including the vision and mission of CUIIC.</p> <p>The vision of the Canadian Underground Infrastructure Innovation Centre (CUIIC) is to be a <b>world-class hub for research, innovation and education in underground infrastructure.</b></p> <p><b>Mission:</b></p> <ul style="list-style-type: none"> <li>● To address current and future challenges related to sustainable underground infrastructure and trenchless construction through research and stakeholder collaboration</li> <li>● To facilitate industry innovation, collaboration, and research across Canada</li> <li>● To promote excellence in education and train the next generation of leaders and industry professionals</li> </ul>	

Underground infrastructure incorporates a range of interdisciplinary topics, including trenchless technologies (construction methods designed to involve minimal excavation), condition assessment, and subsurface utility engineering (identifying and mapping the position of underground assets), among others. Much of the infrastructure that communities rely on – including water, sewer, stormwater, and internet – involves underground systems. The technologies necessary to construct and maintain underground infrastructure with minimal excavation and disruption at ground level are complex and developing rapidly. Furthermore, there is an increasing urgency with respect to the assessment, rehabilitation, and replacement of underground assets, given the combined pressures of population growth, climate change, and aging infrastructure.

CUIIC will expand and build on existing initiatives within the University of Alberta and across Canada, including CETT and CATT, as well as the NSERC Associate Industrial Research Chair in Underground Construction. While CUIIC will be based in the Department of Civil and Environmental Engineering, research in underground infrastructure is highly interdisciplinary. Thus, CUIIC will also involve faculty from other research areas, departments and faculties – including construction, petroleum and geotechnical research groups within the Department of Civil and Environmental Engineering; the Department of Mechanical Engineering, Department of Electrical Engineering, Department of Chemical and Materials Engineering (in the Faculty of Engineering); and Computer Science, among others. Dr. Hashemian (Construction), Dr. Kuru (Petroleum Engineering), and Dr. Barczyk (Department of Mechanical Engineering) will be involved initially; however, involvement from other faculty members—including from other faculties—will be encouraged as CUIIC expands.

The purpose of CUIIC includes the following:

- Promote excellence in education, research and training in underground infrastructure;
- Provide quality learning opportunities for graduate and undergraduate students focused on underground infrastructure;
- Advance research in underground infrastructure, with broad-based input from stakeholders used to prioritize overall research objectives;
- Provide relevant and applied research and training opportunities for students focused on addressing current challenges within underground and trenchless construction;
- Offer educational opportunities using traditional and new platforms to provide up-to-date, evidence-based content related to underground infrastructure; and
- Become an internationally recognized hub for research, education, and collaboration to meet the future needs of communities.

Currently, CETT is the only organization that exists in western Canada to promote research and education in underground trenchless construction. CUIIC will expand on the initiatives of CETT and the Centre for Advancement of Trenchless Technologies (CATT) at the University of Waterloo, which have more than forty years of combined experience in trenchless technology research and the training of industry professionals. Leveraging the networks of both CETT and CATT will enable CUIIC to bring in additional stakeholders and resources.

CETT has been active in research and education since 2012, reaching over 1000 professionals from Alberta and across North America through more than 20 course offerings on a range of topics related to underground trenchless construction and underground infrastructure. CETT also has a history of developing strong, long-term partnerships with industry: one example is the decade-long partnership with TELUS Communications, including ongoing research, interactions and events around improving construction of telecommunications infrastructure (e.g., the University of Alberta/TELUS FTTx

Underground Construction Symposium and the University of Alberta/TELUS FTTx Virtual Series). Research under CETT has involved interdisciplinary collaborations—for instance, with Dr. Kuru (Petroleum Engineering), Dr. Barczyk (Department of Mechanical Engineering), Dr. Mohamad (Construction Engineering), and Dr. Hashemian (Construction), as well as contributions from undergraduate and graduate students in Computer Science.

CATT, which is based at the University of Waterloo, has a membership base of over 90 organizations and has been active (mainly in southern Ontario) for over thirty years. CATT initiatives include numerous professional development courses, the Trenchless Roadshow (the largest annual trenchless event in Canada), and the Canadian Trenchless Directory.

CUIIC will build on the past success and vast networks of CETT and CATT (both organizations will cease operations) to bring together multiple stakeholders across Canada and develop sustainable solutions for underground infrastructure. This will position the University of Alberta at the forefront of research in underground infrastructure in Canada and make the University of Alberta an international hub for innovation in this sector.

The activities of CUIIC will complement existing initiatives at the University of Alberta, including the Construction Innovation Centre, the Hole School of Construction Engineering and the Nasser School of Building Science and Engineering. Each of these initiatives has activities within the Department of Civil and Environmental Engineering. However, CUIIC is distinct in its vision and focus on underground infrastructure. CUIIC will also facilitate strong partnerships within and beyond the University of Alberta. Other faculties at the University of Alberta, faculty members at the University of Waterloo and other stakeholders across Canada (municipalities, contractors, industry, etc.) focused on underground infrastructure will be involved with CUIIC.

4. **Provide a statement of the priority of the proposed centre or institute within the overall priorities of the Faculty and/or the University of Alberta. Include a statement of benefits the University of Alberta could expect to receive through creation of the proposed centre or institute, including benefits to students.**

The strategic goals of the University of Alberta are outlined in the Institutional Strategic Plan and are organized around the vision of build – experience – excel – engage – sustain. CUIIC aligns with these objectives as described below.

*BUILD a diverse, inclusive community of exceptional students, faculty, and staff from Alberta, Canada, and the world.*

CUIIC will attract top talent among students and faculty, particularly within the Faculty of Engineering (e.g., Civil and Environmental Engineering, Mechanical Engineering, Electrical Engineering, Chemical and Materials Engineering) but also contribute to the education of students in other faculties (e.g., Computer Science). The interdisciplinary nature of research into underground infrastructure, the challenges associated with providing underground infrastructure to communities, and the standard of excellence fostered at CUIIC will enable a diverse, inclusive, and productive community to be established, with a focus on strong partnerships with industry to drive future innovation in underground infrastructure.

*EXPERIENCE diverse and rewarding learning opportunities that inspire us, nurture our talents, expand our knowledge and skills, and enable our success.*

CUIIC will offer an environment that provides unique learning opportunities through close collaborations, including interdisciplinary collaborations, between researchers and trainees and those providing solutions to real-world underground infrastructure problems, including industry, municipalities, contractors, and other stakeholders. A learning environment that involves close relationships with industry will both challenge students and increase the relevance of the training provided.

*EXCEL as individuals, and together, sustain a culture that fosters and champions distinction and distinctiveness in teaching, learning, research, and service.*

CUIIC will foster a culture that promotes excellence in teaching, learning, research, and service. CUIIC will build on and expand existing partnerships and engagement to ensure that there is an open, collaborative environment that stimulates the exchange of ideas and pushes forward research, while also providing stimulating and relevant educational opportunities. CUIIC will offer trainees access to the necessary resources - within industry and academia - to excel as the next leaders in the underground infrastructure domain.

*ENGAGE communities across our campuses, city and region, province, nation, and the world to create reciprocal, mutually beneficial learning experiences, research projects, partnerships, and collaborations.*

CUIIC will build on existing partnerships and collaborations to engage diverse stakeholders (academic, industrial, municipal, etc.) to advance mutually beneficial research projects and collaborations across Canada and the world.

*SUSTAIN our people, our work, and the environment by attracting and stewarding the resources we need to deliver excellence to the benefit of all.*

CUIIC will benefit communities across Canada by expanding the knowledge and expertise related to delivery of sustainable underground infrastructure.

### **Statement of Benefits**

CUIIC will foster quality educational opportunities and establish the University of Alberta as a world-class hub for research, education, and innovation in underground infrastructure. CUIIC will promote interdisciplinary collaboration in and beyond the Faculty of Engineering at the University of Alberta, providing ways to deliver safer, more efficient underground infrastructure to communities through strong partnerships with other organizations and industry.

The benefits of establishing CUIIC at the University of Alberta include the following:

#### **Collaboration:**

- Foster long-term, engaged partnerships with external organizations (including industry, contractors, municipalities, etc.)
- Provide stable funding of multidisciplinary research projects, with a focus on opportunities for junior faculty members and trainees to engage in research
- Increased collaboration and involvement of other departments within the Faculty of Engineering in underground infrastructure research
- Increased relevance of educational content due to involvement of industry and other experts from the underground infrastructure domain



	<p><b>Industry Presence:</b></p> <ul style="list-style-type: none"> <li>● Involvement of multiple industry partners and securing matching funds provides a sustainable and stable model for ongoing research</li> <li>● Ongoing partnerships ensure that research and education (including professional development opportunities) are relevant and applicable to current industry and community needs</li> <li>● Improved training and research opportunities for students and other HQPs and better employment prospects when programs are complete</li> <li>● Educational opportunities for students that include interactions with industry and other stakeholders</li> <li>● Enhanced ability to attract top talent (students and faculty) to the University of Alberta</li> </ul> <p><b>Connection to Community:</b></p> <ul style="list-style-type: none"> <li>● Development of a diverse, inclusive network of professionals dedicated to advancing research, education, and innovation in underground infrastructure</li> <li>● Improved delivery of sustainable underground infrastructure for communities</li> <li>● Recognition of the University of Alberta as a world-class leader in research and education in underground infrastructure</li> </ul>
5.	<p><b>Provide a description of the proposed centre/institute governance structure/reporting lines. Include a diagram of organizational structure.</b></p> <p>Memberships in CUIIC will be open to all stakeholders with interest or involvement in underground infrastructure, including industry members, contractors, engineering designers and consultants, equipment manufacturers, municipalities, utilities and public agencies. Similarly, funding opportunities under CUIIC will be open to any faculty members with an interest in conducting research in underground infrastructure.</p> <p>An Industry Advisory Council, consisting of representatives elected from among the member organizations, will provide insight and feedback on CUIIC activities to the Director. Although the IAC will provide feedback on the activities of CUIIC it will be advisory in nature and have no authority over the Director. Terms of Reference will be developed to define the scope of the IAC. The IAC will include both individuals from the University of Alberta (both from the Faculty of Engineering and other faculties) and professionals in the underground sector. CUIIC staff will report to their respective supervisors and the Director, who will report directly to the Dean of Engineering (Figure 1). The Director will have authority and responsibility for the activities and decisions of CUIIC, including operational and financial authority. Three committees (Research and Innovation, Education and Outreach, and Industry and Membership) will be formed with committee members drawn both from the IAC and the wider CUIIC community. The committees will have functions as follows:</p> <p><b>Research and Innovation Committee</b></p> <ul style="list-style-type: none"> <li>- Identify research priorities</li> <li>- Accept and review research proposals and make recommendations</li> </ul> <p><b>Education and Outreach Committee</b></p> <ul style="list-style-type: none"> <li>- Determine areas of interest/need related to educational initiatives</li> <li>- Plan, organize and execute in-person events (e.g., professional development courses) and any online content (e.g., training, etc.)</li> <li>- Communicate CUIIC activities to members, potential members and the public</li> </ul>

### Industry and Membership Committee

- Provide feedback on CUIIC activities
- Engage with members on challenges/emerging issues related to underground infrastructure

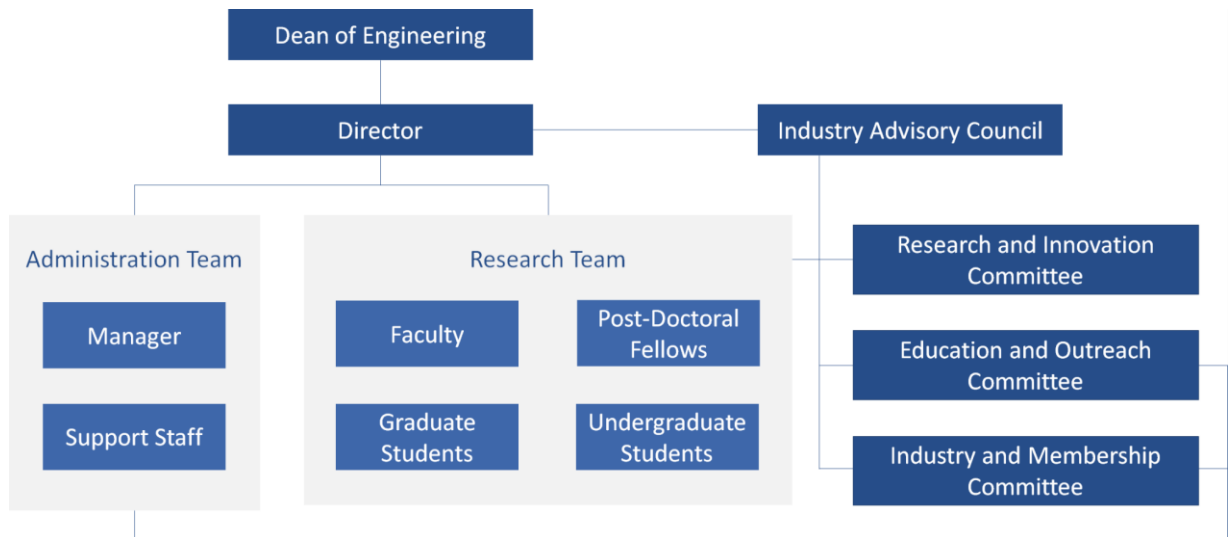


Figure 1. Organizational structure of CUIIC

6. **Provide a statement of the role and qualifications of the centre/institute lead of the proposed centre or institute.**

The Director of CUIIC is Dr. Ali Bayat, NSERC Associate Industrial Research Chair (IRC) in Underground Trenchless Construction and Ralph Haas/Stantec Fellow in Civil Engineering in the Department of Civil and Environmental Engineering at the University of Alberta.

Dr. Bayat's research is highly interdisciplinary and has resulted in significant advances in road and underground trenchless construction. While there are enormous benefits (societal and environmental) to avoiding open cut excavation, installation and/or rehabilitation of underground infrastructure using trenchless methods is challenging in that the processes are not visible, since most activities take place underground. Dr. Bayat's approach focuses on understanding the underlying processes of these dynamic, complex systems, which involve multiple components (soil/ground, machinery, drilling fluid, installation materials, etc.). Using field data and onsite measurements, he develops rigorous, yet practical, models which can be easily applied to increase the safety and efficiency of underground installations.

Dr. Bayat is Director of the Consortium of Engineered Trenchless Technologies (CETT), which he founded with municipal and industry partners in 2011 to provide solutions for underground construction challenges. This initiative included a \$5M industry fund for research, as well as a mandate to share trenchless research with industry. Over 20 professional development courses focused on trenchless technology have also been organized by CETT since 2013 (many of these in partnership with the Faculty of Extension at the University of Alberta), reaching more than 1000 industry leaders and professionals to date.

Building on the involvement of industry partners in CETT, Dr. Bayat continued research related to underground infrastructure through the Natural Sciences and Engineering Research Council of Canada Associate Industrial Research Chair in Underground Trenchless Construction (NSERC IRC) which he has

	<p>held since 2017. The NSERC IRC—which is for a five-year term with a one-year extension, ending in early 2023—was established with five companies (The Crossing Company, TELUS Communications, BGC Engineering, INROCK and UniquEnergy Solutions). This research program focused on advancing research in trenchless technologies. The interdisciplinary nature of this research has involved building collaborations with researchers and trainees from disciplines outside Civil Engineering, including Mechanical Engineering, Geodesy and Geomatics Engineering, Chemical and Materials Engineering, and Computer Science, among others.</p> <p>Dr. Bayat’s research output—detailing research conducted with more than 50 partners—includes 97 journal papers and 100 conference publications. He was awarded the Faculty of Engineering Research Award in 2017. A complete CV for Dr. Bayat is attached (Appendix A).</p>
A	<p><b><u>Employees</u></b></p> <ul style="list-style-type: none"> <li>a) Provide a statement of the employment status of employees (i.e., are they University of Alberta employees?)</li> <li>b) Specific source(s) of any “University funding” must be identified</li> <li>c) Personnel expenditures must include adequate provisions for benefit costs, salary settlements, and other escalating factors.</li> </ul> <p>Existing employees at the University of Alberta (CETT) and University of Waterloo (CATT) will provide administrative support (in-kind support) for the launch of CUIIC until the end of April 2022. As of April 30, 2022, CATT will be dissolved, and all CATT activities discontinued. From this date, all CUIIC personnel will be University of Alberta employees. One employee from CATT with knowledge and experience in the underground sector will be transitioned to an administrative role with CUIIC as an employee of the University of Alberta, with involvement of Human Resources in the Faculty of Engineering.</p> <p>Contributions from the Faculty of Engineering (matched by industry contributions) will cover a portion of the salaries of some CUIIC personnel (PDFs, graduate students and support staff) for the first three years of operation (see Appendix B and C). All personnel expenditures include adequate provisions for benefits, salary, and cost increases.</p>

8.

**Financial Plan**

- a) Include key sources of operating funds, and include revenue sources and expenditures for [ideally] 5 years projected.

CUIIC will be established with the assistance of seed funding from organizations with an interest in underground infrastructure. The founding members will contribute approximately CAD 10K each to a start-up fund (with a target of CAD 100K), which will cover the initial start-up costs and a portion of salary costs for the first year of operation.

One revenue stream for CUIIC is annual membership dues, with an expected membership revenue of approximately CAD 250K per year. A membership model has previously been successfully applied by the Steel Centre in the Department of Civil and Environmental Engineering. Member organizations will benefit from networking and research opportunities, as well as providing feedback related to professional development opportunities (e.g., CUIIC events or training courses) that would be relevant to their employees. Membership funds will be directed towards research, with matching research funds secured from NSERC and other funding agencies. Additional revenue will come from professional development courses, as detailed in the budget. The total expected revenues are approximately CAD 300K in the first year of operation and are projected to reach CAD 1.4M by Year 5.

Expenditures include salary costs for PDFs and other trainees, research expenditures (subject to the provisions of matching funding under NSERC), course expenses (advertising, catering, honorariums, etc.), operational expenses, etc. Projected expenditures total CAD 300K in the first year and average approximately CAD 83K per year.

The full budget and justification for CUIIC for a 5-year period have been included in Appendix B and C, respectively.

**Table 1.** Proposed membership and fee structure

<b>Manufacturers, Suppliers, Contractors, Consultants</b>											
	Annual Fee (\$)	Year 1		Year 2		Year 3		Year 4		Year 5	
		#	Total (\$)	#	Total (\$)	#	Total (\$)	#	Total (\$)	#	Total (\$)
<b>Large</b>	3,000	10	30,000	15	45,000	22	66,000	33	99,000	41	123,000
<b>Medium</b>	2,000	15	30,000	24	48,000	36	72,000	54	108,000	67	134,000
<b>Small</b>	1,000	15	15,000	24	24,000	36	36,000	54	54,000	67	67,000
<b>Utilities, Municipalities, Public Agencies</b>											
	Annual Fee (\$)	Year 1		Year 2		Year 3		Year 4		Year 5	
		#	Total (\$)	#	Total (\$)	#	Total (\$)	#	Total (\$)	#	Total (\$)
<b>Large</b>	2,000	5	10,000	8	16,000	12	24,000	18	36,000	22	44,000
<b>Medium</b>	1,000	10	10,000	15	15,000	22	22,000	33	33,000	41	41,000
<b>Small</b>	500	10	5,000	15	7,500	22	11,000	33	16,500	41	20,500
<b>Total</b>		<b>65</b>	<b>100,000</b>	<b>101</b>	<b>155,500</b>	<b>150</b>	<b>231,000</b>	<b>225</b>	<b>346,500</b>	<b>279</b>	<b>429,500</b>

- b) State specific source(s) of any “University funding”

The Faculty of Engineering will provide salaries for professors. The Faculty of Engineering will also provide initial start-up funding (CAD 75K for each of the first three years) and waive the overhead for all CUIIC activities—this allows the funding from memberships to be used as seed funding for research projects, which is then leveraged to generate matching contributions from NSERC and other funding agencies.

Other University funding will be in the form of graduate student scholarships (administered by the Faculty of Graduate Studies and Research) and teaching assistantships from the Department of Civil and Environmental Engineering (as applicable).

- c) Provide a plan for the sustainable funding of the operation of the centre or institute (salaries, equipment and maintenance, IT support [data management, web design, etc.]

Initially, salaries and other operational expenses for CUIIC will be partially covered by industry seed funding, as well as funding from the Faculty of Engineering. However, ongoing operational costs will be from annual membership fees and courses/educational initiatives. A five-year budget is detailed in Appendix B.

- d) Escalation factors must be built into expenditure projections (i.e. escalation due to inflation, future salary settlements, etc.)

Escalation factors have been included in expenditure projections (refer to Appendix B).

- e) If in-kind support is identified, the specifics of that support must be listed separately.

In-kind support will be a component of almost all CUIIC research projects. The in-kind support from industry for individual research projects is generally expected to be equal to or greater than the monetary contribution from industry.

9.

**Space Requirements.**

Space required?      Yes     No

If "No" selected, where is current space? \_\_\_ Markin/CNRL Natural Resources Engineering Facility (NREF) – laboratories/research space; DICE (office/administrative space)\_\_\_

If "Yes" selected, complete the following:

- On-site at the University of Alberta
- Awaiting allocation
- Rent/lease required

If rent/lease is required, has this been budgeted for?    Yes     No     **N/A**

Is funding required? Yes  No  N/A Reasons: \_\_\_\_\_

Address the following questions:

- a) If rent/lease or license is required, what is the University of Alberta’s commitment?
- b) If new space or modifications to existing space are required, has Facilities and Operations been contacted and has this been included in the budget?

CETT has laboratory capacity allocated to its activities in the Markin/CNRL Natural Resources Engineering Facility (NREF) which will be used for CUIIC research. This includes laboratory space currently shared with other faculty members—Dr. Leila Hashemian (Transportation) and Dr. Ergun Kuru (Petroleum).

Office space at the University of Alberta (in DICE) will be used to coordinate and facilitate the activities of CUIIC. While it is anticipated that CUIIC research will be conducted at the University of Alberta, no additional space is currently required. Since this is the case, no line items for rental or lease of space are included in the current budget.

10.

**Potential Risks to the University of Alberta**

- a) State any reputational, financial, and/or operational risks to the University of Alberta.
- b) Outline plans to mitigate/manage those risks.
- c) Risk Management Services may be consulted.

The potential reputational, financial and operational risks to the University of Alberta and CUIIC are summarized in Table 2, along with the mitigations currently in place.

**Table 2.** Potential risks and mitigations

Risk	Type	Mitigation
Not enough members to be viable long-term	Reputational/ Operational	- Existing organizations (CETT and CATT) have established reputations and track records (40 years between the two organizations); CUIIC will build on those existing relationships - CATT will bring over some existing members (currently ~90 members) - Positive engagement from initial stakeholders
Not enough founding members		- Network of existing relationships and strong communications (CATT/CETT) should facilitate recruitment of founding members - Faculty support for initial three years
Unclear communication around project may result in loss of trust by stakeholders	Reputational	- Establish clear, robust communication plan - Pooled experience of two organizations in developing communications - Administrative personnel for CUIIC include background and experience in communications
Members may not deliver on promised funds	Financial/ Operational	- Many potential members have existing relationships with those involved in CUIIC Planning Committee - Membership agreements will be based on a five-year term - Budgeting is conservative - Endowment fund to be created with any surplus revenue and industry contributions
Funding based on variable sources (e.g., membership)	Financial/ Operational	- Funding structure based on experience of similar organizations (e.g., Steel Centre at University of Alberta) - Establishment of endowment fund to give long-term stability to organization

	funds, matching donations)		<ul style="list-style-type: none"> <li>- Faculty of Engineering support secured for first three years (\$75K) while CUIIC is established</li> <li>- Faculty of Engineering could provide additional funds to backfill if necessary</li> </ul>
11.	<p><b><u>Annual Reporting and Strategic Review: In accordance with UAPPOL Policy</u></b></p> <ul style="list-style-type: none"> <li>a) State a provision for annual reporting to the Reporting Dean</li> <li>b) State a provision for annual reporting to the Office of the Provost</li> <li>c) State a provision for strategic and operational review by the Reporting Dean (or delegate) at no less frequency than every five years.</li> </ul> <p>An annual report focused on activities, educational and research outcomes, and finances of CUIIC will be submitted to the Dean of the Faculty of Engineering and Office of the Provost. The timing of the annual report submission will be determined in conjunction with the Dean of the Faculty of Engineering and the Office of the Provost.</p> <p>High-level internal reviews of CUIIC activities will take place annually.</p> <p>A strategic and operational review of CUIIC will be conducted by the Reporting Dean or a delegate every five years. This review will encompass the activities, educational and research outcomes, and financial records. The purpose of this review is to ensure that the vision and activities of the CUIIC continue to be in alignment with the Faculty of Engineering and the University of Alberta.</p>		
12.	<p><b><u>Intellectual Property (IP) and Copyright</u></b></p> <ul style="list-style-type: none"> <li>a) Will any copyright or patentable IP be created, and if so, how will it be handled?</li> <li>b) How will ownership and commercialization of IP be handled?</li> </ul> <p>Copyright to published information will be in accordance with University of Alberta policy and collective agreements.</p> <p>Since CUIIC exists to advance underground infrastructure for sustainable communities, the focus will not be on patentable IP. If any concept generated from research or activities under CUIIC merits commercialization, the appropriate resources at the University of Alberta will be engaged to facilitate further development.</p> <p>The membership agreement will contain a clause related to the IP ownership, developed with the Research Services Office in accordance with University of Alberta policy.</p>		
13.	<p><b><u>Termination Plan/Provisions</u></b></p> <ul style="list-style-type: none"> <li>a) Exigency plan for termination: If physical and/or financial resources will remain upon termination, a plan for consultation with donors or agencies associated with the centre or institute must be included in the dissolution plan.</li> </ul> <p>In the event of dissolution of CUIIC, any remaining funds will be distributed as follows:</p> <ul style="list-style-type: none"> <li>1. in accordance with the research funding committed to the Principal Investigator(s) of each research project; and</li> <li>2. in accordance with the terms of other contractual agreements of CUIIC (if any)</li> </ul> <p>If, after this distribution, there are any funds remaining, these will be retained by the Faculty of Engineering at the University of Alberta.</p>		

14.	<p><b>Letters of Support:</b> Attach letters from relevant on- and off-campus sources</p> <p>Letters of support from the following people and organizations have been attached (Appendix D):</p> <ul style="list-style-type: none"> <li>● Faculty of Engineering</li> <li>● Department of Civil and Environmental Engineering</li> <li>● University of Waterloo</li> <li>● EPCOR</li> <li>● AECOM</li> <li>● Stantec</li> <li>● Associated Engineering</li> <li>● Aegion/Insituform</li> <li>● City of Waterloo</li> <li>● Consortium for Advancement of Trenchless Technology (CATT)</li> <li>● Dillon Consulting Ltd.</li> <li>● Earth Boring Company Ltd.</li> <li>● Infrastructure Assessment Academy</li> <li>● IPEX Inc.</li> <li>● MTE Consultants</li> <li>● North American Society for Trenchless Technologies (NASTT) NW Chapter</li> <li>● Tunneling Association of Canada</li> <li>● Utility Engineering and Surveying Institute (UESI) AB-BC Chapter</li> <li>● UESI Ontario Chapter</li> </ul>
15.	<p>Provide, if applicable, any <b>agreements and/or memoranda of understanding between the University of Alberta and its partner(s)</b> to establish, fund and operate the proposed academic centre or institute.</p> <p>N/A</p>

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**Appendix A – Canadian Underground Infrastructure Innovation Centre (CUIIC)  
Director Curriculum Vitae**

Department of Civil and Environmental Engineering  
University of Alberta  
Edmonton, Alberta, Canada  
T6G 1H9

## **Curriculum Vitae**

Alireza Bayat

Phone: 780-492-5112  
Email: [abayat@ualberta.ca](mailto:abayat@ualberta.ca)

<https://www.ualberta.ca/engineering/faculty/alireza-bayat>

January 2022

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# Curriculum Vitae

## 1. Personal Information

*Name:* Alireza Bayat  
*Address:* 7-243 Donadeo Innovation Centre for Engineering  
Edmonton, AB, Canada T6G 1H9  
*E-mail:* abayat@ualberta.ca  
*Phone:* 780-492-5112  
*P.Eng. Status:* Active in Ontario since 2008  
Active in Alberta since 2010

## Education

Ph.D., Civil Engineering, 2009  
University of Waterloo  
Thesis title: *Field and Numerical Investigation to Determine the Impact of Environmental and Wheel Loads on Flexible Pavements*  
Advisor Name: Dr. Mark Knight, Dr. Leo Rothenberg

M.Sc., Civil Engineering, 2004  
Sharif University of Technology  
Dissertation title: *Numerical Investigation and Field Monitoring of Stability During Installation of Karun Bridge Rock Mass Abutment*  
Advisor Name: Dr. M.H Sadaghiani

B.Sc., Civil Engineering, 2002  
Sharif University of Technology

## Appointments

*Professor*, July 2018 – Present  
Department of Civil & Environmental Engineering, University of Alberta

*NSERC Associate Industrial Research Chair in Underground Trenchless Construction*, March 2017 – Present  
National Sciences and Engineering Research Council

*Editorial Advisory Board*, Spring 2017 – Present  
Trenchless Technology Canada

*Associate Editor*, March 2016 – Present  
ASCE Journal of Pipeline Systems Engineering and Practice

*Associate Professor, July 2015 – June 2018*

Department of Civil & Environmental Engineering, University of Alberta

*Assistant Professor, August 2009 – June 2015*

Department of Civil & Environmental Engineering, University of Alberta

*Industrial / Other work experience, September 2008 – Present*

Terien Inc., Co-Director

*Ralph Haas / Stantec Fellow in Civil Engineering, November 2012 – Present*

Department of Civil & Environmental Engineering, University of Alberta

*Graduate Research Assistant, September 2004 – August 2009*

Department of Civil Engineering, University of Waterloo

*Lecturer, January 2008 – May 2008*

Department of Civil Engineering, University of Waterloo

*Industrial / Other work experience, July 2008 – November 2008*

Centre for Advancement of Trenchless Technologies (CATT), Design Engineer

*Industrial / Other work experience, February 2006 – October 2006*

Centre for Advancement of Trenchless Technologies (CATT), Design Engineer

*Graduate Research Assistant, September 2002 – August 2004*

Department of Civil Engineering, Sharif University of Technology

*Industrial / Other work experience, July 2002 – August 2004*

Sazbon Consultant Engineering Corporation

## **Organized Workshops and Training Courses**

### *2021 University of Alberta/TELUS FTTx Virtual Series*

- Series of four biweekly web-based seminars focused on providing information about cutting edge technologies and provide perspectives from the industrial and public sector leaders on current risks and challenges to successful fibre construction projects
- Themes included fibre projects in indigenous communities, innovations in fibre construction, digitization, and supply chain impacts on large projects
- October-November-December 2020

### *2020 University of Alberta/TELUS FTTx Virtual Series*

- Series of four biweekly web-based seminars with discussion/questions
- October-November 2020

### *Geotechnical Consideration for Underground Trenchless Construction*

- One-day workshop on geotechnical issues as applicable to underground trenchless construction methods
- Edmonton, Alberta, Canada
- February 27, 2020

### *Trenchless Technologies 101*

- One-day workshop aimed at industry professionals giving an overview of current trenchless construction methods
- Edmonton, Alberta, Canada
- September 19, 2019

### *FTTx Underground Construction Workshop*

- Two-day workshop on fibre construction aimed at all stakeholders in fibre construction projects, including service providers, municipalities, construction contractors, equipment manufacturers, etc.
- Edmonton, Alberta, Canada
- May 8-9, 2019

### *Direct Pipe Installations: From Planning to Construction*

- One-day workshop involving more than half a dozen speakers covering different aspects of Direct Pipe Installation
- Developed for professionals in the trenchless construction industry
- First event in North America offered covering this topic
- Calgary, Alberta, Canada
- May 2, 2019

### *Water and Wastewater Pipeline Condition Assessment and Rehabilitation*

- One-day workshop on water/wastewater pipeline condition assessment and rehabilitation aimed at professionals within the industry
- Edmonton, Alberta, Canada
- February 21, 2019

### *Advanced HDD Design*

- One-day workshop on HDD design aimed at professionals in the trenchless construction industry
- Edmonton, Alberta, Canada
- October 25, 2018

### *Planning and Design of Horizontal Directional Drilling Projects*

- Three-day short course directed towards professionals in the trenchless construction industry
- Edmonton, Alberta, Canada
- May 29–May 31, 2018

#### *Geotechnical Consideration for Underground Trenchless Construction*

- Short course focused on geotechnical considerations in the design of HDD projects
- Edmonton, Alberta, Canada
- February 15, 2018

#### *Microtunneling and Pilot Tube Microtunneling*

- One-day short course on Microtunneling and Pilot Tube Microtunneling technologies for pipe installation
- Edmonton, Alberta, Canada
- October 26, 2017

#### *Trenchless Technologies 101*

- One-day short course introducing the concepts and technologies behind various trenchless construction methods
- Edmonton, Alberta, Canada
- September 28, 2017

#### *Horizontal Directional Drilling*

- Two-day short course directed towards professionals in the trenchless construction industry
- Istanbul, Turkey
- June 2017

#### *Planning and Design of Horizontal Directional Drilling Projects*

- Three-day short course directed towards professionals in the trenchless construction industry
- Edmonton, Alberta, Canada
- May 30–June 1, 2017

#### *Planning and Design of Horizontal Directional Drilling Projects*

- Three-day short course directed towards professionals in the trenchless construction industry
- Edmonton, Alberta, Canada
- May 24–26, 2016

#### *Planning and Design of Horizontal Directional Drilling Projects*

- Three-day short course directed towards professionals in the trenchless construction industry
- Calgary, Alberta, Canada
- May 26–28, 2015

#### *Pipeline Condition Assessment Workshop*

- One-day workshop covering issues faced in pipeline condition assessment and offering perspectives from several experts

- Edmonton, Alberta, Canada
- May 5, 2015

*Pilot-tube and Guided Boring Workshop*

- One-day workshop featuring a series of speakers covering topics related to pilot-tube and guided boring
- Edmonton, Alberta, Canada
- October 7, 2014

*Planning and Design of Horizontal Directional Drilling Projects*

- Two-day short course directed towards professionals in the trenchless construction industry
- Calgary, Alberta, Canada
- June 3–4, 2014

*IRRF Research Symposium*

- One-day event offering participants an in-depth look at the Integrated Road Research Facility (IRRF)'s activities and research
- Edmonton, Alberta, Canada
- May 6, 2014

*Planning and Design of Horizontal Directional Drilling Projects*

- Two-day short course directed towards professionals in the trenchless construction industry
- Calgary, Alberta, Canada
- May 2013

**Professional Affiliations**

- American Society for Engineering Education (ASEE)
- American Society of Civil Engineers (ASCE)
- Canadian Society for Civil Engineering (CSCE)
- North American Society for Trenchless Technology (NASTT)
- Canadian Geotechnical Society (CGS)

**Academic Awards and Achievements**

- Faculty of Engineering Research Award, 2017
- NASTT's Trent Ralston Young Trenchless Achievement Award, 2015
- Ralph Haas/Stantec Fellow in Civil Engineering, 2012 to Present
- Best Conference Paper, Canadian Society for Civil Engineering Conference, Winnipeg, 2010
- Graduate Merit Scholarship, University of Waterloo, January 2009
- Graduate Merit Scholarship, University of Waterloo, August 2008



- Winner of CSCE Student Competition Award, June 2008
- Ontario Graduate Scholarship (OGS), May 2008
- President Graduate Scholarship, University of Waterloo, May 2008
- Graduate Merit Scholarship, University of Waterloo, April 2008
- Graduate Scholarship, University of Waterloo, January 2007
- Engineering Graduate Scholarship, University of Waterloo, September 2006
- 1<sup>st</sup> Place, NASTT No-Dig Conference Poster Presentation, San Diego, CA, April 2007
- Winner of CCTV Student Competition, NASTT No-Dig Conference, San Diego, CA, April 2007
- Graduate Scholarship, University of Waterloo, May 2006
- Winner of Canadian Geotechnical Society Competition, Toronto, January 2006
- 1<sup>st</sup> Place, NASTT No-Dig Conference Poster Presentation, Nashville, TN, April 2006
- Faculty of Engineering Graduate Scholarship, University of Waterloo, September 2005
- International Doctoral Student Award, University of Waterloo, September 2004-2007

## **2. Teaching**

### **Teaching Philosophy**

It is my responsibility as a professor to commit all of the skills available in my repertoire to facilitate learning and encourage curiosity, rather than simply deliver information. An effective teacher does more than just provide students with course content; rather, a valuable professor helps the students develop the abilities needed to apply their education within both the university and industry. The engineering field is about solving problems and critical thinking: thus, communication and teamwork skills are as equally important as course content. Through many years of teaching experience, I have honed my capabilities as a professor to reflect the merits of an effective teacher and apply these beliefs to every student I encounter.

For several years, long before I began graduate studies, I was a mathematics teacher in a well-known Iranian high school. This was my introduction to the valuable responsibility of teaching, and where my passion for imparting knowledge first developed. In the subsequent years as a PhD student, I held a number of teaching assistant positions in a variety of civil engineering classes, as well as conducted guest lectures and instructed courses at the Centre for Advancement of Trenchless Technologies and the Ontario Good Road Association. Through these rewarding experiences, I realized that my teaching style stemmed from the habits I had practiced as a student. I was inquisitive learner in class, always asking questions, determined to absorb as much as possible. As such, I came to realize that my ardent questions promoted dialogue within the class and encouraged other students to speak up and participate in lectures. These interactions engaged my classmates and allowed myself a deeper level of learning and understanding. As a professor, I carry forth the techniques I practiced as a student and use the principles as the foundation in which I conduct my classes. In each class or lecture I lead, I encourage an atmosphere in which my students feel comfortable asking questions, challenging my statements, and generating discussions amongst themselves, as this is how learning truly occurs. I want my students to be engaged in conversation, both with myself and with each other, as the reception of ideas challenges them to apply their problem-solving and creative thinking skills. The students, however, are not the only ones to present questions and challenges in class; I do as well. I prepare for classes by considering how I can question my students and encourage them to think critically of a situation, developing their own thoughts rather than simply repeating what they have been told. If there is a lull in discussion, I will present them with queries, promoting class engagement and challenging their skills as thinkers and learners.

As a professor, it is my responsibility to ensure that I utilize every tool in my possession to facilitate learning. I am constantly analyzing my classroom to gauge the students' reception of knowledge, adjusting my techniques to fit the learning needs of each class, and to evaluate how my teaching methods can improve. Challenging my students with in-class questions allows me to determine the level of receptiveness and to determine if the students have successfully learned the subject matter. Depending on the response, I am able to adjust my teaching approach and clarify material that was not understood. To accommodate different

learning styles and the needs of my students, I have implemented a number of different elements into my courses such as group projects, guest speakers, tests, homework assignments, and term reports. This variety maintains student engagement, ensures that all learning needs are met and, most importantly, all students are challenged. Classes should be a balance of both fundamental and practical applications and I provide my students with the theory and opportunities to apply my teachings (or see them applied) in real-life situations. The connections I have formed through my research initiatives allow me to expose my students to industry activities by hosting a number of guest speakers in class. When students see the actual application of the theory, it can be better understood, a concept I promote in my courses.

I firmly believe that, as a teacher, I must constantly learn and improve, and it is important that I continually update and adjust my methods. I always strive to develop my skills further, and I have attended a number of workshops and seminars dedicated to strengthening current teaching methods and introducing new ones. In 2011, I attended the American Society for Civil Engineering conference in Vancouver to learn about effective teaching approaches in engineering, and I have since kept a current subscription to the ASCE's magazine to stay informed on the topic. I work to integrate new methods and improve old to ensure my students have a valuable learning experience, leaving my classroom as stronger thinkers and overall more receptive scholars. Most recently, I have strengthened and refined my online teaching strategies in response to the shift to online course delivery in March 2020.

## **Teaching Initiatives and Contributions**

### *(1) Development of new courses*

#### *CIV E 719 Pavement Materials*

Developed together with Dr. Leila Hashemian, this course allows students to become familiar with asphalt material components. Through the careful study of bitumen, aggregates, and other materials used in asphalt materials, students are challenged to discover how material properties can affect overall performance. The objective of the course is to expose students to a range of asphalt materials, to promote understanding of design components, and to gain exposure to the testing, and performance value, of different elements in pavement.

#### *CIV E 609/709 Underground Trenchless Construction*

This is a new graduate-level course developed in underground trenchless construction. The objective of this course is to introduce trenchless technology methods and their importance in public works, pipeline construction, and rehabilitation. Students are exposed to new topics and concepts through class lectures, specified readings, five guest presentations, student seminars, and the completion of assignments. In this course, the theory and practice of trenchless construction methods are explained. Students are evaluated based on classroom assessment techniques, targeted exams or homework questions, and a term report.

### *CIV E 719 Pavement Rehabilitation*

Pavement rehabilitation is a graduate-level course developed in collaboration with my postdoctoral fellow, Dr. Somayeh Nassiri. This course builds knowledge on engineering concepts and information needed to maintain, repair and rehabilitate pavements. Design of flexible and rigid overlays and other repair and rehabilitation techniques and initial and life-cycle cost analysis of various rehabilitation activities are discussed.

### *CIV E 719 Advanced Pavement Design*

This is a new course developed in advanced pavement design methods. The objective of the course is to ensure that students are familiar with new mechanistic-empirical pavement design methods. Students are evaluated based on assignments, projects, midterms and a final exam.

### *(2) Overhauling courses*

#### *CIV E 381 Soil Mechanics*

I updated and expanded the course material for the university's Soil Mechanics course. All assignments were redesigned and the lab format and manual for the course's four physical labs was updated.

### *(3) Reading Courses*

I have offered five reading courses and supervised 13 students completing their reading courses in different topics. Students in reading courses meet with me every week and present their findings in a presentation format.

### *(4) Guest Instructor*

I have been asked to be a guest lecturer in other courses offered in the department, which include:

- CIV E 241: Technical Communication course, where I presented the geotechnical engineering discipline and a few students completed their report under my guidance.
- CIV E 618: Pavement Management course, where I presented two lectures to familiarize students with advanced pavement design and monitoring methods.

### *(5) Community Outreach*

#### *Consortium for Engineered Trenchless Technologies, FTTx Underground Construction Workshop Developer/Instructor, 2019-present*

Through late 2018 and early 2019, I planned the FTTx Underground Trenchless Construction Workshop in collaboration with TELUS Communications. The first year of this course, which was aimed at stakeholders including service providers, municipalities, construction contractors, and equipment manufacturers, reached capacity and received positive feedback from course participants.

*Consortium for Engineered Trenchless Technologies, Trenchless Technologies Short Courses, Horizontal Directional Drilling Course Developer/Instructor, 2013-*

Based on the success of the Horizontal Directional Drilling (HDD) Short Course developed with The Crossing Company Inc., I partnered with other subject matter experts to expand CETT course offerings for industry professionals. CETT now holds approximately four courses per year, with industry experts from North America and beyond presenting their experience. There is a total of eight courses, and the courses offered each year alternate among those listed below. Planning and Design of Direct Pipe Projects (EXGEN 4804) was first held in 2019, and this was the first time a formal course covering this topic was offered in North America. These courses represent a significant initiative in advancing knowledge of various underground trenchless construction methods across the engineering profession and within the construction industry.

- EXGEN 4797 Water and Wastewater Pipeline Condition Assessment and Rehabilitation (7 hrs)
- EXGEN 4798 Trenchless Technologies 101 (7 hrs)
- EXGEN 4799 Microtunneling and Pilot Tube Microtunneling (7 hrs)
- EXGEN 4800 Geotechnical Consideration for Underground Trenchless Construction (7 hrs)
- EXGEN 4801 Pipe Materials for Trenchless Construction (7 hrs)
- EXGEN 4803 Advanced HDD Design (7 hrs)
- EXGEN 4804 Planning and Design of Direct Pipe Projects (7 hrs)
- EXCPE 4781 Horizontal Directional Drilling (21 hrs)

*Consortium for Engineered Trenchless Technologies, Horizontal Directional Drilling Course Developer/Instructor, 2013-2018*

In 2013, I developed a Horizontal Directional Drilling (HDD) Short Course in collaboration with an industry partner, The Crossing Company Inc. This course has been offered annually to industry professionals as a detailed and highly technical look at the design and planning of HDD projects. Its first year was so successful (reaching maximum registration capacity) that it was held again the following year and again reached record registration capacity. This course was offered every year from 2013-2018.

*Integrated Road Research Facility, First Annual Research Symposium*

In May 2014, the IRRF hosted its first research symposium with the goal of sharing its research with industry. This free event drew in record attendance from across the country. The keynote speaker, Dr. Ralph Haas, presented to attendees on the importance of test roads, and IRRF researchers provided detailed overviews of the projects they have been working on for the past few years.

*Consortium for Engineered Trenchless Technologies, Municipal Users Forum*

In the summer of 2013, CETT partnered with Louisiana Tech University's Trenchless Technology Centre to host a Municipal Users Forum. This forum included five guest presenters that shared valuable insights with 60 attendees from around the Edmonton area on the subject of trenchless technology.

*Centre for Advancement of Trenchless Technology, Horizontal Directional Drilling Course Instructor, 2008-2009*

During my graduate studies at the University of Waterloo, I voluntarily taught Horizontal Directional Drilling courses to industry professionals at the Centre for Advancement of Trenchless Technology (CATT).

## Teaching Experience and Evaluations

Course	Description	Term	Enrolment	USRI Median
ENV E 251	Properties of Environmental Engineering Materials (50% with Dr. Hashemian)	Winter 2022		
CIV E 609	Underground Trenchless Construction	Winter 2021	12	
ENV E 251	Properties of Environmental Engineering Materials (50% with Dr. Hashemian)	Winter 2021	82	
CIV E 609	Underground Trenchless Construction	Winter 2020	28	n/a
ENV E 251	Properties of Environmental Engineering Materials (50% with Dr. Hashemian)	Winter 2020	59	n/a
CIV E 609	Underground Trenchless Construction	Winter 2019	27	4.8
CIV E 609	Underground Trenchless Construction	Winter 2018	30	4.5
CIV E 381	Soil Mechanics	Winter 2018	93	4.5
CIV E 609	Underground Trenchless Construction	Winter 2018	16	4.5
CIV E 719	Pavement Materials	Winter 2017	4	n/a
CIV E 381	Soil Mechanics	Winter 2017	98	4.6
CIV E 609	Underground Trenchless Construction	Winter 2017	24	4.8
ENV E 351	Environmental Materials	Winter 2015	32	-
CIV E 609	Underground Trenchless Construction	Winter 2015	9	n/a
CIV E 381	Soil Mechanics	Fall 2014	118	4.7
CIV E 609	Underground Trenchless Construction	Winter 2014	17	4.3
CIV E 709	Advanced Topics in Construction Engineering Management (Reading Course)	Winter 2014	1	n/a
CIV E 719	Pavement Rehabilitation	Winter 2014	7	n/a
CIV E 381	Soil Mechanics	Fall 2013	105	4.3
CIV E 709	Advanced Topics in Construction Engineering Management (Reading Course)	Fall 2013	3	n/a
CIV E 609	Underground Trenchless Construction	Winter 2013	13	4.3
CIV E 799	Advanced Topics in Soil Mechanics (Reading Course)	Winter 2013	2	n/a
CIV E 719	Advanced Pavement Design	Winter 2013	4	n/a
CIV E 381	Soil Mechanics	Fall 2012	45	4.4
CIV E 709	Advanced Topics in Construction Engineering Management (Reading Course)	Fall 2012	6	n/a
CIV E 719	Advanced Topics in Transportation Engineering (Reading Course)	Fall 2012	1	n/a
CIV E 709	Trenchless Technologies	Winter 2012	19	4.5
CIV E 381	Soil Mechanics	Winter 2012	106	4.1
CIV E 381	Soil Mechanics	Fall 2011	70	4.3
CIV E 709	Trenchless Technologies	Winter 2011	22	4.3
CIV E 381	Soil Mechanics	Winter 2011	132	4.1
CIV E 381	Soil Mechanics	Fall 2010	94	4.3
CIV E 381	Soil Mechanics	Winter 2010	208	3.9
CIV E 381	Soil Mechanics	Fall 2009	28	4.5

## Professional Development Courses

Course	Organizer	Date	Enrolment	Location
UofA/TELUS 2021 FTTx Virtual Series	CETT / TELUS	October – December 2021	212	Virtual delivery
UofA/TELUS 2020 FTTx Virtual Series	CETT / TELUS	October/ November 2020	222	Virtual delivery
Geotechnical Consideration for Underground Trenchless Construction	CETT / Faculty of Extension	February 2020	17	Edmonton
Trenchless Technologies 101	CETT / Faculty of Extension	September 2019	12	Edmonton
FTTx Underground Construction Workshop	CETT / TELUS	May 2019	112	Edmonton
Direct Pipe Installations: From Planning to Construction	CETT / Faculty of Extension	May 2019	31	Calgary
Water and Wastewater Pipeline Condition Assessment and Rehabilitation	CETT / Faculty of Extension	February 2019	20	Edmonton
Advanced HDD Design	CETT / Faculty of Extension	October 2018	27	Edmonton
Planning and Design of Horizontal Directional Drilling	CETT / Faculty of Extension	May 2018	11	Edmonton
Geotechnical Considerations for Underground Trenchless Construction	CETT / Faculty of Extension	February 2018	28	Edmonton
Trenchless Technologies 101	CETT / Faculty of Extension	September 2017	15	Edmonton
Microtunneling and Pilot Tube Microtunneling	CETT / Faculty of Extension	October 2017	16	Edmonton
Horizontal Directional Drilling	TSTT	June 2017	22	Istanbul
Planning and Design of Horizontal Directional Drilling	CETT	May 2017	18	Edmonton
Condition Assessment and Rehabilitation for Water and Wastewater Pipeline	Faculty of Extension	Feb 2017	35	Edmonton
Planning and Design of Horizontal Directional Drilling	Faculty of Extension	May 2016	20	Edmonton
Planning and Design of Horizontal Directional Drilling	CETT	May 2015	45	Calgary
Planning and Design of Pilot Tube Micro-tunneling	CETT	Oct 2015	68	Edmonton
Planning and Design of Horizontal Directional Drilling	CETT	May 2014	48	Calgary
Planning and Design of Horizontal Directional Drilling	CETT	May 2013	62	Calgary



## Supervision of Graduate Students and Postdoctoral Fellows

Name	Year Admitted	Year Completed	Degree	% Supervised/ Joint With	Present Position
Qian Cong Zhang	2022		MSc	100	Enrolled fulltime
Shadi Ansari	2021		PDF	50% with Dr. Hashemian	Fulltime
In Shik (Justin) Park	2020		PhD	100	Enrolled fulltime
Otto Hedges	2020		PhD	100	Enrolled fulltime
Qiming (Jasmine) Ma	2020		MSc	100	Enrolled fulltime
Bingxuan Li	2020		MSc	100	Enrolled fulltime
Paula Rodriguez Leon	2020		MSc	100	Enrolled fulltime
Aditya Roshan	2019		PDF	100	Fulltime
Syed Muhammad Shumail Ali	2019	2020	MEng	100	Graduated
Siddha Shome	2019	2020	MEng	100	Graduated
Mingjie Han	2019	2021	MSc	50% with Dr. Barczyk (Mechanical Engineering)	Graduated
Yunyan Huang	2019		PhD	100	Enrolled fulltime
Mudasir Mir	2019		MSc	100	Enrolled parttime
Yang Zhou	2019	2020	MSc	100	Graduated
Leila Carolina Martoni Amaral	2019	2021	MSc	100	Employed at CCI Inc.
Zahra Monfared	2019		PhD	100	Enrolled fulltime
Zhengwei Li	2018	2019	PDF	100	PDF at the UofA
Sheng Huang	2018	2020	PDF	100	Faculty Member at Sun Yat-Sen University
Amirhossein Ghasemirad	2018	2020	MSc	50% with Dr. Hashemian	Graduated
Yi (Andy) Su	2018	2020	MSc	100	Graduated
In Shik (Justin) Park	2018	2020	MSc	100	PhD student at UofA
Roshan Rijal	2018	2020	MSc	100	Graduated
Mohamad Molavi Nojumi	2018		PDF	100	Enrolled fulltime
Saeid Moharrami	2018		PhD	50% with Dr. AbouRizk	Enrolled fulltime
Stefan Goerz	2017	2018	MSc	50% with Dr. Hendry	Geotechnical Engineer at CCI Inc.
Azar Shabani	2018	2018	PDF	100	PDF at the UofA
Tugce Baser	2017	2018	PDF	100	Faculty Member at UIUC
Ahmed Ali Sial	2016	2017	MEng	100	Graduated
Wael El Halabi	2016	2017	MEng	100	Graduated
Geoff Petzold	2017	n/a	MSc	50% with Dr. AbouRizk	Voluntary withdrawal
Vinicius Velasco	2017	2018	MSc	50% with Dr. Hashemian	Operations Supervisor at

					West-Can Seal Coating
Ashkan Faghih	2016		PhD	100	Enrolled fulltime
Muhammad Aaqib Hadayat	2017	2018	MEng	100	Graduated
Kamal Jamaluddin	2017	2018	MEng	100	Graduated
Arash Ghahremani	2016	2017	MEng	100	Graduated
Nero (Bo) Gao	2016	2018	MSc	100	Graduated
Yichen Wu	2016	2019	MSc	100	Graduated
Brett Newstead	2015	2018	MSc	50% with Dr. Hashemian	Graduated
Sai Deng	2015	2018	MSc	100	Graduated
Mahsa Mohajerani	2015		MSc	100	
Mahsa Ahmadian	2015	2018	MSc	100	Graduated
Chao Kang	2015	2020	PDF	100	Instructor at UNBC
Yolanda Alberto Hernandez	2014	2015	PDF	100	Assistant Professor at Tokyo University
Arian Asefzadeh	2014	2018	PhD	100	Graduated
Leila Hashemian	2014	2017	PDF	100	Assistant Professor at University of Alberta
Leon Gay	2013	2014	PDF	100	Associate Professor at Universidad de Guanajuato, Mexico
Yaolin Yi	2013	2016	PDF	100	Assistant Professor at Nanyang Technological University, Singapore
Simita Biswas	2013	2016	MSc	100	Graduated
Tareq Khondoker	2013	2016	MSc	100	Graduated
Md. Hasanuzzaman	2013	2016	MSc	100	Graduated
Susen Das	2013	2016	MSc	100	Graduated
Mohammad Rezaei	2013	Discontinued	PhD	100	
Montazar Rabiei	2012- Switched from Dr. Gul in 2013	2016	PhD	50% with Dr. Roger Cheng	Graduated
Sahar Salimi	2012	2014	MSc	100	
Mahmood Ranjbar	2012	2014	MSc	100	Design Engineer
Ahsan Zia	2012	2014	MEng	100	
Ahsan Afzal	2012	2014	MEng	100	
Md. Rokibul Hossain	2012	2014	MEng	100	Design Engineer at Alberta Transportation
Javed Alamgir	2012	2013	MEng	100	Estimator at URS

					Flint
Negar Tavafzadeh	2012		PhD	50% with Dr. Hashemian	Enrolled fulltime
Ali Rostami	2012	2017	PhD	100	
Hediyeh Vaseli	2012	2015	MSc	100	Engineer at Golder Associate
Kahou Ngan	2012	2014	MSc	100	
Ashkan Faghieh	2012	2014	MSc	100	Site Engineer at The Crossing Company
Somayeh Nassiri	2011	2014	PDF	100	Assistant Professor at Washington State University
Meisam Norouzi	2011	2012	MSc	100	Road Engineer at Paradox Access Solutions Inc.
Naser Farkhideh	2011	2012	MSc	100	Geotechnical Engineer at Machibroda Engineering
Reza Navab	2011	2014	MSc	50% with Dr. Yasser Mohamed	Design Engineer at IVIS Inc.
Carrie Murray	2011	2013-Discontinued	PhD	100	Geotechnical Director at WorleyParsons
Mohammad Shafiee	2011	2016	PhD	100	Graduated
Soroush Khazraeializadeh	2010	2012	MSc	100	Project Engineer at Imperial Oil
John Kerolus	2010	2012	MEng	100	Manager at CH2M HILL
Hossein Akbarzadeh	2010	2012-Discontinued	PhD	100	
Jhuma Saha	2009	2010	MSc	100	Design Engineer at WorleyParsons
Ehsan Khan	2009	2010	MEng	100	
Hicham Youssef Elkhilil	2009	2010	MEng	100	
Abdallah Ibrahim Anabtawi	2009	2010	MEng	100	
Muhammad Wahab Kaleem	2009	2010	MEng	100	
Sandeep Mangat	2009	2010	MEng	100	
Khalid Riaz	2009	2010	MEng	100	
Harsharan Rangi	2009	2010	MEng	100	
Renny Gheroo	2009	2011	MEng	100	
Pardip Das	2009	2011	MEng	100	
Daniel Meles	2008-Switched from Dr Martin in 2010	2014	PhD	50% with Dr. Dave Chan	Geotechnical Engineer at WorleyParsons

Tezera Azmatch	2006- Co-supervisor from 2011	2013	PhD	50% with Dr. Sego	Geotechnical Engineer at AMEC
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*Other Personnel*

<b>Name</b>	<b>Year Started</b>	<b>Year Completed</b>	<b>Degree</b>	<b>% Supervised/ Joint With</b>	<b>Position</b>
Qiming Ma	2020	2020	BSc	100	Undergraduate Research Assistant
Tianyun Fang	2020	2020	BSc	100	Undergraduate Research Assistant
David Agbi	2019	2019	BSc	100	Undergraduate Research Assistant
Boem Joon (Jay) Kwon	2019	2019	BSc	100	Undergraduate Research Assistant
Jintao (James) Liu	2019	2019	BSc	100	Undergraduate Research Assistant
Mahya Roustaei Hossein Abadi	2018	2018	PhD	100	Visiting Professor
Caiyu (Sally) Xu	2018	2018	BSc	50% with Dr. Hashemian	Undergraduate Research Assistant
Yiwen (Vicki) Zhang	2018	2018	BSc	50% with Dr. Hashemian	Undergraduate Research Assistant
Sidharth Patra	2018	2018	BSc	50% with Dr. Hashemian	MITACS Summer Internship
Samantha Chum	2017	2017	BSc	100	Undergraduate Research Assistant
Maariyah Shaikh	2017	2017	BSc	100	Undergraduate Research Assistant
Yinggeer (Jenny) Quan	2017	2017	BSc	100	Undergraduate Research Assistant
Monsour Fakhri	2017			100	Visiting Professor
Bryson Huculak	2016	2016	BSc	100	NSERC Summer Co-op
Ian Lu	2015	2016	BSc	100	Volunteer researcher
Ian Chin	2015	2015	BSc	100	NSERC Summer Co-op
Tianchen Li	2014	2015	BSc	100	Dean's Research Award
Nabila Chartur	2014	2015	BSc	100	Dean's Research Award
Manaswy Gollamudi	2014	2015	BSc	100	Dean's Research Award
Yashaswy Gollamudi	2014	2015	BSc	100	Dean's Research Award
Pragnesh Pahuja	2014	2014	BSc	100	MITACS Summer Internship
Bianca Angotti	2013	2013	High school	100	WISEST Program
Dai Dao	2013	2014	BSc	100	
Janelle Malcolm	2012	2012	BSc	100	Dean's Research Award

## Research Staff

Name	Year Started	Year Ended	% Supervised/ Joint With	Position
Hang Zhu				
Justin Wong	2021	2021	100	Research Assistant (Programmer)
Wonbin Jeong	2020		100	Research Assistant (Programmer)
Dichong Song	2020		100	Research Assistant (Programmer)
Juwon (Andrew) Park	2019	2020	100	Research Assistant (Programmer)
Virginia Dowdell	2019	2019	100	Communications and Technical Writer
Lana Gutwin	2018		100	Research Coordinator
Lindsey Gauthier	2018	2018	100	Research Administrator
Aaron Dycke	2017	2018	100	Laboratory Technician
Delaina Lawson	2017	2018	100	Communications and Technical Writer
Mahmood Salimi	2014	2016	100	Research Associate
Sheena Moore	2015	2017	100	Communications and Technical Writer
Tatiana Boryshchuk	2014	2015	100	Communications and Technical Writer
Lauren Wozney	2013	2014	100	Communications and Technical Writer
Tejay Gardiner	2012	2013	100	Communications and Technical Writer

## Student Awards and Scholarships

- *First Place Student Chapter Annual Presentation at NASTT No-Dig*, awarded to University of Alberta NASTT Student Chapter, 2019
- *Second Place Student Chapter Annual Presentation at NASTT No-Dig*, awarded to Ashkan Faghieh, 2019
- *NASTT Argent Memorial Scholarship*, awarded to Ashkan Faghieh, 2019
- *University of Alberta Doctoral Recruitment Scholarship*, awarded to Zahra Monfared, 2019
- *Second Place Student Chapter Annual Presentation at NASTT No-Dig*, awarded to Sai Deng, 2018
- *Faculty of Engineering Early Career Researcher Award*, awarded to Amirhossein Ghasemirad, 2018
- *Third Place Student Chapter Annual Presentation at NASTT No-Dig*, awarded to Chao Kang, 2017

- *ASME OMAE Calgary Chapter Graduate Scholarship in Engineering*, awarded to Ashkan Faghih, 2017
- *Second Place Poster at NASTT No-Dig*, awarded to Chao Kang, 2017
- *Michael E. Argent Memorial Scholarship Award* North American Society of Trenchless Technology, awarded to Ali Rostami, 2016
- *First Place CSCE Poster Competition*, awarded to Ali Rostami, 2016
- *First Place Poster at NASTT No-Dig*, awarded to Montazar Rabiei, 2016
- *FSGR Graduate Travel Award*, awarded to Mohammad Shafiee, 2015
- *First Place CSCE Poster Competition*, awarded to Negar Tavafzadeh Haghi, 2014
- *Second Place Poster at NASTT No-Dig*, awarded to Ashkan Faghih, 2014
- *NASTT No-Dig CCTV Competition*, awarded to Reza Navab, 2013
- *First Place CSCE Poster Competition*, awarded to Reza Navab, 2013
- *Elevate Postdoctoral Fellowship Award*, MITACS, awarded to Somayeh Nassiri, 2013
- *Michael E. Argent Memorial Scholarship Award* North American Society of Trenchless Technology, awarded to Reza Navab, 2013
- *First Place CSCE Poster Competition*, awarded to Naser Farkhideh, 2012
- *NASTT No-Dig CCTV Competition*, awarded to Soroush Khazraeializadeh, 2012
- *Michael E. Argent Memorial Scholarship Award*, North American Society of Trenchless Technology, awarded to Carrie Murray, 2012
- *Best Poster at NASTT No-Dig*, awarded to Carrie Murray, 2012
- *Accelerate Graduate Research Award*, MITACS, awarded to Ali Rostami, 2012
- *Accelerate Graduate Research Award*, MITACS, awarded to Reza Navab, 2012
- *Accelerate Graduate Research Award*, MITACS, awarded to Soroush Khazraeializadeh, 2011

### **3. Research**

My research interests have evolved over time, with an increasing emphasis on the trenchless construction of underground infrastructure. As Director of the Consortium for Engineered Trenchless Technologies (CETT) and NSERC Associate Industrial Research Chair in Underground Trenchless Construction, my research focuses the technical and operational challenges associated with underground trenchless construction, particularly in cold climatic conditions. The underground trenchless domain, while relatively new, addresses the limitations associated with more traditional open-cut construction methods, while the steadily increasing uptake of various trenchless techniques makes this an important and dynamic field of study. Maintaining close ties with multiple industry partners, particularly through the establishment of the NSERC IRC program, has enhanced my research initiatives, ensuring that they achieve a high standard, and are both impactful and relevant to everyday practitioners.

While predominantly focused on aspects of underground trenchless construction, I actively maintain a strong base of research in road infrastructure. I am the lead researcher at the Integrated Road Research Facility, which I helped form with provincial and municipal partners to investigate the impact of cold climates on pavement performance. The IRRF also investigates the feasibility of using waste materials in road construction.

The following sections highlight my research activities.

#### **Research Initiatives**

##### *NSERC Associate Industrial Research Chair (NSERC IRC)*

Since 2017, I have held the NSERC Associate Industrial Research Chair (IRC) in Underground Trenchless Construction and oversee an extensive research program in the area of underground trenchless construction. I have formed solid working relationships with various industry partners, including The Crossing Company, TELUS Communications, UniqEnergy (formerly Evolution Energy Services), INROCK, and BGC Engineering. These companies have all made significant contributions in support of the IRC program.

With the continued collaboration of the industry partners mentioned above, my research group is working to develop an extensive risk database and management strategy for trenchless techniques, innovative protocols and standards for specifying geotechnical investigation requirements, and feasible design methods and tools for trenchless projects. Just over two years into the NSERC IRC research program, collaboration with The Crossing Company is informing the development of a software tool that provides real-time feedback for HDD operations. This tool, which is based on analysis of data collected downhole, has the potential to revolutionize drilling practice in the field. Other initiatives are also ongoing.

Biweekly meetings are held with The Crossing Company to review ongoing research into specific energy in HDD. The Crossing Company collaborates closely with IRC researchers,



providing access to data collected during drilling operations, which is analyzed with the objective of developing specific indicators to assess drilling efficiency. During the biweekly meetings, which include both IRC researchers and representatives from The Crossing Company, the latest results are presented and discussed, and researchers have opportunities to ask for clarification on aspects of the data and drilling practice. The ongoing interaction has been productive, informing research direction and allowing the focus to be directed towards addressing critical aspects of drilling practice.

An NSERC IRC Research Update Session was held in September 2018 to showcase the results of research carried out under the program. This session had approximately 20 attendees, both researchers and industry partners. Research carried out under the IRC program was presented, including evaluation of microtrenching for fibre installation in the laboratory and the field, specific energy in HDD, the use of simple geotechnical parameters to determine acceptable annular pressure ranges for HDD, and optimization of drilling fluid for hole cleaning in HDD. Opportunities also were given for discussion and informal interaction between researchers and industry partners.

I collaborated with TELUS to plan the first FTTx Underground Construction Workshop at the UofA (May 2019). More than 100 participants attended, including 40 TELUS employees. This event provided a forum for presenting IRC research on technology assessment of microtrenching for underground fibre construction, and also gave researchers a sense of the overall state of the fibre construction industry, forming a basis to identify challenges and inform future research. Furthermore, the planning in advance of the workshop raised awareness of IRC research initiatives within TELUS as a whole and strengthened my relationship with key individuals within the organization, facilitating further research into underground fibre construction. This first workshop received positive feedback, and the plan is to hold this event again in 2020.

#### *Consortium for Engineered Trenchless Technologies (CETT)*

With support from the Department of Civil & Environmental Engineering, I established the Consortium for Engineered Trenchless Technologies (CETT) at the University of Alberta (UofA). This unique research initiative is the first of its kind in Western Canada and provides UofA students and faculty with resources to conduct cutting-edge research in trenchless technology. CETT's initial partners, including the City of Edmonton Drainage Services, The Crossing Company, and IVIS Inc., contributed nearly \$1.5 million over 5 years towards research to pioneer practical trenchless solutions for infrastructure.

The underground space is increasingly crowded, and, based on projections of population growth and increasing urbanization, this trend is set to continue, which results in crowding of above-ground spaces and fuels the demand for underground installations. Trenchless technologies fill a critical role by providing underground construction methods that are both safe and minimally disruptive.

My research under CETT covers all aspects of trenchless technologies, from installation of

new utilities using trenchless methods, to condition assessment and rehabilitation or replacement of existing utilities. For new installations, the focus is on reducing and/or managing the risk of trenchless techniques, most of which are relatively new, and also improving implementation and/or productivity associated with the techniques themselves. Robust research into these methods increases the confidence of regulatory authorities when it comes to their wider uptake. For existing infrastructure, the challenge is closely related, with a need for cost-effective ways to locate existing utilities, carry out accurate, non-disruptive condition assessment, and rehabilitate or replace existing underground infrastructure that has reached the end of its service life. Another overlapping issue relates to asset management: the effective prioritization of maintenance and/or rehabilitation or replacement of existing underground assets in a way that balances risk and cost is absolutely necessary, especially considering the age of existing infrastructure.

This area of research has proven to be both challenging and rewarding. My recent research has covered all aspects – new installation, rehabilitation, and condition assessment – of underground trenchless construction, particularly in terms of improved efficiency and/or risk reduction. More specifically, my recent research projects under CETT have involved (1) analysis of more than 100 HDD projects across western Canada to identify the most common risks encountered in HDD projects, (2) reduction of frac-out risk in HDD by development of accurate annular pressure models, (3) investigation and testing of the efficacy of drilling fluid additives in improving cutting transport for HDD, (4) assessment of clogging potential and how soil composition (i.e. presence of kaolin and/or bentonite) can impact tunneling performance in clayey soils, along with recommendations of types and concentrations of soil conditioners used to prevent clogging, (5) condition assessment of water transmission/distribution networks, (6) use of cast-in-place-pipe (CIPP) for rehabilitation of water transmission/distribution pipes, and (7) development of pipe bursting model for risk related to the potential impact of ground deformation on surrounding infrastructure.

In 2013, CETT welcomed TELUS to its Industry Advisory Committee to investigate and develop trenchless approaches for fibre-to-the-x (FTTx) installation. This has led to ongoing research into the assessment of various technologies for fibre construction in cold climates, including the pilot installation of a fibre network using microtrenching with a backfill technique refined through laboratory testing.

One of CETT's most successful initiatives has been the development of various courses with the objective of educating professionals regarding various trenchless methods. This started in 2013 with the development of a three-day workshop on Planning and Design of Horizontal Directional Drilling (HDD) Projects, in conjunction with The Crossing Company Inc. Over the years, CETT's course offerings have expanded considerably. As of May 2019, CETT offered eight different courses through the UofA Faculty of Extension, covering topics including Trenchless Technologies 101, Advanced HDD Design, Water and Wastewater Pipeline Condition Assessment and Rehabilitation, and Geotechnical Consideration for Underground Trenchless Construction, to name a few. In May 2019, CETT also offered the first workshop on Planning and Design of Direct Pipe Projects to be held in North America.

CETT continues to expand its reach and impact on the trenchless technology industry. Ongoing and new connections with industry allow CETT to continue to expand its research as well as develop an influential network for dissemination of research and education related to trenchless technologies.

### *Integrated Road Research Facility (IRRF)*

I was key in establishing the Integrated Road Research Facility (IRRF), a unique collaboration between the University of Alberta, Alberta Transportation, Alberta Recycling, and the City of Edmonton. The IRRF was formed with the goal of answering important questions about the impact of cold climates on pavement performance, as well as test the feasibility of use of waste and recycled materials in road construction. Through the application of innovative methods and advanced technologies, the IRRF venture continues to progress engineering construction and design practices by providing alternate, maintainable solutions for road construction.

The IRRF consists of a pavement materials characterization laboratory (PMCL), supported with funding from the Canadian Foundation for Innovation, and a multi-million dollar test road facility containing over 400 sensors at the Edmonton Waste Management Centre. Three sections of the road are instrumented to evaluate the application of Tire Derived Aggregate (TDA) from waste tires as lightweight embankment fill material for road construction, and three others are used to evaluate the effectiveness of three materials (TDA, bottom ash, and styrofoam) as pavement insulation materials. Two additional control sections are used to characterize the performance of two pavement structures made of different surface materials. The construction cost of this road was nearly \$3.5 million, which our partners (Alberta Transportation and Alberta Recycling) financed. More than 8,000 tonnes of shredded tires - approximately 20 percent of Alberta's annual discarded tires, with a market value of \$1.6 million - were used in the construction of this test road. The cost of the instrumentation and installation of eight test sections was approximately \$700,000, and this was supported by IRRF partners as well as the Canadian Foundation for Innovation and Alberta Innovation and Advanced Education.

The IRRF test road is also equipped with sensors to determine the load-bearing capacity of the different sections of pavement. By performing Falling Weight Deflectometer (FWD) tests, we are able to determine where the pavement is weakest. The information collected is combined with other test results, such as the temperature of the pavement, to better understand weak portions of pavement and determine how the road may be improved. These tests are integral to creating roads that can withstand both the extreme temperatures in Edmonton and the heavy loads the roads bear.

Over the past few years, IRRF researchers, in conjunction with industry partners, have been conducting a number of research projects on the test road and at the PMCL. In May 2014, the IRRF hosted its First Annual Research Symposium to showcase and share its ongoing research with others in the pavement engineering industry. The event included renowned industry expert Dr. Ralph Haas as its keynote speaker and drew in a large crowd from across

Canada to create a greater awareness of IRRF's innovative activities. Many attendees remarked on the ingenuity of the IRRF, and several expressed interest in working in partnership with the IRRF in the future.

The unique test road and lab facility provides a great training opportunity for graduate students and postdoctoral fellows in my research group. Dr. Somayeh Nassiri, who joined my team in 2011 as a postdoctoral fellow and was active in a number of IRRF research projects, moved on to become a faculty member at Washington State University. Dr. Leila Hashemian, another one of my postdoctoral fellows who has been involved in IRRF projects for three years, joined the UofA Faculty of Engineering as Assistant Professor.

### Current Research Support

Funding Organization & Program	Title	PI	Co-Investigators	Period Held	Level of Support	Average /year	Total In-Kind
AMTA; City of Calgary	Wide Base Single Tire Impact on Pavement and Environment	Co-PI	Dr. Hashemian	2019-2020	\$79,200		
AB Innovates	Design and Performance Evaluation of Road Base Courses Comprised of Asphaltenes Derived from Alberta Oil Sands	Co-PI	Dr. Hashemian	2019-2020	\$240,000	\$120K	\$100,000
NSERC CRD	Automated and Integrated Decision Support System for Tunnel Construction	Dr. Abou Rizk	Self	2019-2022	\$160,000	\$40K	\$80,000
Shanghai Construction Group (Canada) Corporation	Automated and Integrated Decision Support System for Tunnel Construction	Dr. Abou Rizk	Self	2019-2022	\$80,000	\$20K	\$40,000
NSERC CRD	Evaluation and Optimization of the Integrity of HDD Installed Pipelines	Self		2018-2020	\$40,000	\$20K	\$40,000
CCI	Evaluation and Optimization of the Integrity of HDD Installed Pipelines	Self		2018-2020	\$20,000	\$10K	
NSERC CRD	Advancing Water Main Renovation and Design	Co-PI	Dr. Knight	2017-2019	\$100,000	\$50K	
Insituform	Advancing Water Main Renovation and Design	Co-PI	Dr. Knight	2017-2019	\$50,000	\$25K	\$50,000
Alberta Innovates	Advancing Water Main Renovation and Design	Co-PI	Dr. Knight	2017-2019	\$100,000	\$50K	

NSERC IRC	Underground Trenchless Construction	Self		2017-2022	\$1,200,000	\$200K	
The Crossing Company	Underground Trenchless Construction	Self		2017-2022	\$300,000	\$50K	\$120,000
BGC Engineering	Underground Trenchless Construction	Self		2017-2022	\$60,000	\$10,000	\$108,000
INROCK	Underground Trenchless Construction	Self		2017-2022	\$120,000	\$20,000	\$60,000
Evolution Energy Services	Underground Trenchless Construction	Self		2017-2022	\$120,000	\$20,000	\$60,000
TELUS Communications	Underground Trenchless Construction	Self		2017-2022	\$600,000	\$100,000	
NSERC Discovery	Pavement Performance in Cold Regions and Application of Insulation Layers	Self		2016-2021	\$110,000	\$22,000	

### Submitted

Funding Organization & Program	Title	PI	Co-Investigators	Period Held	Level of Support	Total Cash	Total In-Kind
Alberta Transportation	Wide Spread Tandem Axles: Pavement Impact and Cost-Benefit Analysis	Co-PI	Dr. Hashemian				
NSERC Alliance	Use of TSRU Materials for Innovative Road Pavement Applications	Co-PI	Dr. Hashemian				

### Past Research Support

Funding Organization & Program	Title	PI	Co-Investigators	Period Held	Level of Support	Total Cash	Total In-Kind
NSERC CRD	Development of a Pilot Tube Microtunneling (PTMT) Guideline and Design Tool for the City of Edmonton	Self	D. Chan S. AbouRizk R. Cheng	2013-2019	\$624,000	\$104,000	
CFI-LOF Operating Grant	Integrated Field and Laboratory Infrastructure for the development and	Self		2014-2019	\$65,000	\$13,000	

	Characterization of Road Materials						
NSERC Engage	Application of Trenchless Technologies in Residential	Self	The Landmark Group	2017	\$24,000	\$24,000	
Saskatchewan Transportation	Road Salt Gradation	Co-PI	Dr. Mehran	2015-2016	\$39,600	\$39,600/yr	
City of Edmonton	Assessment of Tunnel Boring Machine Clogging Potential	Self		2014-2016	\$120,000	\$60,000/yr	
MITACS Cluster and TELUS	Development of a Decision Support System for FTTH Installations for TELUS	Self		2013-2016	\$356,328	\$118,776 /yr	
Alberta Transportation	Pavement Instrumentation at the Integrated Road Research Facility	Self		2012-2017	\$175,000	\$35,000	
NSERC CRD	Risk Assessment and Mitigation Development for HDD Construction	Self	D. Chan S. AbouRizk R. Cheng	2012-2016	\$472,000	\$118,200 /yr	
IVIS Inc.	Productivity for CIPP Projects	Self		2012-2016	\$320,000	\$80,000 /yr	
City of Edmonton	Development of a Pilot Tube Microtunneling (PTMT) Guideline and Design Tool for the City of Edmonton	Self		2012-2016	\$320,000	\$80,000 /yr	\$395,000
Crossing Company Inc.	Risk Assessment and Mitigation Development for HDD Construction	Self		2012-2016	\$272,000	\$68,000 /yr	\$204,800
NSERC Discovery	Investigation of the Effects of Environmental Factors on pavement Properties in Cold Regions	Self		2011-2016	\$90,000	\$18,000 /yr	
MITACS and City of Edmonton	Development of a carbon calculator for underground utility construction	Self		2014-2015	\$30,000	\$30,000/yr	
MITACS Elevate	Evaluation of application of shredded tires as insulation layers for highways in Alberta	Self		2013-2014	\$64,000	\$32,000/yr	
Alberta Recycling Management	Monitoring the Performance of Fill Embankment and	Self		2013-2015	\$110,000	\$55,000/yr	~ \$1.6 M worth of material

	Insulation Sections in EWMC Research Road						
City of Edmonton	RT3 Friction Test Program on Urban Roadways – Phase II	Self		2012-2013	\$50,400	\$50,400/yr	
MITACS and Crossing Company	Risk of Construction for HDD Projects	Self		2012-2013	\$45,000	\$45,000/yr	
City of Edmonton	Strength and Weaknesses of the City of Edmonton's Sewer Physical Condition Classification Manual (SPCCM)	Self		2012-2013	\$56,400	\$28,200/yr	
MITACS and IVIS Inc.	Productivity Analysis of CIPP Projects	Self		2012-2013	\$30,000	\$30,000/yr	
C-TEP	Evaluation of New Technologies for Quality Control/ Quality Assurance of Subgrade and Unbound Pavement Layers C-TEP	Self		2012-2013	\$24,600	\$24,600/yr	
MITACS and IVIS Inc.	A Comparative Analysis on Two Asset Condition Assessment Protocols used in Canada; PACP and City of Edmonton's SPCCM	Self		2011-2012	\$30,000	\$30,000/yr	
Alberta Transportation	Field Pavement Instrumentation and Monitoring for the IRRF Test Road	Self		2011-2014	\$184,200	\$61,400/yr	
Alberta Transportation	Evaluating the Application of Shredded Tires for Highway Projects in Alberta. Part I: Operations	Self		2010-2013	\$77,050	\$25,683/yr	
Alberta Transportation	Evaluating the Application of Shredded Tires for Highway Projects in Alberta. Part II: Preliminary Design and Instrumentation	Self		2010-2013	\$194,040	\$64,680/yr	~ \$3.5 M for road construction
NSERC RTI	Abrasion Testing Equipment for Aggregate Characterization on	Dr. Martin		2012-2013	\$14,997	\$14,997/yr	

	Railways and Pavements						
Alberta Advanced Education and Technology	Integrated Field and Laboratory Infrastructure for the Development and Characterization of Road Materials and Pavement Performance for Cold Regions	Self		2012-2013	\$254,752	\$254,752 /yr	
Canadian Foundation for Innovation	Integrated field and Laboratory Infrastructure for the Development and Characterization of Road Materials and Pavement Performance for Cold Regions	Self		2012-2013	\$254,752	\$254,752 /yr	
City of Edmonton	Identification, Evaluation and Implementation of Real Time Traction Tool (RT3) Technologies for Winter Road Management in the City of Edmonton	Self		2011-2012	\$25,800	\$25,800/yr	
University of Alberta	New Faculty Start-up Funds	Self		2010-2014	\$300,000	\$75,000/yr	
Alberta Transportation	Assessment of the Accuracy of Weight-In-Motion (WIM) Data for Pavement Design Applications in Alberta	Self		2010-2011	\$25,000	\$25,000/yr	

## Contributions

The following section highlights my most significant research contributions:

### (1) *Horizontal Directional Drilling (HDD) Construction Risks and their Impact on Project Schedule*

I am leading a five-year collaborative research program to evaluate HDD construction risks and their impact on project schedules. HDD is an effective means of constructing transmission infrastructure that minimizes the impact on the environment, surface and subsurface infrastructure, wildlife, and communities. However, the routine challenges and unknowns associated with construction in underground conditions have tied HDD projects



with numerous construction risks and unplanned events, resulting in significant schedule delays and cost overruns. One hundred medium-to-large-sized HDD projects constructed in Western Canada between 2005 and 2009 were analyzed in this study. Risk events that occurred in each project, the impact of each risk to the project schedule, and the frequency of occurrence of each risk type were identified. The preliminary findings showed 22 risk events, and the average impact of the aggregate risks comprised 46 percent of the overall construction schedule. Thus, the impact of risk on the project schedule, and, by extension, on the project cost, was found to be significant to Canada's HDD industry. The long-term objective of the study is to develop a risk assessment framework addressing the HDD risks identified in the preliminary study to provide guidelines for risk evaluation and mitigation for future HDD construction projects. New developments will be created to assess two significant HDD risk events (i.e., high annular pressure and pull-back forces) to better enable HDD planning, construction, and mitigation execution.

### *(2) Evaluation and Application of Waste and Recycled Materials for Road Construction*

I am leading a multi-year research at the Integrated Road Research Facility investigating the application of (1) Tire Derived Aggregate (TDA) and (2) bottom ash for road construction. A comprehensive field-monitoring system and laboratory program were designed to evaluate the short-term and long-term performance of TDA as lightweight embankment fill material. Three embankments (each 20 m long) were constructed and instrumented to monitor their compressibility, time-dependent deflection, and horizontal movement/deformation. Two embankments were constructed using two types of TDA materials, including Passenger and Light Truck Tires (PLTT) and Off-The-Road (OTR) tires. The last embankment was constructed using a mix of PLTT and soil (50 percent ratio). We also performed several one-dimensional large-scale compression tests in the laboratory to characterize the behaviour of TDA material under static and dynamic loading. In the second experiment, numerical models were developed to simulate and predict the behaviour of the TDA embankments for comparison with field and laboratory results. These models could be used as design tools for future TDA embankment projects. In the last experiment on the test road, a field monitoring system composed of three pavement sections (each 30 m long) was designed to evaluate the effectiveness of three insulation materials for pavement in cold regions. The sections include one section with a 100 mm thick Styrofoam layer, one section with a 500 mm thick TDA layer, and one section with a 1000 mm thick bottom ash layer. All layers were placed on top of the subgrade and paved over. Geotechnical and environmental sensors, such multi depth deflectometers, moisture probes and thermistors, were installed to monitor deformation (heave), moisture, and temperature changes and frost depths in the pavement layers. All sections will be monitored for at least five years, and climate factors such as air temperature and precipitation are being recorded. Pavement distresses, such as settlement, heave, roughness, and cracks, will also be monitored to quantify the effectiveness of the insulation layers in reducing the frost depth and improving pavement performance. Guidelines will be developed for the design of pavement with insulation layers to complement current Alberta Transportation good practices.

### *(3) Investigation of Impacts of Environmental and Traffic Loads on Flexible Pavement*

Pavement performance and longevity is influenced by three main design parameters, including materials, traffic loads, and the environment. Since completing my PhD, I have been working on pavement response under a variety of environmental and traffic loading conditions. As part of the IRRF test road, I developed a comprehensive field monitoring system to investigate the properties and performance of pavement materials in cold regions. In the first experiment of the test road, two pavement sections were instrumented with environmental and traffic load sensors, including thermistors, moisture probes, earth pressure cells, asphalt strain gauges, and multi-depth deflectometers. Using an automated pavement surface evaluation system from the City of Edmonton, pavement surface distresses such as rutting, roughness, and low-temperature cracking will be monitored over the long-term. Periodic Falling Weight Deflectometer (FWD) testing is being conducted on both sections on a bi-weekly basis, with higher frequency during thaw periods, to investigate the effects of changing temperature and moisture content on the stiffness and load bearing capacity of the pavement structures. Using the long-term field data (in-situ load and environmental pavement responses and traffic data from the WIM system, as well as pavement distresses from automated pavement surface evaluation) and laboratory material testing results, we have been able to conduct several studies on the effects of environmental and traffic load factors on pavement responses and performance. These include: a) investigating the seasonal variation of subgrade modulus and the effects of freeze-thaw cycles on pavement performance; b) validating and calibrating mechanistic pavement design and analysis for implementation in cold regions; c) investigating the impact of heavy loads and tire characteristics on pavement responses; and d) developing mechanistic guidelines and policies for the spring road-ban in cold climate conditions.

## 4. Publications

*Note:* Throughout this section, names in **bold** indicate students under my supervision.

### Refereed Journal Publications:

- J.1 **Monfared, Z.**, Nojumi, M., and Bayat, A. (2022) "A Review of Water Quality Factors in Water Main Failure Prediction Models," *Water Practice and Technology*, Vol. 17, No. 1, pp. 60-74. <https://doi.org/10.2166/wpt.2021.094>
- J.2 **Amaral, L.**, Roshan, A. and Bayat, A. (2021) "Review of Machine Learning Algorithms for Automatic Detection of Underground Objects in GPR Images," *Journal of Pipeline Systems Engineering and Practice*, Vol. 3, No. 2. [https://doi.org/10.1061/\(ASCE\)PS.1949-1204.0000632](https://doi.org/10.1061/(ASCE)PS.1949-1204.0000632)
- J.3 Huang, S., Kang, C., Bayat, A., Heath, K., Trovato, C., and Osbak, M. (2021) "Impact of mechanical tripping on cuttings transport in large-diameter horizontal directional drilling applications," *Tunneling and Underground Space Technology*, Vol. 117, 104159. <https://doi.org/10.1016/j.tust.2021.104159>.
- J.4 **Han, M.**, Xie, B., Barczyk, M. and Bayat, A. (2021) "Image-Based Joint State Estimation Pipeline for Sensorless Manipulators," *IEEE Robotics and Automation Letters*, pp. 2158-2165, doi: 10.1109/IROS51168.2021.9636439.
- J.5 Nojumi, M. M., **Basavarajappa, M.**, Hashemian, L., and Bayat, A. (2021) "Investigation of the Impact of Tire Configurations on Different Pavement Structures using Finite Element Analysis," *International Journal of Pavement Research and Technology*, <https://doi.org/10.1007/s42947-021-00057-7>.
- J.6 **Ghasemirad, A.**, Bala, N., Bayat, A., and Hashemian, L. (2021) "Application of Asphaltenes in High Modulus Asphalt," *Construction and Building Materials*, manuscript accepted.
- J.7 **Johnson, T.**, Bala, N., Bayat, A., and Hashemian, L. (2020) "Laboratory Evaluation of Cracking Resistance for Asphalt Mixtures Modified with Nanoclay and Nanocellulose," *Canadian Journal of Civil Engineering*, <https://doi.org/10.1139/cjce-2020-0644>.
- J.8 **Huang, Y.**, Nojumi, M. M., Hashemian, L., and Bayat, A. (2021) "Application of Machine Learning for Temperature Prediction in a Test Road in Alberta," *International Journal of Pavement Research and Technology*, <https://doi.org/10.1007/s42947-021-00023-3>.
- J.9 **Zhou, Y.**, Kang, C., and Bayat, A. (2021) "The Impact of Beater Shape in Mixing Test to Determine Clogging Potential," *Journal of Testing and Evaluation*, <https://doi.org/10.1520/JTE20200599>.
- J.10 Kang, C., Huang, S., and Bayat, A. (2021) "Compressibility Characteristics of TDA from OTR (Off-the-Road) Tires: A Numerical Approach," *Transportation Geotechnics*, manuscript accepted.
- J.11 **Wu, Y.**, Kang, C., Nojumi, M. M., Bayat, A. and Bontus, G. (2021) "Current Water Main Rehabilitation Practice using Trenchless Technology," *Water Practice and Technology*, <https://doi.org/10.2166/wpt.2021.026>.
- J.12 **Huang, Y.**, Nojumi, M. M., Hashemian, L., and Bayat, A. (2021) "Performance Evaluation of Different Insulating Material using Field Temperature and Moisture

- Data," *Transportation Research Record: Journal of the Transportation Research Board*, 2675(9), pp. 595-607. <https://doi.org/10.1177/03611981211003572>.
- J.13 Kang, C., Huang, S., Bayat, A., Heath, K., Trovato, C., and Osbak, M. (2020) "Assessing Friction Coefficient in HDD Using Analytical Models," *ASCE Journal of Pipeline Systems Engineering and Practice*, Volume 12, No. 6, 04021014. [https://doi.org/10.1061/\(ASCE\)PS.1949-1204.0000552](https://doi.org/10.1061/(ASCE)PS.1949-1204.0000552)
- J.14 **Newstead, B.**, Hashemian, L., Bayat, A. and Stuart, C. (2020) "Investigation of Ambient Noise, Surface Quality Improvements, and Friction Characteristics of Different Asphalt Surfaces in Alberta, Canada," *Canadian Journal of Civil Engineering*, <https://doi.org/10.1139/cjce-2019-0042>.
- J.15 **Vaseli, H.**, Hashemian, L., and Bayat, A. (2020) Productivity Analysis of Micro-Trenching Using Symphony Simulation Modeling, *Civil Engineering Journal*, Volume 6, No. 11. DOI: 10.28991/cej-2020-03091607
- J.16 Hashemian, L., Saroj, N., Mehran, B., and Bayat, A. (2020) "Salt Gradation Analysis for Winter Road Maintenance in Canada," *Civil Engineering Journal*, Volume 6, No. 9, pp. 1670-1683. <http://dx.doi.org/10.28991/cej-2020-03091573>
- J.17 **Rostami, A.**, Kang, C., Yi, Y., and Bayat, A. (2020) "Numerical Modeling of the Annular Failure Pressure during HDD in Noncohesive Soils," *Journal of Pipeline Systems Engineering and Practice*, Volume 11, Issue 2, 04020004. DOI: 10.1061/(ASCE)PS.1949-1204.0000445
- J.18 Kang, C., **Wu, Y.**, Yi, Y., and Bayat, A. (2019) "Assessment of the clogging potential of two clays," *Applied Clay Science*, Volume 178, 105134. <https://doi.org/10.1016/j.clay.2019.105134> (Technical Note)
- J.19 **Navab-Kashani, R.**, Gay, L., and Bayat, A. (2019) "Experimental and Numerical Study on Production Rate in Sewer Mainline Video Inspection," *Journal of Pipeline Systems Engineering and Practice*, Volume 10, Issue 2, 04019011. DOI: 10.1061/(ASCE)PS.1949-1204.0000373
- J.20 **Tavafzadeh, N.**, Hashemian, L. and Bayat, A. (2019) "Seasonal Response and Damage Evaluation of Pavements Comprised of Insulation Layers," *International Journal of Pavement Research and Technology*, Volume 12, pp. 170-177. <https://doi.org/10.1007/s42947-019-0022-3>
- J.21 Yi, Y., Kang, C., and Bayat, A. (2019) "Predicting One-Dimensional Compression of Tire Derived Aggregate Using a Simple Method," *Soils and Foundations*, Volume 59, Issue 5, pp. 1292-1301. <https://doi.org/10.1016/j.sandf.2019.05.010>.
- J.22 **Haghi, N., Monfared, M.**, Hashemian, L., and Bayat, A. (2019) "Capital Cost Comparison of Pavements Comprised of Insulation Layers: Case Study in Edmonton, Canada," *Journal of Construction Engineering and Management*, Volume 145, Issue 7, 04019038. [https://doi.org/10.1061/\(ASCE\)CO.1943-7862.0001660](https://doi.org/10.1061/(ASCE)CO.1943-7862.0001660).
- J.23 **Haghi, N.**, Hashemian, L. and Bayat, A. (2018) "The Effect of Insulation Layers on Pavement Strength during Non-Freeze-Thaw Season," *International Journal of Pavement Engineering*. Volume 19, Issue 6, pp. 543-552. DOI: 10.1080/10298436.2016.1178741

- J.24 **Deng, S.**, Kang, C., Bayat, A., Kuru, E., Osbak, M., Barr, K., and Trovato, C. (2020) "Rheological properties of clay based drilling fluids and evaluation of their hole cleaning performances in horizontal directional drilling," *Journal of Pipeline Systems Engineering and Practice*, Volume 11, Issue 3, 04020031. DOI: 10.1061/(ASCE)PS.1949-1204.0000475.
- J.25 **Asefzadeh, A.**, Hashemian, L., and Bayat, A. (2018) "Fatigue life evaluation of pavement embankments made with tire derived aggregates," *Canadian Journal of Civil Engineering*, Volume 45, pp. 795-802. dx.doi.org/10.1139/cjce-2017-0671.
- J.26 **Rabiei, M.**, Yi, Y., Bayat, A., and Cheng, R. (2018) "Simple methods for fluidic drag estimation during pipe installation via HDD," *Tunneling and Underground Space Technology*, Volume 76, pp. 172-176, <https://doi.org/10.1016/j.tust.2018.03.007>.
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### **Submitted Journal Publications**

- S.1 **Huang, Y.**, Nojumi, M., Hashemian, L., and Bayat, A. (2021) "Evaluation of Machine Learning Approach for Temperature Prediction in Pavement Base and Subgrade Layers in Alberta," *Journal of Transportation Engineering, Part B: Pavements*, manuscript submitted and under review.

- S.2 **Faghih, A.**, and Bayat, A. (2021) "Accuracy of Pull Force Estimation in Horizontal Directional Drilling Pipe Installations – A Review of Two Hundred Case Studies," *Journal of Pipeline Systems - Engineering and Practice*, manuscript submitted and under review.
- S.3 **Faghih, A.**, and Bayat, A. (2021) "Pull Force Estimation for Bundled Pipes Installation in Horizontal Directional Drilling," *Tunnelling and Underground Space Technology*, manuscript submitted and under review.
- S.4 **Zhou, Y.**, Kang, C., and Bayat, A. (2020) "A new index to quantitatively assess clogging potential based on mixing test results," *Journal of Testing and Evaluation*, manuscript submitted and under review.
- S.5 Huang, S. and Bayat, A. (2021) "Experimental Investigation and Application of Mechanical Specific Energy in Mechanical Drilling: A Review," *International Journal of Rock Mechanics and Mining Sciences*, manuscript submitted and under review.

## Refereed Conference Publications:

- C.1 **Faghih, A.**, Collins, R., and Bayat, A. (2021) "As-Built Modeling of Pipes Installed by Horizontal Directional Drilling," *North American Society of Trenchless Technology (NASTT) No-Dig North*, Calgary, Alberta. Paper accepted.
- C.2 **Han, M.**, Xie, B., Barczyk, M., and Bayat, A. (2021) "Image-Based Joint State Estimation Pipeline for Sensorless Manipulators," *2021 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*. doi: 10.1109/IROS51168.2021.9636439.
- C.3 **Ghasemirad, A.**, Bala, N., Hashemian, L., and Bayat, A. (2021) "Asphaltenes-Modified Binders for High Modulus Asphalt Concrete Applications," *Transportation Research Board 100<sup>th</sup> Annual Meeting – A Virtual Event*. (Poster Presentation)
- C.4 **Huang, Y.**, Nojumi, M., Hashemian, L., and Bayat, A. (2021) "Performance Evaluation of Different Insulating Material Using Field Temperature Data," *Transportation Research Board 100<sup>th</sup> Annual Meeting – A Virtual Event*. (Poster Presentation)
- C.5 **Huang, Y.**, Nojumi, M. M., Hashemian, L., and Bayat, A. (2021) "Performance Evaluation of Different Insulating Material using Field Temperature and Moisture Data," *Transportation Research Record: Journal of the Transportation Research Board*, 2675(9), pp. 595-607. <https://doi.org/10.1177/03611981211003572>.
- C.6 **Park, I.** and Bayat, A. (2020) "Simplified Application of the Delft Method to Estimate Maximum Allowable Annular Pressure in HDD," *Pipelines 2020*, San Antonio, Texas (Conference Held Virtually)
- C.7 Bayat, A., and Osbak, M. (2019) "Reducing Risk: Undervalued Information in Underground Construction," *North American Society of Trenchless Technology (NASTT) No-Dig North*, Calgary, Alberta.
- C.8 **Faghih, A.**, and Bayat, A. (2019) "Experimental Study on Pullback Loads for Steel Pipelines Installed by Horizontal Directional Drilling," *International No-Dig 2019 37<sup>th</sup> International Conference and Exhibition*, Florence, Italy.
- C.9 **Newstead B.**, Hashemian L., and Bayat A. (2019) "Investigation of Ambient Noise, Surface Quality Improvements, and Friction Characteristics of Different Asphalt Surfaces in Alberta, Canada," *Transportation Research Board (TRB) 98th Annual Meeting*, Washington DC, United States.
- C.10 Hashemian, L. and Bayat, A. (2018) "Evaluation of Tire Material as Pavement Embankment," *GeoEdmonton 2018*, Edmonton, Alberta.
- C.11 Kang, C., **Wu, Y.**, and Bayat, A. (2018) "Clogging Assessment of Edmonton Clay," *GeoEdmonton 2018*, Edmonton, Alberta.
- C.12 Kang, C., and Bayat, A. (2018) "Effect of kaolinite and bentonite on the clogging potential of Edmonton clay," *2018 TAC/NASTT-NW Tunnelling and Trenchless Conference*, Edmonton, Canada.
- C.13 **Newstead, B.**, Hashemian, L., and Bayat, A. (2018) "A Study on Pavement Network Condition and Reporting in the Province of Alberta Through a Questionnaire Survey," *SES – Innovations in Pavement Management, Engineering and Technologies, Transportation Association of Canada (TAC) Conference*, Saskatoon, Saskatchewan.
- C.14 **Asefzadeh, A.**, Hashemian, L., and Bayat, A. (2018) "The Effect of Bottom Ash on Soil Suction and Resilient Modulus of Medium Plasticity Clay," *Transportation Research*

- Board (TRB) 97th Annual Meeting, Washington, D.C.*
- C.15 Hashemian, L. and Bayat, A. (2017) "Evaluation of Pavement Load Bearing Capacity Comprised of Insulation Layers during Thaw Season," *Tenth International Conference on the Bearing Capacity of Roads, Railways, and Airfields*, Athens, Greece.
- C.16 **Asefzadeh, A.**, Hashemian, L., and Bayat, A. (2017) "Characterization of Permanent Deformation Behavior of Silty Sand Subgrade Soil under Repeated Load Triaxial Tests," *Transportation Research Board (TRB) 96th Annual Meeting*, Washington, D.C.
- C.17 **Rezaei, M.**, Hashemian, L., and Bayat, A. (2017) "Laboratory Evaluation of Moisture Susceptibility and Rutting Potential of Cold Mix Asphalt Materials," *Transportation Research Board (TRB) 96th Annual Meeting*, Washington, D.C.
- C.18 Hashemian, L., **Velasco, V.**, and Bayat, A. (2018) "Laboratory Investigation of Pavement Backfilling Materials for Micro-Trenching in Cold Regions," *Transportation Research Board (TRB) 97th Annual Meeting*, Washington, D.C.
- C.19 **Deng, S., Gao, N.**, Bayat, A., Osbak, M. and Barr, K. (2018) "Study of the cleaning capacity of drilling fluid in Horizontal Directional Drilling," *North American Society of Trenchless Technology (NASTT) No-Dig Show*, Palm Springs, California.
- C.20 Kang, C., **Wu, Y.**, and Bayat, A. (2018) "Clogging potential assessment of kaolinite and performance evaluation of an additive," *North American Society of Trenchless Technology (NASTT) No-Dig Show*, Palm Springs, California.
- C.21 **Rostami, A., Deng, S.**, Yi, Y., Kang, C. and Bayat, A. (2017) "Initial Experimental Study on Formation of Filter Cake in Sand During Horizontal Directional Drilling," *26th North American Society of Trenchless Technology (NASTT) No-Dig Show*, Washington, D.C.
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- C.23 **Asefzadeh, A.**, Hashemian, L., and Bayat, A. (2017) "Characterization of Permanent Deformation Behavior of Silty Sand Subgrade Soil under Repeated Load Triaxial Tests," *96th Transportation Research Board of National Academy of Science Conference*, Washington, D.C.
- C.24 **Rezaei, M.**, Hashemian, L., and Bayat, A. (2017) "Laboratory Evaluation of Moisture Susceptibility and Rutting Potential of Cold Mix Asphalt Materials," *96th Transportation Research Board of National Academy of Science Conference*, Washington, D.C.
- C.25 Kang, C., Yi, Y., Bayat, A., Fernando, S. and Hsung, Y. (2016) "Clogging Problem in Tunnel Boring Machine (TBM) Drilling Process," *Tunnelling Association of Canada 2016 Annual Conference*, Ottawa, Ontario.
- C.26 **Hasanuzzaman, M.**, Hashemian, L., Bayat, A. (2016) "Laboratory Evaluation of the Moisture Susceptibility of Different Cold Patching Materials," *Canadian Technical Asphalt Association (CTAA) Conference*, Banff, Alberta.
- C.27 **Rabiei, M.**, Yi, Y., Bayat, A., Cheng, R. and Osbak, M. (2016) "Fluidic Drag Evaluation of Pipes Installed via Horizontal Directional Drilling Using Slot Flow Approximation," *25th North American Society of Trenchless Technology (NASTT) No-Dig Show*, Dallas, Texas.

- C.28 **Rostami, A.**, Yi, Y., Osbak, M. and Bayat, A. (2016) "Investigating Filter Cake Formation on Borehole Stability during Horizontal Directional Drilling in Non-Cohesive Soil," *25th North American Society of Trenchless Technology (NASTT) No-Dig Show*, Dallas, Texas.
- C.29 **Hernandez, Y.A.** and Bayat, A. (2016) "Appraisal of Clogging and Adhesion of Conditioned Clay in the Laboratory," *25th North American Society of Trenchless Technology Conference*, Dallas, Texas.
- C.30 Hashemian, L. and Bayat, A. (2016) "Three Years' Monitoring of Instrumented Test Road," *International Conference on Accelerated Pavement Testing (APT)*, San Jose, Costa Rica.
- C.31 **Asefzadeh, A.**, Hashemian, L., **Tavafzadeh, N.**, and Bayat, A. (2016) "Comparison of Spring Load Restrictions and Winter Weight Premium Methods in Cold Regions- A Case Study," *Transportation Research Board of National Academy of Science Conference*, Washington, D.C.
- C.32 **Tavafzadeh, N.**, Hashemian, L. and Bayat, A. (2016) "The Effect of Seasonal Variation on Structural Capacity of Pavements Comprised of Insulation Layers," *Transportation Research Board of National Academy of Science Conference*, Washington, D.C.
- C.33 **Biswas, S.**, Hashemian, L., **Hassanuzzaman, M.**, and Bayat, A. (2016) "Investigation of Pothole Maintenance in Canada through Questionnaire Survey and Laboratory Testing," *Transportation Research Board of National Academy of Science Conference*, Washington, D.C.
- C.34 **Shafiee, M.**, Hashemian, L., **Asefzadeh, A.**, and Bayat, A. (2016) "Time-Frequency Domain Analysis of Asphalt Longitudinal Strain," *Transportation Research Board of National Academy of Science Conference*, Washington, D.C.
- C.35 **Tavafzadeh, N.**, Hashemian, L. and Bayat, A. (2015) "The Effect of Insulation Layers on Subgrade Strength during Thaw Season," *Transportation Association of Canada (TAC) Conference*, Charlottetown, Prince Edward Island.
- C.36 **Shafiee, M.**, **Biswas, S.**, **Tavafzadeh, N.**, Hashemian, L., and Bayat, A. (2015) "Investigation of Thermal Induced Strains in Flexible Pavements," *Transportation Association of Canada (TAC) Conference*, Charlottetown, Prince Edward Island.
- C.37 **Asefzadeh, A.**, **Tavafzadeh, N.**, Hashemian, L., and Bayat, A. (2015) "Evaluation of Existing Spring Load Restriction Models Based on Experimental Field Data," *Transportation Association of Canada (TAC) Conference*, Charlottetown, Prince Edward Island.
- C.38 **Das, S.**, **Navab, R.**, Gay, L. and Bayat, A. (2015) "Productivity and Cost Analysis of CIPP Sewer Main Rehabilitation Projects," *24th North American Society of Trenchless Technology (NASTT) No-Dig Show*, Denver, Colorado.
- C.39 **Rabiei, M.**, Yi, Y., Bayat, A., Cheng, R. and Osbak, M. (2015) "New Method for Predicting Pullback Force for Pipes Installed via Horizontal Directional Drilling (HDD)," *24th North American Society of Trenchless Technology (NASTT) No-Dig Show*, Denver, Colorado.
- C.40 **Rostami, A.**, Yi, Y., Bayat, A. and Osbak, M. (2015) "Parametric Study on the Maximum Allowable Pressure of Drilling Fluid During HDD Based on the Cavity Expansion Theory," *24th North American Society of Trenchless Technology (NASTT) No-Dig Show*, Denver, Colorado.

- C.41 **Tavafzadeh, N.**, Hashemian, L. and Bayat, A. (2015) "Structural Capacity of Roads with Insulation Layers during Non-Freeze-Thaw Season," *Transportation Research Board of National Academy of Science Conference*, Washington, D.C.
- C.42 **Shafiee, M.**, Nassiri, S. and Bayat, A. (2014) "Field Investigation of the Effect of Operational Speed and Lateral Wheel Wander on Flexible Pavement Mechanistic Responses," *Transportation Association of Canada (TAC) Conference*, Montreal, Quebec.
- C.43 **Tavafzadeh, N.**, Nassiri, S. and Bayat, A. (2014) "Investigation of Thermal Behaviour and Structural Capacity of Bottom Ash as an Insulation Layer," *Transportation Association of Canada (TAC) Conference*, Montreal, Quebec. (poster presentation)
- C.44 **Salimi, S.**, Nassiri, S. and Bayat, A. (2014) "Effect of Plowing and Sanding on Friction and Stopping Distance During Breaking," *Transportation Association of Canada (TAC) Conference*, Montreal, Quebec. (poster presentation)
- C.45 **Murray, C., Rostami, A., Osbak, M., Yi, Y. and Bayat, A.** (2014) "Comparison of Bingham Plastic Model with the Power Law Model in Annular Pressure Prediction during Horizontal Directional Drilling," *23<sup>rd</sup> North American Society of Trenchless Technology (NASTT) No-Dig Show*, Orlando, Florida.
- C.46 **Murray, C., Bayat, A. and Osbak, M.** (2014) "Elevated Annular Pressure Risk in Horizontal Directional Drilling," *23<sup>rd</sup> North American Society of Trenchless Technology (NASTT) No-Dig Show*, Orlando, Florida.
- C.47 **Rostami, A., Murray, C., Osbak, M. and Bayat, A.** (2014) "Horizontal Directional Drilling – A Parametric Study of the Rheological Parameters of the Power Law Model," *23<sup>rd</sup> North American Society of Trenchless Technology (NASTT) No-Dig Show*, Orlando, Florida.
- C.48 **Navab, R.** and Bayat, A. (2014) "Productivity Improvement of Sewer Mains Televising," *23<sup>rd</sup> North American Society of Trenchless Technology (NASTT) No-Dig Show*, Orlando, Florida.
- C.49 **Ranjbar, M., Bayat, A., Nassiri, S., Fernando, S., Davies, R. and Lueke, J.** (2014) "Eliminator" Experience for Pipeline Installation in the City of Edmonton," *23<sup>rd</sup> North American Society of Trenchless Technology (NASTT) No-Dig Show*, Orlando, Florida.
- C.50 **Nassiri, S., Bayat, A., and Salimi, S.** (2014) "Literature Review of Municipal Road Winter Maintenance Practices and Policies in Canada," *Transportation Research Board of National Academy of Science Conference*, Washington, D.C.
- C.51 **Salimi, S., Nassiri, S. and Bayat, A.** (2014) "Evaluation of Halliday's Real-Time Traction Tool for Winter Road Friction Measurements," *Transportation Research Board of National Academy of Science Conference*, Washington, D.C.
- C.52 **Tavafzadeh, N., Nassiri, S., Shafiee, M.H. and Bayat, A.** (2014) "Using Field Data to Evaluate Bottom Ash as Pavement Insulation Layer," *Transportation Research Board of National Academy of Science Conference*, Washington, D.C.
- C.53 **Meles, D., Bayat, A., Shafiee, M.H., Nassiri, S., and Gul, M.** (2013) "Field Study on Construction of Highway Embankment Made from Two Tire-Derived Aggregate Types and Tire-Derived Aggregate Mixed as Fill Materials," *Transportation Research Board 92<sup>nd</sup> Annual Meeting*, Washington, D.C.
- C.54 **Meles, D., Bayat, A. and Chan, D.** (2013) "Compression Behaviour of Compacted Tire Derived Aggregate Using a Static Compaction Method," *Transportation Research*



- Board 92nd Annual Meeting, Washington, D.C.*
- C.55 **Norouzi, M.**, Nassiri, S., and Bayat, A. (2013) "Evaluation of Seasonal Variation in Pavement Mechanistic Responses Using Falling Weight Deflectometer Data," *Transportation Research Board 92nd Annual Meeting, Washington, D.C.*
- C.56 Nassiri, S., **Farkhideh, N.** and Bayat, A. (2013) "Comparison of MEPDG Nationally Calibrated Traffic Inputs with the WIM Measurements in Alberta," *Transportation Research Board 92nd Annual Meeting, Washington, D.C.*
- C.57 Nassiri, S., **Shafiee, M.H.**, and Bayat, A. (2013) "Development of Roughness Models Using Alberta Transportation's Pavement Management System," *Transportation Research Board 92nd Annual Meeting, Washington, D.C.*
- C.58 **Ngan, K.**, and Bayat, A. (2013) "Evaluation of Pull Force Field Data for a Deep Pipe Bursting Project in Edmonton, Alberta," *22<sup>nd</sup> North American Society of Trenchless Technology (NASTT) No-Dig Show, Sacramento, California.*
- C.59 **Khazraeializadeh, S.**, Bayat, A. (2013) "A Comparative Analysis on Structural Condition Rating Systems Using Four Asset Condition Assessment Protocols," *22<sup>nd</sup> North American Society of Trenchless Technology (NASTT) No-Dig Show, Sacramento, California.*
- C.60 Osbak, M., **Murray, C.** and Bayat, A. (2013) "The Economics of Risk Absorption and Risk Transfer Strategies in Horizontal Directional Drilling," *22<sup>nd</sup> North American Society of Trenchless Technology (NASTT) No-Dig Show, Sacramento, California.*
- C.61 Nassiri, S., Bayat, A. and Skirrow, R. (2013) "Integrated Road Research Facility (IRRF): An Albertan Research Initiative," *Transportation Association of Canada (TAC) Conference, Winnipeg, Manitoba.*
- C.62 **Meles, D.**, Bayat, A. and Skirrow, R. (2013) "Field and Laboratory Characterization of Tire Derived Aggregate in Alberta," *Transportation Association of Canada (TAC) Conference, Winnipeg, Manitoba.*
- C.63 **Shafiee, M.H.**, Nassiri, S. and Bayat, A. (2013) "Light-Weight Deflectometer for Unbound Material Characterization," *Transportation Association of Canada (TAC) Conference, Winnipeg, Manitoba.*
- C.64 **Meles, D.**, Skirrow, R. and Bayat, A. (2013) "Performance and Time-Dependent Compression Behavior of Highway Fill Material Constructed Using Tire-Derived Aggregate," *Canadian Geotechnical Society Conference, Montreal, Quebec.*
- C.65 Osbak, M., Bayat, A. and **Murray, C.** (2012) "The Impact of Risk in Horizontal Directional Drilling," *International Pipeline Conference, Calgary, Alberta. [IPC 2012 Best Paper Candidate]*
- C.66 **Akbarzadeh, H.** and Bayat, A. (2012) "Impact of Earth Loads on Polyethylene Pipes Installed by Horizontal Directional Drilling," *21<sup>st</sup> Annual NASTT No-Dig Show, Nashville, TN.*
- C.67 Osbak, M., **Akbarzadeh, H.**, Bayat, A. and **Murray, C.** (2012) "Investigation of Horizontal Directional Drilling Construction Risks," *21<sup>st</sup> Annual NASTT No-Dig Show, Nashville, TN.*
- C.68 **Farkhideh, N.**, Soleymani, H., Bayat, A. and Simchi, A. (2012) "Evaluation of the Accuracy of Weigh-In-Motion Systems in Alberta and its Effects on Pavement Design," *Transportation Research Board 91st Annual Meeting, Washington, D.C.*
- C.69 **Akbarzadeh, H.** and Bayat, A. (2012) "Investigating Soil Arching Over Polyethylene

- Pipes Installed by Horizontal Directional Drilling,” *Underground Infrastructure Research (UIR) International Conference and Road Show*, Niagara, ON.
- C.70 **Murray, C.**, Osbak, M. and Bayat, A. (2012) “Horizontal Directional Drilling - Construction Risk Management Strategies,” *ASCE 2013 Pipeline Conference*, Fort Worth, Texas.
- C.71 **Saha, J.**, and Bayat, A. (2011) “Evaluation of the Canadian Climate Information and its Effect on Pavement Performance through MEPDG Prediction,” *Transportation Research Board 90th Annual Meeting*, Washington, D.C.
- C.72 Bayat, A., **Akbarzadeh, H.**, and Soleymani, H. (2011) “Investigation of Temperature Dependency of Asphalt Concrete using a Laboratory Dynamic Modulus and Field Deflection Testing,” *Transportation Research Board 90th Annual Meeting*, Washington, D.C.
- C.73 Bayat, A., Lawrence, K., Knight, M., Rubeiz, K., and Petroff, L. (2011) “BoreAid and PPI-BoreAid: New Horizontal Directional Drilling Design and QA/QC Tools,” *ASCE International Conference on Pipelines and Trenchless Technology*, Beijing, China.
- C.74 Lawrence, K., Bayat, A., Knight, M., Rubeiz, K., and Petroff, L. (2011) “PPI-BoreAid: A Preliminary Design Tool for Horizontal Directional Drilling using Polyethylene Pipeline,” *ASCE Pipeline Conference*, San Diego, California.
- C.75 Bayat, A., Knight, M., and Adedapo, A. (2010) “Flexible Pavement Response under Dynamic Wheel Loads- A CPATT Full-Scale Instrumented Test Road Study,” *Canadian Society for Civil Engineering Conference Annual Conference*, Winnipeg, Manitoba. [Selected as CSCE Conference Best Paper]
- C.76 Soleymani, H., and Bayat, A. (2010) “Characterization of Subgrade and Unbound Granular Materials for Flexible Pavement: Evolutions and Future Challenges,” *The 8th International Conference on Geotechnical and Transportation Engineering: Geotropika*, Malaysia.
- C.77 Bayat, A., Lawrence, K., Knight, M., and Rubeiz, C. (2010) “PI-BoreAid: A New Polyethylene Pipeline Horizontal Directional Drilling (HDD) Design and QA/QC Application,” *20th Annual NASTT No-Dig Conference*, Washington, D.C.
- C.78 Bayat, A., and Knight, M. (2010) “Investigation of Flexible Pavement Structural Response for the Centre for Pavement and Transportation Technology (CPATT) Test Road,” *Transportation Research Board of National Research Council Conference*, Washington, D.C.
- C.79 Bayat, A., and Knight, M. (2010) “Measurement and Analysis of Flexible Pavement Thermal-Induced Strains,” *Transportation Research Board 89th Annual Meeting*, Washington, D.C.
- C.80 Bayat, A., Lawrence, K., and Knight, M. (2009) “Horizontal Directional Drilling Pipeline Design and QA/QC using the BoreAid Software Program,” *ASCE Pipeline Conference*, San Diego, California. [https://doi.org/10.1061/41069\(360\)71](https://doi.org/10.1061/41069(360)71).
- C.81 Bayat, A., Lawrence, K., and Knight, M. (2008) “Addressing Geotechnical Considerations of Horizontal Directional Drilling Using the New Design Tool BoreAid,” *61st Canadian Geotechnical Society Conference*, Edmonton, Alberta.
- C.82 Bayat, A., Lawrence, K., and Knight, M. (2008) “BoreAid: Implementation of Structured Framework for HDD Design,” *Canadian Society for Civil Engineering Annual Conference*, Quebec City, Quebec. [Won Best Student Paper Award]

- C.83 Bayat, A., Lawrence, K. and Knight, M. (2008) "BoreAid: A New HDD Design Tool," *Underground Construction Technology (UCT) Conference*, Atlanta, Georgia.
- C.84 Knight, M., Bayat, A., and Adedapo, A. (2006) "Flexible Pavement and Soil Behavior in a Restored Pavement Cut," *10th International Conference on Asphalt Pavements (ICAP)*, Quebec City, Quebec.
- C.85 Bayat, A., and Sadaghiani, M. H. (2005) "Numerical Investigation and Field Monitoring of Karun Bridge Abutment," *33rd Annual Conference of the Canadian Society for Civil Engineering (CSCE)*, Toronto, Ontario.
- C.86 Vacin, O., Knight, M., Adedapo, A., Bayat, A. and Tighe, S. (2005) "Field Strain Criteria for Asphalt Mixes at the CPATT Test Road," *Transportation Association of Canada Conference*, Prince Edward Island.

## Books

- B.1 Al-Qadi, I., Ozer, H., Loizos, A. and Murrell, S. *Airfield and Highway Pavements 2019: Innovation and Sustainability in Highway and Airfield Pavement Technology*. ASCE (Contributed chapter: Newstead, B., Hashemian, L. and Bayat, A. (2019) A Cost-Performance Comparison of Different Paving Materials on a Pavement Test Section in Alberta, Canada, pp. 163-173.).
- B.2 Moya, J., Nordbeck, A., Villacorta, F., and Salazar, L. (2017). *The Roles of Accelerated Pavement Testing in Pavement Sustainability: Engineering, Environment, and Economics: 829-843*. Published, Springer (Contributed chapter: Hashemian L., and Bayat A. (2017). Three years' monitoring of IRRF instrumented test road.).
- B.3 Najafi, M. (2012) "Trenchless Technology: Planning, Equipment, and Methods," McGraw Hill. (Contributor and Editor for Chapter 6).

## Other

### *Technical Reports*

- TR.1 Hashemian, L., Nojumi, M., Basavarajappa, M. and Bayat, A. (2020) "Impact of Wide Base Single Tires on Pavement and Environment," Research Report. Prepared for: Alberta Motor Transport Association, Alberta; City of Calgary, Alberta.
- TR.2 Hashemian, L. and Bayat, A. (2020) "Third Progress Report: Impact of Wide Base Single Tires on Pavement and Environment," Research Report. Prepared for: Alberta Motor Transport Association, Alberta; City of Calgary, Alberta.
- TR.3 Hashemian, L. and Bayat, A. (2020) "Second Progress Report: Impact of Wide Base Single Tires on Pavement and Environment," Research Report. Prepared for: Alberta Motor Transport Association, Alberta; City of Calgary, Alberta.
- TR.4 Bayat, A. and Kang, C. (2020) "Second (36 month) Progress Report: Industrial Research Chairs - Regular - Research (IRCPJ) entitled 'NSERC Associate Industrial Research Chair in Underground Trenchless Construction' (Associate Chairholder: Dr. A. Bayat), with TELUS Communications Inc., BGC Engineering Inc., The Crossing Company Incorporated, Evolution Energy Services, INROCK Ltd.," Research Report. Prepared for NSERC.

- TR.5 Bayat, A. and Kang, C. (2019) "Investigation of Pilot Tube Micro-Tunneling (PTMT) and Pipe Bursting Construction Risks: FINAL REPORT," Research Report. Prepared for NSERC CRD and City of Edmonton.
- TR.6 Hashemian, L. and Bayat, A. (2019) "Milestone 1 Progress Report: Impact of Wide Base Single Tires on Pavement and Environment," Research Report. Prepared for: Alberta Motor Transport Association, Alberta; City of Calgary, Alberta.
- TR.7 Bayat, A. and Nojumi, M. (2019) "Advancing Water Main Renovation and Design: CRD Grant Progress Report," Prepared for Alberta Innovates, Alberta.
- TR.8 Bayat, A. (2019) "Milestone #4 and Final Report: Advancing Water Main Renovation and Design: CRD Grant Progress Report," Prepared for Alberta Innovates, Alberta.
- TR.9 Rezaei, M., Hashemian, L., and Bayat, A. (2018) "Blackfalds/Wetaskiwin Microtrenching Pilot Projects: Summary Report on Site Observations," Research Report Prepared for: TELUS Communications.
- TR.10 Rezaei, M., Hashemian, L., and Bayat, A. (2017) "Blackfalds/Wetaskiwin Project Report," Research Report. Prepared for: TELUS Communications.
- TR.11 Meles, D., Yi, Y., Nassiri, S., and Bayat, A. (2015) "Evaluation of application of tire derived aggregate for highway embankment," Research Report. Alberta Recycling, Edmonton, Canada.
- TR.12 Navab, R., Gay, L., and Bayat, A. (2014) "Review of the City of Edmonton's Sewer Physical Condition Classification Manual (SPCCM)," Prepared for: City of Edmonton, Edmonton, Alberta.
- TR.13 Vaseli, H., Gay, L., and Bayat, A. (2013) "A Literature Review for Alternative Fiber Optic Installation Methods," Prepared for: TELUS, Edmonton, Alberta.
- TR.14 Vaseli, H., Gay, L., and Bayat, A. (2013) "Micro-Trenching Field Installation Report," Prepared for: TELUS, Edmonton, Alberta.
- TR.15 Shafiee, M.H., Nassiri, S., Khan, R.H. and Bayat, A. (2013) "Evaluation of New Technologies for Quality Control/Quality Assurance (QC/QA) of Subgrade and Unbound Pavement Layer Moduli," Prepared for: Centre of Transportation Engineering & Planning (C-TEP), Edmonton, Alberta.
- TR.16 Nassiri, S., Salimi, S. and Bayat, A. (2013) "Identifying, Evaluating and Implementing Road Friction Measurement for Winter Road Maintenance. Phase II Report: Evaluation of the Halliday's RT3-Curve for Winter Road Friction Measurements," Prepared for City of Edmonton, Edmonton, Alberta.
- TR.17 Meles, D., Nassiri, S., Yi, Y. and Bayat, A. (2013) "Material Characterization and Field Evaluation of Tire-Derived Aggregate as Highway Embankment Fill Material," Prepared for Alberta Recycling, Edmonton, Alberta.
- TR.18 Bayat, A. and Nassiri, S. (2012) "Identifying, Evaluating and Implementing Tire-Road Friction Measurement for Winter Road Maintenance. Phase I Report: Technology Scan," Prepared for: City of Edmonton's Operation and Maintenance group, Edmonton, Alberta.

### *Non-Refereed Contributions*

- NR.1 Newstead, B.\*, Hashemian, L., and Bayat, A. Detailed review and study on the cost, constructability and benefits of Microsurfacing, Stone Mastic Asphalt and High Traffic Asphalts in Alberta, Canada. Presented at the Canadian Technical Asphalt Association Conference, Regina, Saskatchewan. November 2018.
- NR.2 Hashemian, L.\*, Bayat, A. Research Areas in Pavement Engineering at the University of Alberta. Presented at the committee meeting of GRINCH Seminar and Poster Symposium, University of Waterloo, Waterloo, ON. April 25, 2019.
- NR.3 Bayat, A. (2017) "Introduction to Trenchless Technologies," Presentation at the Sharif University of Technology, Tehran, Iran.
- NR.4 Bayat, A. (2016) "Seasonal Variation of Pavement Responses: Three Years of Monitoring IRRF Instrumented Test Road," *Presentation at the Transportation Research Board of National Academy of Science Conference*, Washington, D.C.
- NR.5 Ranjbar, M., Yi, Y., Bayat, A. (2015) "Pipeline Installation Using the Eliminator in Edmonton, Alberta," 2015 NASTT NW Chapter Magazine.
- NR.6 Tavafzadeh, N., Hashemian, L., and Bayat, A. (2015) "Investigation of Thermal Behavior and Structural Capacity of Bottom Ash as an Insulation Layer," *Poster Presentation at Edmonton Section of the Canadian Society for Civil Engineering (CSCE)*, Edmonton, Alberta. [Won Poster Award]
- NR.7 Vaseli, H. and Bayat, A. (2015) "Application of Microtrenching for Fiber to the Home," *Poster Presentation at Edmonton Section of the Canadian Society for Civil Engineering (CSCE)*, Edmonton, Alberta. [Won Poster Award]
- NR.8 Rabiei, M. and Bayat, A. (2015) "Mudflow Pattern during Pullback of Horizontal Directional Drilling Pipe Installation," NASTT NW Chapter Conference, Edmonton, Alberta.
- NR.9 Rostami, A. and Bayat, A. (2015) "Parametric study on the maximum allowable pressure of drilling fluid during HDD based on the cavity expansion theory," *Poster Presented at 2015 NASTT No-Dig Show*, Denver, Colorado.
- NR.10 Rabiei, M., Yi, Y., Bayat, A., Cheng, R. and Osbak, M. (2015) "New method for predicting pullback force for pipes installed via HDD," *Poster Presented at 2015 NASTT No-Dig Show*, Denver, Colorado.
- NR.11 Tavafzadeh, N., Nassiri, S., Shafiee, M.H. and Bayat, A. (2014) "Evaluation of Bottom Ash as Pavement Insulation Layer," *Poster Presentation at Edmonton Section of the Canadian Society for Civil Engineering (CSCE)*, Edmonton, Alberta. [Won Best Poster Award]
- NR.12 Faghih, A. and Bayat, A. (2014) "Consideration of Fluidic Drag in HDD," *Poster Presented at 2014 NASTT No-Dig Show*, Orlando, Florida. [Won Poster Award]
- NR.13 Shafiee, M.H., Nassiri, S. and Bayat, A. (2014) "Using In-situ Pavement Response Measurements to Evaluate Linear-Elastic Backcalculation Procedure for Flexible Pavements," *Poster Presentation at Edmonton Section of the Canadian Society for Civil Engineering (CSCE)*, Edmonton, Alberta.
- NR.14 Shafiee, M.H., Nassiri, S. and Bayat, A. (2014) "Pavement Structural Response Measurements to Evaluate Linear-Elastic Backcalculation Procedures," *Aurora-*

- Edmonton Section of the Association for the Advancement of Cost Engineering (AACE), Edmonton, Alberta.*
- NR.15 Salimi, S., Nassiri, S. and Bayat, A. (2014) "A Literature Review on Municipal Road Winter Maintenance Practices and Policies in Canada," *Poster Presentation at Edmonton Section of the Canadian Society for Civil Engineering (CSCE), Edmonton, Alberta.* [People's Choice Award Winner]
- NR.16 Faghih, A. and Bayat, A. (2014) "Fluidic Drag Estimation in HDD based on Annular Flow Equations," *Aurora-Edmonton Section of the Association for the Advancement of Cost Engineering (AACE), Edmonton, Alberta.*
- NR.17 Rostami, A., Bayat, A. and Osbak, M. (2013) "Sensitivity Analysis on the Constitutive Parameters of the Power Law Model," *2013 NASTT- Northwest Chapter Conference, Calgary, Alberta.*
- NR.18 Shafiee, M.H., Nassiri, S. and Bayat, A. (2013) "Evaluation of Using Light Weight Deflectometer (LWD) for Characterization of Pavement Unbound Layers' Moduli," *Poster Presentation at Edmonton Section of the Canadian Society for Civil Engineering (CSCE), Edmonton, Alberta.*
- NR.19 Osbak, M., Murray, C. and Bayat, A. (2012) "Investigation of HDD Construction Risks," *2012 NASTT- Northwest Chapter Conference, Edmonton, Alberta.*
- NR.20 Bayat, A. (2011) "Design Tools for HDD Construction," *2010 NASTT- Northwest Chapter Conference, Edmonton, Alberta.*
- NR.21 Farkhideh, N., Nassiri, S. and Bayat, A. (2012) "Accuracy of Weigh-In-Motion Systems in Alberta," *Poster Presentation at Edmonton Section of the Canadian Society for Civil Engineering (CSCE), Edmonton, Alberta.* [Won Poster Award]
- NR.22 Lawrence, K., Bayat, A. (2011) "A Helping Hand for HDD," *Geodrilling International, Issue 172, pp 26-28.*

#### *Magazine Articles*

- MA.1 Bayat, A. (2021) "Using Data to Reduce Risk in Trenchless Construction," *Trenchless Technologies, February 2021, pp. 24-26.* (Feature Story)
- MA.2 Bayat, A. (2020) "Results of Winter Road Maintenance Operations Research," *Alberta Heavy, Q1 pp. 25-30.*
- MA.3 Ranjbar, M., Yi, Y., Bayat, A. (2015) "Pipeline Installation Using the Eliminator in Edmonton, Alberta," *2015 NASTT NW Chapter Magazine.*
- MA.4 Rostami, A., Yi, Yaolin., Bayat, A. and Osbak, M. (2014) "Drilling Fluid Management During Horizontal Directional Drilling," *2014 Horizontal Directional Drilling Guide*
- MA.5 Osbak, M., Murray, C. and Bayat, A. (2012) "Investigation of HDD Construction Risks," *NASTT's Trenchless Today* (selected as Outstanding Technical Paper)

## Completed Theses

### PhD Theses

Year	Name	Title
2018	Negar Tavafzadeh Haghi	Use of Waste/Recycled Material as Insulation in Road Construction
2017	Ali Rostami	Estimation of Plan Pressure and Maximum Allowable Pressure of Drilling Fluid during Pilot Bore in Horizontal Directional Drilling
2016	Montazar Rabiei (Co-supervised with Dr. Cheng)	Pullback Force Evaluation of Pipes Installed via Horizontal Directional Drilling
2016	Mohammad Shafiee	Flexible Pavement Response Monitoring and Evaluation under Dynamic Loading and Environmental Effects
2014	Daniel Meles (Co-supervised with Dr. Chan)	Application of Tire Derived Aggregate for Highway Embankment Fill
2012	Tezera Firew Azmatch (Co-supervised with Dr. Sego from 2011)	Frost Heave: New Ice Lens Initiation Condition and Hydraulic Conductivity Prediction

### MSc Theses

Year	Name	Title
2021	Leila Carolina Martoni Amaral	Automatic Detection of Underground Objects in Ground Penetrating Radar Images using Machine Learning
2020	Andy Su	Impact of Cuttings on Fluid Rheology and Hole Cleaning Capacity in Horizontal Directional Drilling
2020	Roshan Rijal	Comparative Study between Hydro and Air Excavation Technologies
2020	Justin (In Shik) Park	Framework for Field-Based Annular Pressure Prediction in Horizontal Directional Drilling
2020	Yang Zhou	An Innovative Index to Assess Clogging Potential
2019	Yichen Wu	Canadian Municipality Water Main Condition Assessment and Pipe Renewal Methods
2018	Brett Newstead	Investigation of Pavement Management Practices and Pavement Material Performance in Alberta, Canada
2018	Vinicius Afonso Velasco Rios	Evaluation of Backfill Solutions for Micro-Trenching in Cold Regions
2018	Nero Gao	Pressure Management of Drilling Fluid and Role of Overcut Ratio in Horizontal Directional Drilling
2018	Mahsa Ahmadian Nezhad Monfared	Comparison of Trenchless Technologies and Open Cut Methods in New Residential Land Development
2016	Md. Hasanuzzaman	Investigation on Micro-Trenching Technology for FTTH Deployment
2016	Simita Biswas	Pothole Condition in Canada and Evaluation of Maintenance Material
2016	Susen Das	Evaluation of Cured-in-Place Pipe Lining Installations
2016	Tareq Khondoker	Subsurface Profiling Using Indices in Guided Boring Method and Comparison of Normal Stress Calculation Methods for Pipe Jacking/Microtunnelling: Approaches for Facilitating New Pipe Installations by Jacking

2015	Hediyeh Vaseli	Application of Microtrenching for Fibre to the Home in Cold Region
2014	Kahou Ngan	Predicting Soil Expansion Force in Static Pipe Bursting Using Cavity Expansion Solutions and Numerical Modeling
2014	Mahmood Ranjbar	Assessment of Pipeline Installations Using the Eliminator: A New Guided Boring Machine
2014	Ashkan Faghieh	Fluidic Drag in Horizontal Directional Drilling and its Application in Specific Energy
2014	Sahar Salimi	Evaluation of Different Winter Road Conditions and Effectiveness of Winter Road Maintenance Operations
2013	Reza Navab	Productivity Analysis of Closed Circuit Television (CCTV) Sewer Mainline Inspection
2013	Naser Farkhideh	Evaluation of Weigh-In-Motion Systems in Alberta
2012	Meisam Norouzi	Performance Evaluation of Flexible Pavements in Alberta Using Falling Weight Deflectometer Data
2012	Soroush Khazraeializadeh	A Comparative Analysis on Sewer Structural Condition Grading Systems Using Four Sewer Condition Assessment Protocols
2011	Jhuma Saha	Evaluation of Climatic Effects on Pavement Performance Using MEPDG

### Master of Engineering Reports

2021	Siddha Shome	Geological Perspective of Underground Trenchless Installations—A Review Study
2020	Syed Muhammad Shumail Ali	Overview and Assessment of Various Pipe Renewal-Rehabilitation Method in Underground Trenchless Technologies
2017	Arash Ghahremani	Comparison of Trenchless and Open Cut in New Development
	Mohammad Aaqib Hadayat	Assessment of Underground Trenchless Rehabilitation Methods
	Kamal Jamaluddin	Subsurface Utility Engineering and the Effect of Trenchless Technologies
2017	Ahmed Ali Sial	Underground Pipeline Integrity Assessment Methods
2017	Wael El Halabi	Subsurface Utility Engineering
2013	Kwesi Wells	Pullback Load for HDD Bundle
2013	Ahsan Afzal	Installation of Fiber Optic Network by Trenchless Techniques: Opportunities and Challenges
2013	Ahsan Zia	Applications of Horizontal Directional Drilling in Permafrost and Cold Regions
2013	Javed Alamgir	Identification and Management of Risks in Horizontal Directional Drilling Construction
2012	John Kerolus	Comparison Between Open Cut and Trenchless Methods and Impacts of User Cost
2011	Pradip Das	Accuracy of Weigh-In-Motion (WIM) in Alberta
2011	Renny Gheroo	A Literature Review on the Relationship Between Wet and Dry Pavement Condition on Traffic Accidents
2011	Mohammad Kaleem	Comparison of Asphalt Concrete Resilient and Dynamic Moduli
2011	Ahmad Anabtawi	Comparison of Current Methods for Estimating Pullback Load for PE Pipe Installed by Directional Drilling
2011	Hicham Elkhailil	Analysis of Maximum Allowable Mud Pressure during Directional Drilling
2010	Sandeep Mangat	Comparison of Trenchless Technologies with Open Cut Methods
2010	Ehsan Khan	Analytical and Field Evaluation of Asphalt Pavement Temperature Prediction Models



## 5. Service

### Key Research/ Consulting Experience

#### *BoreAid and Terein Inc.*

In 2007, I designed BoreAid, the first comprehensive HDD design tool of its kind, with the help of a colleague during my studies at the University of Waterloo. BoreAid is a software tool that streamlines the planning and design of HDD projects by considering all aspects of a project to align drilling activities with industry best practices and enhance performance of boring operations. The software takes into account such things as bore path planning, load calculation, product pipe selection, drilling fluid management and pressure estimation to guide users through safer and more effective HDD activities. Due to its user-friendly platform and effectiveness, BoreAid was well-received within the trenchless industry and is currently being used internationally by consultants and contractors. A large number of HDD pipeline installations have been planned using BoreAid software, attesting to its efficiency for HDD design. Following the creation of BoreAid, my colleague and I co-founded Terein Inc., a global provider of trenchless design tools and consultation in the design and planning of HDD projects. As the Co-Director of Terein Inc., I provide HDD training and consulting for large-sized HDD projects worldwide.

#### *PPI-BoreAid/ PPI PACE*

In 2011, my partner and I collaborated with the Plastic Pipe Institute to create PPI-BoreAid: a free online version of BoreAid that utilizes the calculation methodology and framework from the original BoreAid software to assist in the installation of polyethylene pipe for HDD projects. This partnership with PPI also created PPI-PACE (Pipeline Analysis and Calculation Environment) in 2013. PPI-PACE, another free web-based program distributed by PPI, assists trenchless industry professionals in the design of pressure pipes.

#### *Vermeer BoreAid*

Due to BoreAid's widespread success, all product assets for the software were acquired by Vermeer Corporation in 2013 and a long-term partnership was developed. The partnership between Terein Inc. and Vermeer Corporation aligns the goals of both parties to further develop innovative technology in the trenchless sector. As Terein Inc.'s Co-Director, I will be working alongside Vermeer Corporation for further software enhancements and development opportunities in other trenchless areas. This long-term partnership provides me with a vital industry connection and platform to continually enhance trenchless technology on a global level and provide innovative developments to strengthen the trenchless industry's future operations.

## Professional Activities outside the University

Member – ASCE Committee on Design and Construction Guidelines for Installation of Underground Pipeline using Horizontal Directional Drilling (HDD)	2021, 2020
Committee Member – New Frontiers in Research Fund (NFRF) Multidisciplinary Review Panel, Exploration Competition (Social Sciences and Humanities Research Council of Canada)	2021, 2020, 2019
Member – Editorial Advisory Board <i>Trenchless Technology Canada</i>	2021, 2020, 2019, 2018, 2017
Associate Editor – <i>ASCE Journal of Pipeline Systems Engineering and Practice</i>	2021, 2020, 2019, 2018, 2017, 2016
Main Member – Standing Committee on Season Climatic Effects on Transportation Infrastructure – AFP50	2021, 2020, 2019, 2018, 2017, 2016
Board Member – North American Society of Trenchless Technology (NASTT) – NW Chapter	2021, 2020, 2019, 2018, 2017, 2016, 2015, 2014
Member – MITACS College of Grant reviewers	2021, 2020, 2019, 2018, 2017, 2016, 2015, 2014, 2013
Member – NASTT Conference Planning Committee	2021, 2020, 2019, 2018, 2017, 2016, 2015, 2014, 2013
University of Alberta NASTT Student Chapter Faculty Advisor	2021, 2020, 2019, 2018, 2017, 2016, 2015, 2014, 2013, 2012, 2011
Board Member, Secretary, and University of Alberta Representative – Centre for Pavement and Transportation Engineering Planning	2021, 2020, 2019, 2018, 2017, 2016, 2015, 2014, 2013, 2012, 2011, 2010
Committee Member – TRB Full-Scale Accelerated Pavement Testing Committee (AFD40)	2021, 2020, 2019, 2018, 2017, 2016, 2015, 2014, 2013
University of Alberta Representative – Transportation Research Board of the National Academy of Sciences (TRB)	2021, 2020, 2019, 2018, 2017, 2016, 2015, 2014, 2013, 2012, 2011, 2010
Member – NASTT NW Chapter Conference Planning Committee	2021, 2020, 2019, 2018, 2016, 2014
Member – ASCE Pilot Tube MOP Task Force	2017, 2016, 2015, 2014, 2013
Technical Reviewer – NSERC Discovery Grant	2017, 2012
Member – Scientific Committee at International Congress on Underground Infrastructure, Water Management and Trenchless Technology	2017
University Representative and Board Member – Geotechnical Society of Edmonton (GSE)	2013, 2012, 2011, 2010, 2009
Member of Student Presentation Award Selection Committee – Canadian Geotechnical Society	2012
Session Chair, 8th International Transportation Speciality Conference, Winnipeg, Canada	2010

### *Journal /Conference Reviews:*

- ASCE Journal of Construction Engineering Management
- International Journal of Geomechanics

- Canadian Geotechnical Journal
- Transportation Research Board Conference
- International Journal of Pavement Engineering
- International Journal of Pavement Research and Technology
- ASCE Journal of Materials in Civil Engineering
- Arabian Journal of Science and Engineering
- Canadian Journal of Civil Engineering
- Urban Water Journal
- CSCE Conference
- NASTT No-Dig Conference
- Soils and Foundations

*Editorships:*

- Editorial Advisory Board *Trenchless Technology Canada*
- Associate Editor - *ASCE Journal of Pipeline Systems Engineering and Practice*
- Contributor and Editor - Chapter 6 of *Trenchless Technology: Planning, Equipment, and Methods* by M. Najafi

**Participation in Service Work within the University**

Member – Faculty Evaluation Committee	2021, 2020, 2019
Director – Consortium for Engineered Trenchless Technology (CETT)	2021, 2020, 2019, 2018, 2017, 2016, 2015, 2014, 2013, 2012, 2011
Lead Researcher and University Representative – Integrated Road Research Facility (IRRF)	2021, 2020, 2019, 2018, 2017, 2016, 2015, 2014, 2013, 2012
Member – Academy of NSERC Reviewers – University of Alberta	2021, 2020, 2019, 2018, 2017, 2016, 2015, 2014
Selection Committee for Appointing Assistant Professor (Dr. Leila Hashemian)	2017
Geotechnical Group Representative for Faculty of Engineering Open House	2013
Organizer of Retaining Wall Student Competition in Geotechnical Group – In charge of finding judges and sponsors from both the University of Alberta and the industry	2013, 2012, 2011, 2010
Judge – Faculty of Engineering Graduate Research Symposium	2012

## Defense Committees

- PhD Examination, Shenglin Wang (UWaterloo), 2019 (External Examiner)
- PhD Examination, Transportation Engineering for Negar Tavafzadeh Haghi, 2019 (Chair and Examiner)
- PhD Examination, Geotechnical Engineering for Kirk Scanlan, 2018 (Chair and Examiner)
- PhD Examination, Construction Engineering and Management for Amin Amini Khafri, 2018
- PhD Examination, Construction Engineering for Estacio Pereira, 2017
- PhD Examination, Geotechnical Engineering for Chao Kang, 2016 (Chair and Examiner)
- PhD Examination, Transportation Engineering for Mohammad Shafiee, 2016
- PhD Examination, Environmental Engineering for Marclus Mwai, 2016
- PhD Examination, Construction Engineering and Management for Meiminat Soleimanifar, 2016
- PhD Examination, Construction Engineering and Management for Sheng Mao, 2016 (Examiner)
- PhD Examination, Geotechnical Engineering for David Elwood, 2015 (Chair and Examiner)
- PhD Examination, Construction Engineering for Mansooreh Moghadam, 2014
- PhD Examination, Geotechnical Engineering for Daniel Meles (Supervisor and Examiner)
- PhD Examination, Structural Engineering for Adamsu Shimeles (Chair and Examiner)
- PhD Examination, Construction Engineering for Shafiul Hassan
- PhD Examination, Geotechnical Engineering for Ali Azad (Chair and Examiner)
- PhD Examination, Construction Engineering for Elmira Moghani
- PhD Examination, Geotechnical Engineering for Gonzalo Zambrano
- PhD Examination, Geotechnical Engineering for Silawat Jeeravipoolvarn (Chair and Examiner)
  
- PhD Candidacy Examination, Construction Engineering for Eduardo Sosa Silverio
- PhD Candidacy Examination, Cross-Disciplinary for Ashkan Faghieh
- PhD Candidacy Examination, Mining Engineering for Firuz Khodayari
- PhD Candidacy Examination, Construction Engineering for Estacio Pereira
- PhD Candidacy Examination, Construction Engineering for Ali Rostami
- PhD Candidacy Examination, Structural Engineering for Montazar Rabiei
- PhD Candidacy Examination, Construction Engineering for Mustafa Ali

- PhD Candidacy Examination, Geotechnical Engineering for Yuan Li  
(Chair and Examiner)
- PhD Candidacy Examination, Environmental Engineering for Mohamad Meshref
- PhD Candidacy Examination, Environmental Engineering for Marclus Mwai
- PhD Candidacy Examination, Construction Engineering for Sheng Mao  
(Chair and Examiner)
- PhD Candidacy Examination, Construction Engineering for Hamid Zaman
- PhD Candidacy Examination, Geotechnical Engineering for Mohan Acharya
- PhD Candidacy Examination, Mining Engineering for Chris Pichurski  
(Chair and Examiner)
- PhD Candidacy Examination, Construction Engineering for Meimanat Soleimanifar
- PhD Candidacy Examination, Construction Engineering for Farhad Shams
- PhD Candidacy Examination, Geotechnical Engineering for Chao Kang
- PhD Candidacy Examination, Construction Engineering for Roland Ekyalimpa  
(Chair and Examiner)
- PhD Candidacy Examination, Construction Engineering for Shafiul Hasan
- PhD Candidacy Examination, Geotechnical Engineering for David Elwood
- PhD Candidacy Examination, Structural Engineering for Rupak Mutsuddy
- PhD Candidacy Examination, Geotechnical Engineering for Ali Azad
- PhD Candidacy Examination, Geotechnical Engineering for Gonzalo Zambrano
- PhD Candidacy Examination, Geotechnical Engineering for Ahmad Alsayed
- PhD Candidacy Examination, Geotechnical Engineering for Kirk Scanlan  
(Chair and Examiner)
- PhD Candidacy Examination, Petroleum Engineering for Ehsan Rahmati  
(Chair and Examiner)
  
- MSc Examination, Water Resources Engineering for Hanyu Liu, 2020
- MSc Examination, Cross-Disciplinary for Yi Chen Wu, 2020  
(Supervisor and Examiner)
- MSc Examination, Structural Engineering for Daniel Unsworth, 2019  
(Chair and Examiner)
- MSc Examination, Cross-Disciplinary for Vinicius Afonso Velasco Rios, 2019  
(Supervisor and Examiner)
- MSc Examination, Geotechnical Engineering for Stefan Goerz, 2019  
(Supervisor and Examiner)
- MSc Examination, Cross-Disciplinary for Bo Gao, 2018  
(Supervisor and Examiner)
- MSc Examination, Cross-Disciplinary for Sai Deng, 2018  
(Supervisor and Examiner)

- MSc Examination, Cross-Disciplinary for Brett Newstead, 2018 (Supervisor and Examiner)
- MSc Examination, Construction Engineering and Management for Mahsa Ahmadian, 2018 (Supervisor and Examiner)
- MSc Examination, Transportation Engineering for Simita Biswas, 2016 (Supervisor and Examiner)
- MSc Examination, Construction Engineering and Management for Susen Das, 2016 (Supervisor and Examiner)
- MSc Examination, Geotechnical Engineering for Weidong Li, 2016
- MSc Examination, Construction Engineering and Management for Md. Tareq Khondoker, 2016 (Supervisor and Examiner)
- MSc Examination, Construction Engineering and Management for Md. Hasanuzzaman, 2016 (Supervisor and Examiner)
- MSc Examination, Geotechnical Engineering for Hediye Vaseli, 2015 (Supervisor and Examiner)
- MSc Examination, Construction Engineering and Management for Ka Hou Ngan, 2015 (Supervisor and Examiner)
- MSc Examination, Construction Engineering and Management for Mahmood Ranjbar, 2015 (Supervisor and Examiner)
- MSc Examination, Construction Engineering for Reza Navab, 2014 (Supervisor and Examiner)
- MSc Examination, Transportation Engineering for Sahar Salimi, 2014 (Supervisor and Examiner)
- MSc Examination, Construction Engineering and Management for Ashkan Faghieh, 2014 (Supervisor and Examiner)
- MSc Examination, Petroleum Engineering for Qing Lan, 2014 (Chair and Examiner)
- MSc Examination, Mining Engineering for Sujith Sundararajan, 2014 (Chair and Examiner)
- MSc Examination, Petroleum Engineering for Jaskaran Parmar, 2013 (Chair and Examiner)
- MSc Examination, Geotechnical Engineering for Dong Ming Zheng, 2013 (Chair and Examiner)
- MSc Examination, Transportation Engineering for Meisam Norouzi, 2013 (Supervisor and Examiner)
- MSc Examination, Transportation Engineering for Naser Farkhideh, 2102 (Supervisor and Examiner)
- MSc Examination, Construction Engineering and Management for Soroush Khazraeializadeh, 2012 (Supervisor and Examiner)

- MSc Examination, Geotechnical Engineering for Ceren Saygilar
- MSc Examination, Transportation Engineering for Jhuma Saha, 2011 (Supervisor and Examiner)
- MSc Examination, Construction Engineering for Aladdin Alwisy, 2010

## Media Coverage

- MC.1 “Question and Answer,” Quarter 3, 2020, Alberta Heavy. A Q&A article regarding my research initiatives with the IRRF and how these overlap with ARHCA interests.
- MC.2 Ongoing CETT Association Updates in Trenchless Technology Canada (2016-2020)
- MC.3 “Take Initiative,” (2018) Tunnels and Tunneling. Overview of current CETT research activities underway at the University of Alberta.
- MC.4 “Why Canadians Don’t Use Winter Tires,” 2016, Interview on 630 CHED.
- MC.5 “City supervisor, U of A prof talk about battle between Edmonton city streets and the elements,” August 10, 2016, *Edmonton Examiner*.
- MC.6 “Recycled Tires Used on Stretch of Anthony Henday,” May 6, 2014. A Salz. *The Edmonton Sun Online*. Regarding my research at the IRRF.
- MC.7 “Winter Research at the U of A” January 21, 2014. T Aschenbrenner. *The Gateway*. Brief feature on my research at the IRRF.
- MC.8 “Education Key to Market’s Growth: Trenchless Technologies can Thrive in Canada as Infrastructure Ages, Energy Sector Booms,” 2014 Special Edition. *Trenchless Technology Canada*. Interview with myself, and a brief feature on CETT.
- MC.9 “New Award Recognizes Achievements of Young Professors,” November 15, 2012. R. Cairney. Department of Civil & Environmental Engineering at the University of Alberta website. Regarding the award of my Ralph Haas/ Stantec Fellow in Civil Engineering.
- MC.10 “Software Boost for Horizontal Directional Drilling,” 2011. *Trenchless World Magazine*, regarding BoreAid.

**Appendix B – Canadian Underground Infrastructure Innovation Centre (CUIIC) 5-Year Budget**



**CUIIC Budget – Summary**

<b>Revenue</b>	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>	<b>Year 4</b>	<b>Year 5</b>
<b>Industry Seed Funding</b>	\$ 100,000	-	-	-	-
<b>Annual Membership Fees</b>	\$ 100,000	\$155,500	\$231,000	\$ 346,500	\$ 429,500
<b>Matching Funding - Research</b>	\$-	\$311,000	\$462,000	\$ 693,000	\$ 859,000
<b>Courses and Education</b>	\$ 30,000	\$40,000	\$50,000	\$ 60,000	\$ 80,000
<b>Faculty of Engineering Support</b>	\$ 75,000	\$75,000	\$75,000	-	-
<b>Total</b>	<b>\$ 305,000</b>	<b>\$581,500</b>	<b>\$818,000</b>	<b>\$ 1,099,500</b>	<b>\$ 1,368,500</b>

<b>Expenses</b>	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>	<b>Year 4</b>	<b>Year 5</b>
<b>Staff and Personnel</b>	\$ 170,000	\$ 170,000	\$ 205,000	\$ 240,000	\$ 275,000
<b>Research Expenditures</b>	\$ 46,000	\$ 326,550	\$ 485,100	\$ 731,808	\$ 930,297
<b>Courses</b>	\$ 9,000	\$ 12,000	\$ 15,000	\$ 18,000	\$ 24,000
<b>Operational Expenses</b>	\$ 30,000	\$ 72,950	\$ 77,900	\$ 109,692	\$ 139,203
<b>Start-Up Expenses</b>	\$ 50,000	-	-	-	-
<b>Total</b>	<b>\$ 305,000</b>	<b>\$ 581,500</b>	<b>\$ 783,000</b>	<b>\$ 1,099,500</b>	<b>\$ 1,368,500</b>

**CUIC Revenues – Membership Fee Structure**

**Manufacturers, Suppliers, Contractors, Consultants**

	Annual Fee (\$)	Year 1		Year 2		Year 3		Year 4		Year 5	
		Number	Total (\$)	Number	Total (\$)	Number	Total (\$)	Number	Total (\$)	Number	Total (\$)
<b>Large</b>	3,000	10	30,000	15	45,000	22	66,000	33	99,000	41	12,3000
<b>Medium</b>	2,000	15	30,000	24	48,000	36	72,000	54	108,000	67	13,4000
<b>Small</b>	1,000	15	15,000	24	24,000	36	36,000	54	54,000	67	6,7000

**Utilities, Municipalities, Public Agencies**

	Annual Fee (\$)	Year 1		Year 2		Year 3		Year 4		Year 5	
		Number	Total (\$)	Number	Total (\$)	Number	Number	Total (\$)	Number	Total (\$)	Number
<b>Large</b>	2,000	5	10,000	8	16,000	12	24,000	18	36,000	22	4,4000
<b>Medium</b>	1,000	10	10,000	15	15,000	22	22,000	33	33,000	41	4,1000
<b>Small</b>	5,00	10	5,000	15	7,500	22	11,000	33	16,500	41	20,500
<b>Total</b>		<b>65</b>	<b>100,000</b>	<b>101</b>	<b>155,500</b>	<b>150</b>	<b>231,000</b>	<b>225</b>	<b>346,500</b>	<b>279</b>	<b>429,500</b>

**CUIIC Revenues – Courses**

	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>	<b>Year 4</b>	<b>Year 5</b>
<b>Courses (/year)</b>	3	4	5	6	8
<b>Course Fees</b>	\$30,000	\$40,000	\$50,000	\$60,000	\$80,000

**NOTE:** Assumption of 25 attendees per course at \$400 each

**CUIIC Expenses – Salary**

	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>	<b>Year 4</b>	<b>Year 5</b>
<b>Manager</b>	\$100,000	\$102,000	\$104,040	\$106,121	\$108,243
<b>Support Staff</b>	\$70,000	\$71,400	\$72,828	\$74,285	\$75,770
<b>Support Staff (half time in Year 3)</b>	-	-	\$35,000	\$70,700	\$72,114
<b>Support Staff (half time in Year 5)</b>	-	-	-	-	\$37,000
<b>Total</b>	\$170,000	\$173,400	\$211,868	\$251,105	\$293,127

**Appendix C – Canadian Underground Infrastructure Innovation Centre (CUIIC)  
Budget Justification**

## **Budget Justification - Canadian Underground Infrastructure Innovation Centre (CUIIC)**

An initial budget for the Canadian Underground Infrastructure Innovation Centre (CUIIC) has been developed for a five-year period.

Initial support from the Faculty of Engineering at the University of Alberta (CAD 75K per year for three years), along with industry seed funding (as detailed below) will be directed to initial start-up and salary costs. There is the possibility of creating a junior faculty position in underground construction (with in-kind salary support from the Faculty of Engineering).

To ensure the long-term sustainability of CUIIC, an endowment fund will be established based on (1) any surplus annual revenue, and (2) industry contributions. The creation of the endowment is underway in consultation with the Faculty of Engineering and will follow all applicable University policies, in particular the Endowment Management Policy/Procedure. For the initial five years of operation of CUIIC, the endowment fund is not expected to be a significant source of revenue; however, as funds in the endowment accrue, interest from the endowment will be used to fund additional research projects.

### **Revenue**

Revenue will come from the following: industry seed funding, annual membership fees, courses and education, matching funds for research, and faculty support.

**Industry seed funding** will be from donors within the underground infrastructure sector. The minimum contribution will be a one-time payment of \$10K, although donors can contribute a higher amount. The expected support is ten organizations for a total of \$100K towards the initial start-up costs of CUIIC (e.g., salaries for administrative support, advertising, website development, etc.). Organizations that provide seed funding will be recognized as founding members and be featured as such on the website and other communication.

**Annual membership fees** will be paid by member organizations and will be used to support the research activities of CUIIC, with an initial target of funding three or four research projects per year (Year 1) and increasing from there. The research dollars will be used to generate matching funding from funding agencies such as NSERC and Alberta Innovates, etc. More than 85% of research dollars generated will be expended on HQP, which will include numerous PhD and MSc students.

An exemption from the overhead fee charged by the University of Alberta (30%) has been proposed for member contributions. The rationale behind this is to maximize the amount available to generate matching funding from agencies such as NSERC. It should be noted that much of the research funds generated will mainly stay within the Department of Civil and Environmental Engineering and Faculty of Engineering, contributing to the research funding and opportunities available to other (particularly junior) faculty members.

**Matching research funding** will be generated from funding agencies (NSERC, Mitacs, Alberta Innovates, etc.) for research projects funded under the CUIIC under various principal investigators, primarily within the Department of Civil and Environmental Engineering and the Faculty of Engineering. The assumption is that beginning in Year 2, every dollar contribution allocated to research under CUIIC will be leveraged to generate two dollars in matching contributions.

**Courses** and educational initiatives will be offered to memberships and generate approximately \$10K per course (assuming 25 attendees at a cost of \$400 each), starting with three courses per year in Year 1 and increasing to 8 courses per year by Year 5.

## **Expenses**

Expenditures during the first five years of operation of the CUIIC will go towards staff and personnel, research, courses, operational expenses, and start-up expenses.

**Staff and personnel expenses** include the cost of salary (and 23% benefits) for one manager and one support staff in Year 1 and 2, with the addition of another support staff in Year 3 (assuming 0.5 FTE in Year 3 and 1.0 FTE in Year 4) and Year 5 (0.5 FTE). The salary costs account for increases of 2% per year in agreement with the University of Alberta collective agreement for support staff (NASA), as well as including benefits (23%).

**Research expenditures** will be in alignment with the requirements of funding agencies (NSERC and other), with a minimum of 85% of funds going towards stipends for trainees (PDFs, MSc and PhD students). While research expenditures would be centered around the needs of each project as determined by the Principal Investigator, all expenditures will satisfy the requirements for matching funds through NSERC (or other applicable funding agency).

**Course expenses** are assumed to be 30% of the total revenues of the course, and cover the costs of advertising, logistics, catering, venues, etc. (or, alternately, the cost associated with the online course delivery platform).

**Operational expenses** include the costs of advertising and communication, computer services and support, office supplies, etc.

**Start-up expenses** include the initial costs associated with establishment of the centre, including establishing branding/visual identity, website development, communications, etc.

**Appendix D – Canadian Underground Infrastructure Innovation Centre (CUIIC)  
Letters of Support**





9-201 Donadeo Innovation Centre for Engineering • 9211 116 Street NW, Edmonton, Alberta, Canada T6G 1H9  
Tel: 780-492-0503 • Fax: 780-492-3973 • [uab.ca/engineering](http://uab.ca/engineering)

February 7, 2022

Centres and Institutes Committee  
Office of the Provost and Vice-President (Academic)  
2-40 South Academic Building  
University of Alberta  
Edmonton, Alberta T6G 2G7

**Re: Establishment of the Canadian Underground Infrastructure Innovation Centre (CUIIC)**

Dear Committee Members,

Please find our attached proposal outlining the creation of the Canadian Underground Infrastructure Innovation Centre (CUIIC) in the Department of Civil and Environmental Engineering.

Many basic services for communities—including water, sewer, and stormwater systems, and telecommunications, among others—are delivered using underground systems. However, the construction, maintenance, and rehabilitation of underground infrastructure across Canada is increasingly challenging, especially given the combined pressures of population growth, rural and remote communities, aging infrastructure, and climate change. CUIIC is envisioned as a world-class hub for research, education, and innovation in underground infrastructure at the University of Alberta and will focus on addressing these challenges.

CUIIC will build on over 40 combined years of experience in research and education at the Consortium of Engineered Trenchless Technologies (CETT) in the Department of Civil and Environmental Engineering and the Centre for Advancement of Trenchless Technologies (CATT) at the University of Waterloo, as well as the activities of the NSERC Associate Underground Research Chair in Underground Trenchless Construction at the University of Alberta. CUIIC is being formed with the input and support of major stakeholders in the underground infrastructure sector across Canada. Leveraging the combined experience and extensive networks of both CETT and CATT will enable CUIIC to bring in additional stakeholders and resources.

CUIIC will be administered within the Department of Civil and Environmental Engineering, where CETT has brought together a core group of productive researchers with expertise in underground infrastructure, particularly trenchless technologies. However, research in underground construction is highly interdisciplinary, and thus CUIIC plans to involve faculty members from across the Faculty of Engineering (including Mechanical Engineering, Chemical and Materials Engineering, and Electrical Engineering) as well as from the Faculty of Science (e.g., Computer Science). To support the start-up activities of CUIIC, funding will be provided by the Faculty of Engineering, and the overhead on CUIIC activities will be waived.

CUIIC will include partners from organizations involved in the underground sector across Canada, with a target of 250 member organizations. CUIIC will offer high-quality educational opportunities for students and young professionals. It will also foster the development of a network of well-funded, interdisciplinary research teams equipped to address the challenges related to underground infrastructure today and in the future. The establishment



of CUIIC will create new opportunities for the University of Alberta and its partners, as well as our city, province, and beyond.

We are pleased to support the establishment of CUIIC and look forward to discussing the strategic value of this important initiative in more detail. Thank you for considering this proposal.

Sincerely,

A handwritten signature in black ink, appearing to read "S. AbouRizk".

Simaan M. AbouRizk, PhD, PEng, FRSC, FCAE, NAC  
Distinguished University Professor, Construction Engineering and Management  
Dean, Faculty of Engineering

February 7, 2022

Centres and Institutes Committee  
University of Alberta  
Edmonton, AB

**Re: Proposal to Establish the Canadian Underground Infrastructure Innovation Centre (CUIIC)**

Dear Committee Members,

I am writing on behalf of the Department of Civil and Environmental Engineering to express the Department's full support for establishing the Canadian Underground Infrastructure Innovation Centre (CUIIC).

CUIIC is uniquely positioned to expand on the activities of the Consortium for Engineered Trenchless Technologies (CETT) at the University of Alberta and the Centre for Advancement of Trenchless Technologies (CATT) at the University of Waterloo. Together, these two initiatives have over forty years of history in advancing research and education related to underground construction, particularly trenchless technologies. CUIIC will build on the base membership of CATT (approximately 100 members in Ontario and eastern Canada); however, more importantly it is an extension of CETT and the NSERC Associate Industrial Research Chair in Underground Trenchless Construction, both within the Department.

CUIIC is envisioned as a world-class hub for research, education and innovation in underground infrastructure. It is being established with input and support of stakeholders in the underground construction sector across Canada, with members including municipalities, contractors, equipment manufacturers, engineering consultants, etc. These strong ties with industry will benefit students within the Department and also the broader Faculty of Engineering, by providing relevant training, and also providing a pool of research funding for interdisciplinary projects. The Centre will be housed in the Department, in laboratory and office space in the Markin/CNRL Natural Resources Engineering Facility and Donadeo Innovation Centre for Engineering. CUIIC will also have access to centralized human resources and financial administration, as well as technical staff.

We believe that CUIIC provides an extraordinary opportunity to address the full spectrum of engineering through its focus on building, maintaining, and rehabilitating underground

infrastructure and to become a singular force for underground technology innovation within Canada and beyond. We enthusiastically endorse the creation of the Canadian Underground Infrastructure Innovation Centre.

Sincerely,



Ania Ulrich, PhD, PEng  
Professor and Interim Chair  
Department of Civil and Environmental Engineering  
School of Mining and Petroleum Engineering

February 8, 2022

Office of the Provost and Vice-President (Academic)  
2-24D South Academic Building  
11328 - 89 Ave NW  
Edmonton AB, T6G 2J7

**To the Provost and Members of the Centres and Institutes Committee:**

The University of Waterloo is pleased to provide this letter of support, for the University of Alberta, Canadian Underground Infrastructure Innovation Centre (CUIIC).

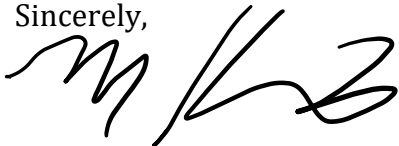
In 1994, the University of Waterloo established the Centre for Advancement of Trenchless Technologies (CATT). This Centre has helped municipalities address their buried infrastructure challenges, by promoting the use of trenchless construction techniques. Since CATT's formation, 28 years ago, it has grown in activity and recognition to be an international leader in buried water infrastructure research and professional education.

We are extremely proud of CATT's accomplishments over the years. However, CATT's Board of Directors, have recognized that a unique Canadian organization, such as CUIIC, is needed to unify and to expand the Underground research and education industry across Canada.

The University of Waterloo is committed, to fully work with Dr Bayat, to ensure that CUIIC is a national and international success, and to foster research innovation and collaborations.

The University of Waterloo strongly supports the need and mission of CUIIC, at the University of Alberta.

Sincerely,



Dr Mark Knight P.Eng., Consulting Engineer, FIAM  
Associate Professor  
Department of Civil and Environmental Engineering





Suite 2000, 10423 – 101 Street  
Edmonton, AB T5H 0E8  
Canada  
[epcor.com](http://epcor.com)

February 17, 2022

Office of the Provost and Vice-President (Academic)  
2-24D South Academic Building  
11328 - 89 Ave NW  
Edmonton AB T6G 2J7

To the Provost and Members of the Centres and Institutes Committee:

**Re: Establishment of Canadian Underground Infrastructure Innovation Centre (CUIIC) at the University of Alberta**

I am writing in support of the establishment of the Canadian Underground Infrastructure Innovation Centre (CUIIC) at the University of Alberta. The vision of CUIIC is to be a world-class hub for research, innovation, and education in underground infrastructure.

At EPCOR, our focus is providing clean water and reliable energy to communities across Canada and the United States. To accomplish this, we rely on various technologies to build, assess, and maintain underground infrastructure in a safe, cost-effective manner. The challenges in this sector include population growth, aging infrastructure, and climate change. To meet these challenges will take innovation and research, as well as improved training for industry professionals.

CUIIC will build on the success of other initiatives, including the Consortium for Engineered Trenchless Technologies and the NSERC Associate Industrial Research Chair in Underground Trenchless Construction at the University of Alberta, as well as the Centre for Advancement of Trenchless Technologies at the University of Waterloo. Together, these organizations already have over 40 years of experience in advancing education and research in trenchless technologies. CUIIC is a natural step forward in positioning the University of Alberta at the forefront of research and education in underground infrastructure in Canada.

EPCOR is pleased to express its support for this initiative. We look forward to the positive impacts of CUIIC and the University of Alberta in expanding the quality and scope of education available for emerging and established professionals in underground infrastructure.

Sincerely,

A handwritten signature in blue ink, appearing to read "Mansur Bitar", is positioned above the printed name.

Mansur Bitar

Director, Construction Services  
EPCOR Drainage Services

Office of the Provost and Vice-President (Academic)  
2-24D South Academic Building  
11328 – 89 NW  
Edmonton, AB T6G 2J7

February 9, 2022

**Subject: University of Alberta - Canadian Underground Infrastructure Innovation Centre**

**To the Provost and Members of the Centres and Institutes Committee:**

AECOM Canada Ltd. is pleased and honoured to provide a letter of support for the new University of Alberta, Canadian Underground Infrastructure Innovation Centre (CUIIC).

Municipalities and utilities, across Canada, all face the same primary challenges. This includes understanding how to cost-effectively rehabilitate or renew the thousands of kilometers of aging and deteriorated underground infrastructure in their current inventories. These critical infrastructure components (water, communications, hydro, gas, tunnels etc.) are the lifeline to sustain and grow Canada's economy.

The CUIIC, for the first time in Canada, will consolidate research, education, and innovation in the area underground infrastructure. It will also act as a much-needed hub for innovation and the training of highly qualified personnel and industry professionals. CUIIC will enrich the knowledge of both young and established professionals through building collaborations between industry and academia. It will also equip the next generation of engineers and industry professionals with cutting-edge underground construction techniques and asset management tools.

By increasing the overall knowledge and expertise of industry professionals, across various disciplines, Canada will be in a better position to meet the challenge of providing cost-effective, sustainable underground infrastructure for the long term. This includes effective management of other emerging issues such as rapidly changing environmental drivers and climate change.

CUIIC will also expand Canada's leadership, on the international stage, in the areas of sustainable underground infrastructure best practices, asset management, trenchless construction methods, and the promotion of green construction technologies, that will significantly reduce Canada's greenhouse gas emissions.

In conclusion we strongly support the need and mission of the CUIIC at the University of Alberta.

Sincerely,  
**AECOM Canada Ltd.**



Chris Macey, P. Eng.  
Associate Vice President – Conveyance  
Americas and Global Technical Practice Leader  
Condition Assessment and Rehabilitation  
chris.macey@aecom.com



**Stantec Consulting Ltd.**  
400-10220 103 Avenue NW  
Edmonton AB T5J 0K4

February 14, 2022

Project/File: 110199000

**Members of the Centres and Institutes Committee**

Centres and Institutes Committee  
Office of the Provost and Vice-President (Academic)  
2-24D South Academic Building  
11328 - 89 Ave NW  
Edmonton AB T6G 2J7

Dear Members of the Centres and Institutes Committee,

**Reference: Letter of Support**

I am pleased to provide this letter in support of the establishment of the Canadian Underground Infrastructure Innovation Centre (CUIIC) at the University of Alberta. The vision is for CUIIC to be a world-class hub for research, innovation, and education in underground infrastructure.

The underground sector, which includes trenchless technologies, is increasingly important in providing sustainable solutions for the construction and rehabilitation of underground infrastructure. Stantec excels in trenchless technologies, ranking #2 in the 2021 Top 50 Trenchless Engineering Firms in North America (as compiled by Trenchless Technologies, a key industry publication).

CUIIC represents significant benefits for industry, including Stantec, and it is our expectation that CUIIC and its partners will provide the following benefits:

- Practical, highly relevant training for potential recruits (graduate and undergraduate students)
- Professional development opportunities to improve the skills and knowledge of personnel
- A hub for collaboration and networking focused on addressing the challenges associated with installing and maintaining underground infrastructure—including pipelines, water lines, wastewater and sewers, telecommunications, etc.

Stantec anticipates a positive impact from CUIIC in improving the delivery and rehabilitation of underground infrastructure, particularly in expanding the quality and scope of the educational opportunities available for emerging and established professionals. We are pleased to support this initiative and look forward to participating with the University of Alberta in this endeavor.

Sincerely,

2022.02.14  
12:59:29 -07'00'

**Greg Tippett** P.Eng  
Senior Principal, Water Regional Delivery Leader, Canada West  
Phone: (780) 917-7334  
Mobile: (780) 884-8228  
greg.tippett@stantec.com





Associated Engineering Group Ltd.  
500, 9888 Jasper Avenue  
Edmonton, AB, Canada, T5J 5C6

TEL: 780.451.7666  
FAX: 780.453.3871  
[www.ae.ca](http://www.ae.ca)

February 8, 2022  
File: FIN-2022/001

Office of the Provost and Vice-President (Academic)  
University of Alberta  
2 - 24D South Academic Building  
11328 - 89 Avenue NW  
Edmonton, AB T6G 2J7

**Re: LETTER OF SUPPORT**

Associated Engineering is pleased to provide a letter of support for the new University of Alberta Canadian Underground Infrastructure Innovation Centre (CUIIC).

Municipalities and utilities across Canada all face the same challenge. This challenge is how to cost effectively replace and renew the thousands of kilometers of aged and deteriorated underground infrastructure. This critical infrastructure (water, sanitary, storm, communications, hydro, gas, etc.) is the lifeline of Canada's economy.

The CUIIC, for the first time in Canada, will consolidate research, education, and innovation in underground infrastructure. It will also act as a much-needed hub for innovation and training of highly skilled personnel and industry professionals. CUIIC will enrich the knowledge of both young and established professionals through building collaborations between industry and academia. It will also equip the next generation of engineers and industry professionals with cutting-edge underground construction techniques and asset management tools.

By increasing the overall knowledge and expertise of industry professionals across various disciplines, Canada will be in a better position to meet the challenge of delivering cost effective and sustainable underground infrastructure.

In conclusion we strongly support the need and mission of the CUIIC at the University of Alberta.

Yours truly,

A handwritten signature in blue ink that reads 'Chris Skowronski'. Below the signature, the name 'Chris Skowronski' is printed in a standard font.

Chris Skowronski  
Senior Vice President Civil Infrastructure

CS/ca

cc: Martin Jobke, President & CEO  
Lance Kubrak, COO  
General Managers  
Jason Lueke, National Practice Leader, Trenchless Technologies



Platinum member

Office of the Provost and Vice-President (Academic)  
2-24D South Academic Building  
11328 - 89 Ave NW  
Edmonton AB, T6G 2J7

09 February 2022

**To the Provost and Members of the Centres and Institutes Committee:**

**Subject: University of Alberta – Canadian Underground Infrastructure Innovation Centre**

Insituform Technologies Limited is pleased and honoured to provide a letter of support for the new University of Alberta, Canadian Underground Infrastructure Innovation Centre (CUIIC).

Municipalities and utilities, across Canada, all face the same challenges. These include understanding how to replace and renew the thousand of kilometers of aged and deteriorated underground infrastructure, in cost effective and responsible terms. These critical infrastructure components (water, communications, hydro, gas, tunnels etc.) are key in the ability to sustain and grow Canada's economy.

CUIIC provides the first real opportunity to consolidate research, education, and innovation in the area underground infrastructure within Canada. It will also act as a much-needed hub for innovation and the training of highly qualified personnel and industry professionals. CUIIC will enrich the knowledge of both young and established professionals through building collaborations between industry and academia. It will also equip the next generation of engineers and industry professionals with cutting-edge underground construction techniques and asset management tools. Insituform and many of our peers and clients have benefitted from educational and research offerings from some of the key members of CUIIC, and we look forward to expanded opportunities with CUIIC.

By increasing the overall knowledge and expertise of industry professionals across various disciplines, Canada will be in a better position, both in the short term and the future, to meet the challenge of provision of cost effective and sustainable underground infrastructure. This includes ongoing changes in our physical environment, as well as recently experienced needs to adapt to local and worldwide conditions impacting how services and products can be delivered.

CUIIC will provide the opportunity to expand Canada's leadership on the international stage in the areas of sustainable underground infrastructure best practices, asset management, trenchless construction methods, and the promotion of green construction technologies, that will significantly reduce Canada's greenhouse gas emissions.

In conclusion we strongly support the need and mission of CUIIC at the University of Alberta.

Sincerely,

**Insituform Technologies Limited**



George Bontus, P.Eng.  
Director of Engineering, Canada

Office of the Provost and Vice-President (Academic)  
2-24D South Academic Building  
11328 - 89 Ave NW  
Edmonton AB, T6G 2J7

**To the Provost and Members of the Centres and Institutes Committee:**

The City of Waterloo (City) is pleased and honoured to provide a letter of support for the new University of Alberta, Canadian Underground Infrastructure Innovation Centre (CUIIC). The City is one of the Founding Members of the Centre for Advancement of Trenchless Technologies (CATT) at the University of Waterloo. The City has a long history of working with CATT on various trenchless and infrastructure related research projects and initiatives over the years. City staff have been actively involved with CATT as board and committee members. The City has also benefitted from sending staff to various trenchless related training opportunities. It is understood that CATT has been working with the University of Alberta to create CUIIC. We are excited to hear about this endeavour to continue to expand grow research and education related to underground infrastructure innovation.

Waterloo, like municipalities across Canada, face similar challenges with how to effectively budget, replace and renew aged and deteriorated underground infrastructure. This critical infrastructure (water, sewers, communications, hydro, gas, etc.) are the lifeline for Canada's economy.

CUIIC will build on what CATT started and the City is supportive of the initiative to consolidate research, education and innovation in the area underground infrastructure. It will also act as a much-needed hub for innovation and the training of highly qualified personnel and industry professionals across Canada. CUIIC will enrich the knowledge of both young and established professionals through building collaborations between industry and academia. It will also equip the next generation of engineers and industry professionals with cutting-edge underground construction techniques and asset management tools. By increasing the overall knowledge and expertise of industry professionals, across various disciplines, the City of Waterloo, and cities across Canada, will be in a better position to meet the challenges of managing and building sustainable underground infrastructure.

CUIIC will also expand Canada's leadership, on the international stage, in the areas of sustainable underground infrastructure best practices, asset management, trenchless construction methods, and the promotion of green construction.

In conclusion, we strongly support the need and mission of the CUIIC at the University of Alberta and look forward to participating in this new endeavor.

Sincerely,



Francis Reyes, P.Eng.  
Director, Engineering Services  
City of Waterloo, Intergraded Planning and Public Works

Office of the Provost and Vice-President (Academic)  
2-24D South Academic Building  
11328 - 89 Ave NW  
Edmonton AB, T6G 2J7

February 8, 2022

**To the Provost and Members of the Centres and Institutes Committee:**

The Centre for the Advancement of Trenchless Technologies (CATT), located at the University of Waterloo, is pleased, and honoured to provide this letter of support for the new University of Alberta, Canadian Underground Infrastructure Innovation Centre (CUIIC).

CATT was established in 1994, to help municipalities address their buried infrastructure challenges by using trenchless construction methods. Since CATT's formation, 28 years ago, it has continued to grow in activity and recognition as an international leader in buried infrastructure research and professional education.

Although CATT is extremely proud of its accomplishments, it recognises the need for a unique Canadian organization, such as CUIIC, that will build on CATT's foundation and successes. CATT's Board of Directors believes that the CUIIC, under the leadership of Dr Bayat, will be a tremendous success and will consolidate Canada as an international leader in sustainable underground infrastructure research, HQP training and professional education.

The CATT Board of Directors are keen to support this exciting new opportunity and will work hard to ensure CUIIC continued success.

In conclusion we strongly support the need and mission of the CUIIC at the University of Alberta.

Sincerely,



Caroline Amyot, M.A.Sc., P.Eng.  
Chair CATT's Board of Directors



February 9, 2022

Office of the Provost and Vice-President (Academic)  
2-24D South Academic Building  
11328 - 89 Ave NW  
Edmonton, Alberta  
T6G 2J7

***To the Provost and Members of the Centres and Institutes Committee:***

Dillon Consulting Limited is pleased and honoured to provide a letter of support for the new University of Alberta, Canadian Underground Infrastructure Innovation Centre (CUIIC).

Municipalities and utilities, across Canada, all face the same challenge. This challenge is how to cost effectively replace and renew the thousand of kilometers of aged and deteriorated underground infrastructure. This critical infrastructure (water, communications, hydro, gas, tunnels, etc.) are the lifeline for Canada's economy.

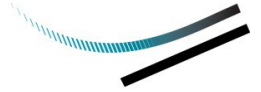
The CUIIC, for the first time in Canada, will consolidate research, education, and innovation in the area underground infrastructure. It will also act as a much-needed hub for innovation and the training of highly qualified personnel and industry professionals. CUIIC will enrich the knowledge of both young and established professionals through building collaborations between industry and academia. It will also equip the next generation of engineers and industry professionals with cutting-edge underground construction techniques and asset management tools.

By increasing the overall knowledge and expertise of industry professionals, across various disciplines, Canada will be in a better position to meet the challenge of, provision of cost effective and sustainable underground infrastructure. Especially in this rapidly changing environment, such as climate change.

CUIIC will also expand Canada's leadership, on the international stage, in the areas of sustainable underground infrastructure best practices, asset management, trenchless construction methods, and the promotion of green construction technologies that will significantly reduce Canada's greenhouse gas emissions.

130 Dufferin Avenue  
Suite 1400  
London, Ontario  
Canada  
N6A 5R2  
Mail: Box 426  
London, Ontario  
Canada  
N6A 4W7  
Telephone  
519.438.6192  
Fax  
519. 672.8209

*Office of the Provost and Vice-President (Academic)*  
*Page 2*  
*February 9, 2022*



In conclusion we strongly support the need and mission of the CUIIC at the University of Alberta.

Sincerely,

A handwritten signature in black ink, appearing to read 'J. Johnson'.

Jason Johnson, P.Eng.  
Partner (CATT Board of Directors – Past Chair)





February 14, 2022

Office of the Provost and Vice-President (Academic)  
2-24D South Academic Building  
11328 - 89 Ave NW  
Edmonton AB, T6G 2J7

**To the Provost and Members of the Centres and Institutes Committee:**

The Earth Boring Co. Limited is pleased and honoured to provide a letter of support for the new University of Alberta, Canadian Underground Infrastructure Innovation Centre (CUIC).

Municipalities and utilities, across Canada, all face the same challenge. This challenge is how to cost effectively, replace and renew the thousand of kilometers of aged and deteriorated underground infrastructure. This critical infrastructure (water, communications, hydro, gas, tunnels etc.) are the lifeline for Canada's economy.

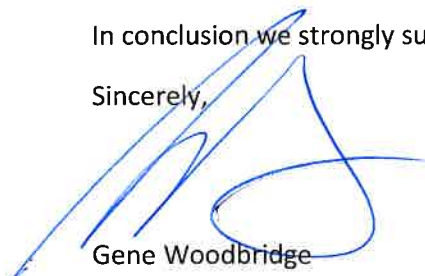
The CUIC, for the first time in Canada, will consolidate research, education, and innovation in the area underground infrastructure. It will also act as a much-needed hub for innovation and the training of highly qualified personnel and industry professionals. CUIC will enrich the knowledge of both young and established professionals through building collaborations between industry and academia. It will also equip the next generation of engineers and industry professionals with cutting-edge underground construction techniques and asset management tools.

By increasing the overall knowledge and expertise of industry professionals, across various disciplines, Canada will be in a better position to meet the challenge of, provision of cost effective and sustainable underground infrastructure. Especially in this rapidly changing environment, such as climate change.

CUIC will also expand Canada's leadership, on the international stage, in the areas of sustainable underground infrastructure best practices, asset management, trenchless construction methods, and the promotion of green construction technologies, that will significantly reduce Canada's greenhouse gas emissions.

In conclusion we strongly support the need and mission of the CUIC at the University of Alberta.

Sincerely,



Gene Woodbridge  
CEO  
Earth Boring Co. Limited



February 10, 2022

Office of the Provost and Vice-President (Academic)  
2-24D South Academic Building  
11328 - 89 Ave NW  
Edmonton AB, T6G 2J7

**To the Provost and Members of the Centres and Institutes Committee:**

Infrastructure Assessment Academy Inc. is pleased to provide a letter of support for the new University of Alberta, Canadian Underground Infrastructure Innovation Centre (CUIIC).

The CUIIC, will consolidate research, education, and innovation in the area underground infrastructure. It will also act as a much-needed hub for innovation and the training of highly qualified personnel and industry professionals across the Country.

CUIIC will enrich the knowledge of both young and established professionals through building collaborations between industry and academia. It will also equip the next generation of engineers and industry professionals with cutting-edge underground construction techniques and asset management tools. Of major concern to us in particular, is the ability for CUIIC to bridge the gap between professionals and trades persons and allowing for training, education and research for all demographics within our industry.

By increasing the overall knowledge and expertise of industry professionals, across various disciplines, Canada will be in a better position to meet the challenge of, provision of cost effective and sustainable underground infrastructure.

CUIIC will also expand Canada's leadership, on the international stage, in the areas of sustainable underground infrastructure best practices, asset management, trenchless construction methods, and the promotion of green construction technologies, that will significantly reduce Canada's greenhouse gas emissions.

In conclusion we strongly support the need and mission of the CUIIC at the University of Alberta and look forward to supporting CUIIC for years to come.

Sincerely,

A handwritten signature in blue ink, appearing to read 'Stephens', is written over a light blue horizontal line.

Tanya Stephens, A.S.C.T., GIS (pg)

President, Secretary





February 7, 2022

Office of the Provost and Vice-President (Academic)  
2-24D South Academic Building  
11328 - 89 Ave NW  
Edmonton AB, T6G 2J7

**To the Provost and Members of the Centres and Institutes Committee:**

IPEX Inc. is pleased and honoured to provide a letter of support for the new University of Alberta, Canadian Underground Infrastructure Innovation Centre (CUIIC). Municipalities and utilities across Canada all face the same challenge. This challenge is how to cost effectively replace and renew the thousands of kilometers of aged and deteriorated underground infrastructure. This critical infrastructure (water, communications, hydro, gas, tunnels etc.) are the lifeline for Canada's economy.

The CUIIC, for the first time in Canada, will consolidate research, education, and innovation in the area of underground infrastructure. It will also act as a much-needed hub for innovation and the training of highly qualified personnel and industry professionals. CUIIC will enrich the knowledge of both young and established professionals through building collaborations between industry and academia. It will also equip the next generation of engineers and industry professionals with cutting-edge underground construction techniques and asset management tools.

By increasing the overall knowledge and expertise of industry professionals, across various disciplines, Canada will be in a better position to meet the challenge of the provision of cost effective and sustainable underground infrastructure, especially in this rapidly changing environment.

CUIIC will also expand Canada's leadership on the international stage in the areas of sustainable underground infrastructure best practices, asset management, trenchless construction methods, and the promotion of green construction technologies that will significantly reduce Canada's greenhouse gas emissions.

In conclusion, we strongly support the need and mission of the CUIIC at the University of Alberta.

Sincerely,

**Alex Sandovski, P.Eng., MBA**  
Municipal Sales Engineer  
IPEX Inc.

**IPEX Inc.**

6810 Invader Crescent, Mississauga, Ontario, Canada L5T 2B6 Tel (905) 670-7676 Fax (905) 670-5295



MTE Consultants

520 Bingham Centre Drive, Kitchener, Ontario N2B 3X9

February 7, 2022

Office of the Provost and Vice-President (Academic)  
2-24D South Academic Building  
11328 - 89 Ave NW  
Edmonton AB, T6G 2J7

**To: The Provost and Members of the Centres and Institutes Committee**

MTE Consultants Inc. is pleased and honoured to provide a letter of support for the new University of Alberta, Canadian Underground Infrastructure Innovation Centre (CUIIC). Municipalities and utilities, across Canada, all face the same challenge. This challenge is how to cost effectively, replace and renew the thousand of kilometers of aged and deteriorated underground infrastructure. This critical infrastructure (water, communications, hydro, gas, tunnels etc.) are the lifeline for Canada's economy.

The CUIIC, for the first time in Canada, will consolidate research, education, and innovation in the area underground infrastructure. It will also act as a much-needed hub for innovation and the training of highly qualified personnel and industry professionals. CUIIC will enrich the knowledge of both young and established professionals through building collaborations between industry and academia. It will also equip the next generation of engineers and industry professionals with cutting-edge underground construction techniques and asset management tools.

By increasing the overall knowledge and expertise of industry professionals, across various disciplines, Canada will be in a better position to meet the challenge of, provision of cost effective and sustainable underground infrastructure. Especially in this rapidly changing environment, such as climate change.

CUIIC will also expand Canada's leadership, on the international stage, in the areas of sustainable underground infrastructure best practices, asset management, trenchless construction methods, and the promotion of green construction technologies, that will significantly reduce Canada's greenhouse gas emissions.

In conclusion we strongly support the need and mission of the CUIIC at the University of Alberta.

Yours truly,

**MTE Consultants Inc.**

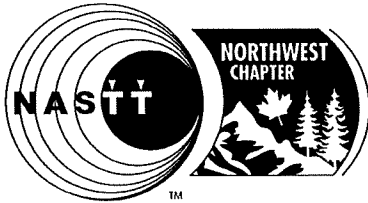
A handwritten signature in blue ink that reads 'V. Pugliese'.

**Vince Pugliese, P.Eng., MBA, PMP**

Technical Manager, Municipal

519-743-6500 ext. 1347

[VPugliese@mte85.com](mailto:VPugliese@mte85.com)



Centres and Institutes Committee  
Office of the Provost and Vice-President (Academic)  
2-24D South Academic Building  
11328 - 89 Ave NW  
Edmonton AB T6G 2J7

To the Provost and Members of the Centres and Institutes Committee:

The North American Society for Trenchless Technologies Northwest Chapter (NASTT NW) is pleased to express its support for the Canadian Underground Infrastructure Innovation Centre (CUIIC) at the University of Alberta. NASTT has been promoting knowledge and education related to trenchless technologies (techniques that minimize the excavation required on projects) for over 30 years and hosts the largest trenchless technology conference in North America (the No-Dig Show). The NASTT NW Chapter was first established in 2005 and is active in Alberta, Saskatchewan and Manitoba.

There are tremendous challenges related to underground construction that will continue to escalate for communities in the immediate future, including increasing population, environmental change, and aging infrastructure, among others. Establishing CUIIC at the University of Alberta will result in a strong hub for research, education, and innovation in underground construction. Ultimately, with CUIIC, the Faculty of Engineering and wider engineering community will be better equipped to address current and future challenges in underground construction.

We at the NASTT NW Chapter look forward to continuing to build strong connections with the University of Alberta academic community through this initiative. Executives of NASTT NW have been involved as stakeholders in discussion and planning around CUIIC as it has developed, and we are excited to continue our involvement with CUIIC as a centre at the University of Alberta.

Sincerely,

Ben Campbell  
Chair – NASTT North West Chapter



# Tunnelling Association of Canada Association canadienne des tunnels

February 24, 2012

University of Alberta  
Office of the Provost and Vice-President (Academic)  
2-24D South Academic Building  
11328 89 Ave NW  
Edmonton AB T6G 2J7

## **To the Provost and Members of the Centres and Institutes Committee:**

The Tunnelling Association of Canada is pleased to provide this letter of support for the University of Alberta's new Canadian Underground Infrastructure Innovation Centre (CUIIC).

Municipalities and utilities across Canada all face the same challenge – how to cost-effectively replace and renew thousand of kilometers of aged and deteriorated underground infrastructure. These vital infrastructure elements (water, communications, hydro, gas, tunnels etc.) are critical to the health and success of Canada's economy.

The CUIIC initiative will consolidate research, education and innovation in the area of underground infrastructure – a first in Canada. Acting as a much-needed hub for innovation and the training of highly qualified personnel and industry professionals, the CUIIC will enrich the knowledge of both young and established professionals by building collaborations between industry and academia. It will also equip the next generation of engineers and industry professionals with cutting-edge underground construction techniques and asset management tools.

By increasing the overall knowledge and expertise of industry professionals across various disciplines, Canada will be in a better position to meet the challenge of providing cost-effective and sustainable underground infrastructure. On the international stage, the CUIIC will also expand Canada's leadership in the areas of sustainable underground infrastructure best practices, asset management, trenchless construction methods, and the promotion of green construction technologies, which will significantly reduce Canada's greenhouse gas emissions.

In conclusion, we strongly support the need for and mission of the Canadian Underground Infrastructure Innovation Centre at the University of Alberta.

Sincerely,

Bruce Downing, P.Eng.  
President

Office of the Provost and Vice-President (Academic)  
2-24D South Academic Building  
11328 - 89 Ave NW  
Edmonton AB, T6G 2J7

**To the Provost and Members of the Centres and Institutes Committee:**

The UESI Canada Alberta BC Chapter is pleased and honoured to provide a letter of support for the new University of Alberta, Canadian Underground Infrastructure Innovation Centre (CUIIC).

Municipalities and utilities across Canada, all face the same challenge. This challenge is how to cost effectively, replace and renew the thousands of kilometers of aged and deteriorated underground infrastructure. This critical infrastructure (water, communications, hydro, gas, tunnels, etc.) are the lifeline for Canada's economy.

The CUIIC, for the first time in Canada, will consolidate research, education, and innovation in the area of underground infrastructure. It will also act as a much-needed hub for innovation and the training of highly qualified personnel and industry professionals. CUIIC will enrich the knowledge of both young and established professionals through building collaboration between industry and academia. It will also equip the next generation of engineers and industry professionals with cutting-edge underground construction techniques and asset management tools.

By increasing the overall knowledge and expertise of industry professionals, across various disciplines, Canada will be in a better position to meet the challenge of providing cost effective and sustainable underground infrastructure. Especially in this rapidly changing environment, such as climate change.

CUIIC will also expand Canada's leadership, on the international stage, in the areas of sustainable underground infrastructure best practices, asset management, trenchless construction methods, and the promotion of green construction technologies, that will significantly reduce Canada's greenhouse gas emissions.

In conclusion we strongly support the need and mission of the CUIIC at the University of Alberta.

Sincerely,



**Dallas Kuzek**

Chair, UESI AB-BC Chapter



**Sinclair Slusariuc**

Vice Chair, UESI AB-BC Chapter

Office of the Provost and Vice-President (Academic)  
2-24D South Academic Building  
11328 - 89 Ave NW  
Edmonton AB, T6G 2J7

February 6, 2022

**To the Provost and Members of the Centres and Institutes Committee:**

The UESI Canada East (Ontario Chapter) is pleased to provide a letter of support for the new University of Alberta, Canadian Underground Infrastructure Innovation Centre (CUIIC).

Municipalities and utilities across Canada all face the same challenge. This challenge is how to develop budgets and detailed plans to replace and rehabilitate the aged and deteriorated underground infrastructure. This critical infrastructure (water, communications, power, gas, tunnels etc.) is the lifeline for Canada's economy. Without the appropriate professionals to undertake this work the challenge becomes more difficult. Education and professional training in the workforce is not focussed on Canada's underground infrastructure and young professionals are not aware of the opportunities that may be available to them.

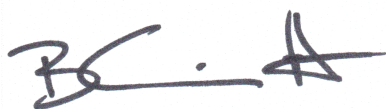
The CUIIC, for the first time in Canada, will consolidate research, education, and innovation in the area of underground infrastructure. It will also act as a much-needed hub for innovation and the training of highly qualified personnel and industry professionals. CUIIC will enrich the knowledge of both young and established professionals through building collaborations between industry and education. It will also train the next generation of engineers and industry professionals with cutting-edge underground construction techniques and asset management tools.

By increasing the overall knowledge and expertise of industry professionals, across various disciplines, Canada will be in a better position to meet the challenge of providing cost effective and sustainable underground infrastructure.

CUIIC will also expand Canada's leadership in the areas of sustainable underground infrastructure best practices, asset management, trenchless construction methods and the promotion of green construction technologies.

In conclusion we strongly support the need and mission of the CUIIC at the University of Alberta.

Sincerely,



Blaine Hunt, P. Eng. *(Licensed in BC, AB, MB, ON)*  
Co-Chair UESI East – Ontario Chapter  
Director of Engineering & Quality, Canada  
T2 Utility Engineers



**Governance Executive Summary  
Action Item**

<b>Agenda Title</b>	<b>Proposed Bachelor of Biomedicine Dual Degree, Faculty of Medicine and Dentistry and Wenzhou Medical University</b>
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**Motion**

<p>THAT the GFC Academic Planning Committee recommend that the Board of Governors approve the proposed Bachelor of Biomedicine Dual Degree as set forth in the attachments and for implementation upon final approval.</p>
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**Item**

Action Requested	<input type="checkbox"/> Approval <input checked="" type="checkbox"/> Recommendation
Proposed by	Dr Brenda Hemmelgarn, Dean, Faculty of Medicine and Dentistry
Presenter(s)	Dr Tracey Hillier, Director, Alberta Institute, Wenzhou Medical University, Faculty of Medicine and Dentistry - MED International

**Details**

Office of Administrative Responsibility	Provost and Vice-President (Academic)
The Purpose of the Proposal is ( <i>please be specific</i> )	The proposal is before the committee to seek approval of the Bachelor of Biomedicine Dual Degree Program.
Executive Summary ( <i>outline the specific item – and remember your audience</i> )	<p>This dual degree program is a collaboration between Wenzhou Medical University (WMU) and the Alberta Institute within the Faculty of Medicine &amp; Dentistry at the University of Alberta. The collaboration is part of the Alberta Institute Wenzhou Medical University (AIWMU) established in 2019.</p> <p>Students who complete all the required credits and meet the academic standards of both universities, will be granted the degrees from each institution. Students will be eligible for a Bachelor of Biomedicine from the University of Alberta after they complete the first four years of the program. They will be eligible for the Bachelor of Clinical Medicine degree from Wenzhou Medical University after all 5 years of the program have been completed. All 5 years of the program need to be successfully completed as a requirement for either degree to be issued.</p> <p>Students in this dual degree program will be taught by University of Alberta FoMD faculty during the first four years of the program, predominantly in years 3 and 4 for a total of 75 credits. They will be held to the same curricular expectations as undergraduate students in similar programs in the Faculty of Medicine and Dentistry including students in the MD Program. The curriculum will be delivered in a way that presents material in a progression from basic science to clinical application, building on foundational knowledge in a sequential way, which will nurture and support student inquiry as well as scholarly and creative</p>



## Item No. 7

	<p>activity. This program will emphasize lifelong learning, problem solving skills, teamwork, and collaboration.</p> <p>The initial contract with WMU for Alberta Institute is for 5 years, however, it is anticipated that the contract will extend beyond that as WMU has indicated that they anticipate long term demand and for the University of Alberta’s ongoing involvement in teaching the program once a dual degree program is approved.</p> <p>If for an unforeseen reason learner demand for the program diminishes, the agreement between the University of Alberta and Wenzhou Medical University includes the following provision “if the recruitment number in the Program falls below mutually agreed targets, both parties agree to assess the situation together and determine appropriate responses.”</p>
Supplementary Notes and context	<i>&lt;This section is for use by University Governance only to outline governance process.&gt;</i>

**Engagement and Routing** (Include meeting dates)

<p>Consultation and Stakeholder Participation (parties who have seen the proposal and in what capacity)</p> <p>&lt;For information on the protocol see the <a href="#">Governance Resources section Student Participation Protocol</a>&gt;</p>	<p><b><u>Those who are actively participating:</u></b></p> <ul style="list-style-type: none"> <li>• Deans Executive Council, Faculty of Medicine and Dentistry</li> <li>• Vice-Dean Faculty Affairs, Faculty of Medicine and Dentistry</li> <li>• Director Alberta Institute, Faculty of Medicine and Dentistry</li> <li>• Associate Dean International, Faculty of Medicine and Dentistry</li> </ul> <p><b><u>Those who have been consulted:</u></b></p> <ul style="list-style-type: none"> <li>• MD Program Curriculum and Program Committee (June 20, 2019; July 25, 2019; Sept 16, 2021) for discussion</li> <li>• <b>Faculty Council, Faculty of Medicine and Dentistry (Sept 21, 2021) Motion Carried: Faculty Council supports the creation of a new Bachelor of Biomedicine degree program for students registered in the Alberta Institute at Wenzhou Medical University.</b></li> <li>• University of Alberta, Program Support Team (Oct 28, 2021) for discussion</li> </ul> <p><b><u>Those who have been informed:</u></b></p> <ul style="list-style-type: none"> <li>• Department Chairs Committee, Faculty of Medicine and Dentistry (Jan 13, 2021; Sept 8, 2021)</li> </ul>
Approval Route (Governance) (including meeting dates)	GFC Programs Committee - March 17, 2022 GFC Academic Planning Committee - March 23, 2022 General Faculties Council - May 2, 2022 Board Committees and Board of Governors - TBD

**Strategic Alignment**

Alignment with <i>For the Public Good</i>	Please note the Institutional Strategic Plan objective(s)/strategies the proposal supports.
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## Item No. 7

	<p>GOAL: Build a diverse, inclusive community of exceptional students, faculty and staff from Alberta, Canada, and the world.          OBJECTIVE 1: Build a diverse, inclusive community of exceptional undergraduate and graduate students from Edmonton, Alberta, Canada, and the world.</p> <p>GOAL: Excel as individuals, and together, sustain a culture that fosters and champions distinction and distinctiveness in teaching, learning, research, and service.          OBJECTIVE 12: Build a portfolio of signature research and teaching areas where the University of Alberta is or will be recognized as a global leader.          OBJECTIVE 14: Inspire, model, and support excellence in teaching and learning.</p> <p>GOAL: Engage communities across our campuses, city and region, province, nation and the world to create reciprocal, mutually beneficial learning experiences, research projects, partnerships, and collaborations.          OBJECTIVE 18: Seek, build, strengthen and sustain partnerships with local, national or international research agencies, governments, government ministries and agencies, universities, Indigenous communities, libraries, not-for-profits, industry, business, and community organizations.          OBJECTIVE 22: Secure and steward financial resources to sustain, enhance, promote, and facilitate the university's core mission and strategic goals.</p>			
Alignment with Core Risk Area	Please note below the specific institutional risk(s) this proposal is addressing. <table border="1"> <tr> <td> <input type="checkbox"/> Enrolment Management  <input type="checkbox"/> Faculty and Staff  <input checked="" type="checkbox"/> Funding and Resource Management  <input type="checkbox"/> IT Services, Software and Hardware  <input checked="" type="checkbox"/> Leadership and Change  <input type="checkbox"/> Physical Infrastructure         </td> <td> <input type="checkbox"/> Relationship with Stakeholders  <input checked="" type="checkbox"/> Reputation  <input type="checkbox"/> Research Enterprise  <input type="checkbox"/> Safety  <input type="checkbox"/> Student Success         </td> </tr> </table>		<input type="checkbox"/> Enrolment Management <input type="checkbox"/> Faculty and Staff <input checked="" type="checkbox"/> Funding and Resource Management <input type="checkbox"/> IT Services, Software and Hardware <input checked="" type="checkbox"/> Leadership and Change <input type="checkbox"/> Physical Infrastructure	<input type="checkbox"/> Relationship with Stakeholders <input checked="" type="checkbox"/> Reputation <input type="checkbox"/> Research Enterprise <input type="checkbox"/> Safety <input type="checkbox"/> Student Success
<input type="checkbox"/> Enrolment Management <input type="checkbox"/> Faculty and Staff <input checked="" type="checkbox"/> Funding and Resource Management <input type="checkbox"/> IT Services, Software and Hardware <input checked="" type="checkbox"/> Leadership and Change <input type="checkbox"/> Physical Infrastructure	<input type="checkbox"/> Relationship with Stakeholders <input checked="" type="checkbox"/> Reputation <input type="checkbox"/> Research Enterprise <input type="checkbox"/> Safety <input type="checkbox"/> Student Success			
Legislative Compliance and jurisdiction	Post-Secondary Learning Act GFC Programs Committee Terms of Reference GFC Academic Planning Committee Terms of Reference Board Learning, Research and Student Experience Committee Terms of Reference			

## Attachments

1. Attachment 1 Undergraduate-degree-template-part-a Bachelor of Biomedicine Dual Degree Program (pages 1 -76)
2. Attachment 2 caqc-new-degree-proposal-template-part-b Bachelor of Biomedicine Dual Degree Program (pages 1 - 51)
3. Attachment 3 Bachelor of Biomedicine UAL Library Impact Statement (pages 1 - 2)
4. Attachment 4 External Review - Kong, Jiming (pages 1 - 2)



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5. Attachment 5 External Review - Choy, Patrick (pages 1 - 2)
6. Attachment 6 Response to Reviews of the Proposal for a Bachelor of Biomedicine Dual Degree Program (pages 1 - 2)

*Prepared by:* Dr Tracey Hillier, Director Alberta Institute, Faculty of Medicine and Dentistry,  
[thillier@ualberta.ca](mailto:thillier@ualberta.ca)

## Proposal Template: New Bachelor's Degree Programs and Specializations (Part A: System Co-ordination Review)

Complete this template for proposals for new bachelor's degree programs or specializations. Institutions should:

- ensure that submission content is concise. Any additional information may be appended;
- indicate “not applicable” when questions are not relevant to a particular proposal; and
- ensure that applicable supporting documents are attached to the proposal.

### SECTION A: PROPOSAL OVERVIEW

**Basic Information** *(Complete the table below)*

<b>Institution</b>	<b>University of Alberta</b>
<b>Program Name</b>	<b>Dual Degree Program in Biomedicine</b>
<b>Specialization Name</b>	<b>Biomedicine</b>
<b>Credential Awarded</b>	<b>Bachelor of Biomedicine</b>
<b>Proposed Effective Date</b>	<b>August 1, 2022</b>

**Type of Initiative** *(Answer the following questions)*

*This is a proposal for (select one from the drop-down menu):*

New program

### SECTION B: OVERVIEW OF PROPOSED PROGRAM OF STUDY

#### 1. Program Description *(Answer the following questions)*

a. Attach (as an appendix to this proposal) a concise program description document that includes:

- 3-4 sentence calendar description of the program,
- a proposed program of study including course names, descriptions, credits and prerequisites, by semester or year of study,
- program location (i.e., campus locations and/or off-site locations), and delivery mode (i.e., face-to-face, online, or blended), and
- program learning outcomes.

**See Appendix A**

b. Where applicable, identify planned collaborations with other post-secondary institutions, departments within the institution or other organizations that this program respectively facilitates or provides for.

This dual degree program is a collaboration between Wenzhou Medical University (WMU) and the Alberta Institute within the Faculty of Medicine & Dentistry at the University of Alberta. The collaboration is part of the Alberta Institute Wenzhou Medical University (AIWMU).

<p>Students who complete all of the required credits and meet the academic standards of both universities, will be granted the degrees from each institution. Students will be eligible for a Bachelor of Biomedicine from the University of Alberta after they complete the first four years of the program. They will be eligible for the Bachelor of Clinical Medicine degree from Wenzhou Medical University after all 5 years of the program have been completed. All 5 years of the program need to be successfully completed as a requirement for either degree to be issued.</p>
<p><b>Reviewer's Comment:</b></p>
<p><b>2. Work Integrated Learning (If applicable, answer the following questions)</b></p>
<p>a. Identify the number of placements required in the program (including type of work setting and duration/timing of activities).</p> <ul style="list-style-type: none"> <li>Work Integrated Learning (WIL) is a key component of this program. WIL in the form of an unpaid observership will be arranged through the Faculty of Medicine and Dentistry during the required on-site summer course between years 2 and 3 of the program. The clinical internship WIL that is required in the 5th year of the program will take place in China at Wenzhou Medical University clinical sites. 60 placements are required each year.</li> </ul>
<p>b. Summarize communications with employers (append applicable letters of support, minutes of program advisory committee meetings, etc.) showing that sufficient placements will be available when needed.</p> <ul style="list-style-type: none"> <li>N/A</li> </ul>
<p>c. Comment on whether/how work integrated learning placements in other programs (at the institution or at other institutions within the Alberta Adult Learning System) may be impacted as a result of this program.</p> <ul style="list-style-type: none"> <li>As the 5th year Clinical Internship WIL occurs in China it will not impact WIL learning placements in other UAlberta programs.</li> <li>The WIL arranged through the Faculty of Medicine and Dentistry during the required summer course is timed when there is a nadir in the number of other clinical learners. New preceptors have been recruited to support this program. A benefit may occur if any of these preceptors later become available to support the learning of students in other programs.</li> </ul>
<p><b>Endorsement of and/or Support for Program (If applicable)</b></p>
<p>a. Describe endorsement(s) from relevant professional organizations, regulatory bodies, advisory committees, employers, and/or industry.</p> <ul style="list-style-type: none"> <li>N/A</li> </ul>
<p><b>Reviewer's Comment:</b></p>

**SECTION C: ENROLMENT PLANNING**

1. (a) Projected Student Enrolment (Complete the table below as applicable).

Proposed Enrolment	1 <sup>st</sup> Year of Implementation	2 <sup>nd</sup> Year of Implementation	3 <sup>rd</sup> Year of Implementation	4 <sup>th</sup> Year of Implementation	Annual Ongoing
<b>Total Headcount</b>	60	120	180	240	240

● 1 <sup>st</sup> Year of Study	60	60	60	60	60
● 2 <sup>nd</sup> Year of Study	0	60	60	60	60
● 3 <sup>rd</sup> Year of Study	0	0	60	60	60
● 4 <sup>th</sup> Year of Study	0	0	0	60	60
● 5 <sup>th</sup> Year of Study	0	0	0	0	60
<b>Anticipated No. of Graduates</b>	0	0	0	60	60
<b>Reviewer's Comment:</b>					

a. Indicate the percentage of international students in the enrolment projections and provide a brief rationale regarding how the percentage was established.

100% of the students will all be international students. The percentage is derived from the nature of the program which only enrolls students admitted to Wenzhou Medical University.

**Reviewer's Comment:**

**2. Learner and Labour Market Demand (Answer the following questions)**

a. Provide evidence of labour market demand for graduates, detailing how such demand was forecasted and substantiated regionally and provincially. (Append supporting documentation, as appropriate.)

Graduates of this program will not be proceeding to work within the province of Alberta. It is anticipated that after graduation they will proceed to graduate programs to pursue research or clinical medicine residency programs in China. Labour market demand has been determined by WMU in its aim to educate a cadre of physicians who have an international perspective on health care, leadership and medical education.

b. Identify which stakeholder groups were consulted regarding demand/need for this program:

<input checked="" type="checkbox"/> Student/learners	<input type="checkbox"/> Employers and professional associations
<input checked="" type="checkbox"/> Faculty	<input type="checkbox"/> Community organizations
<input checked="" type="checkbox"/> Program advisory committee	<input type="checkbox"/> Other post-secondary institutions
<input type="checkbox"/> Regulator and/or accreditation bodies	<input checked="" type="checkbox"/> Other (please identify)

We have worked with the University of Alberta International office on this proposal and consulted with the Office of the Provost. As well, this proposal has been discussed by the Dean's Executive Committee of the FoMD, the MD Curriculum and Program Committee, Department Chairs Committee and Faculty Council. Students and Faculty at WMU have also been invited to provide feedback. The curriculum and program have been approved by WMU and its governing bodies.

- c. Briefly discuss the results of the identified consultations and attach supporting documentation (e.g., minutes of meetings, letters of support, etc.), when available.

The joint program was initiated by the Faculty of Medicine & Dentistry and the FoMD International Office. Discussions across the faculty have been ongoing. The program has been discussed at the MD Program and Curriculum and Program Committee (MDCPC) on June 20, 2019; July 25, 2019 and September 16, 2021. The MDCPC membership includes faculty members, staff, and students from the MD Program.

The program was discussed at an FoMD Department Chairs meeting January 13, 2021 and September 8, 2021 and discussed and approved at the Faculty Council meeting September 21, 2021.

**See attached Appendix B**

- d. Provide evidence of learner demand for this program. How was this demand determined? (Append supporting evidence, as appropriate e.g., survey results, waitlists, demand in similar programs at other institutions etc.)

Learner demand for the Alberta Institute Program was initially determined by WMU. The Alberta Institute at WMU has been accepting students into a collaborative medical program for the past two years and there has been a significant increase in learner demand over the past year. The ranking and mean exam scores of students accepted into the program in 2021 have improved compared with those accepted in 2020. Including a degree from the University of Alberta as part of the Alberta Institute Program is expected to make the program even more attractive to applicants.

Students targeted for admission in this dual degree will be from China. While other programs at the University of Alberta are targeted at students from China, this is the only program targeted at medical students. Domestic students from Alberta and Canada will not be eligible for this program.

- e. Identify and discuss any additional factors that may impact learner demand for this proposed program.

- N/A

- f. Briefly describe how the enrolment plan aligns with the anticipated demand for this program, taking into account the identified labour market demand and other Alberta program providers.

- N/A

- g. Comment on the overall sustainability of learner demand for this program over the longer term.

The initial contract with WMU for Alberta Institute is for 5 years, however, it is anticipated that the contract will extend beyond that as WMU has indicated that they anticipate long term demand and for the University of Alberta's ongoing involvement in teaching the program once a dual degree program is approved.

If for an unforeseen reason learner demand falls, the agreement between the University of Alberta and Wenzhou Medical University includes the following "if the recruitment

number in the Program falls below mutually agreed targets, both parties agree to assess the situation together and determine appropriate responses.”

**Reviewer’s Comment:**

## SECTION D: GRADUATE OUTCOMES AND PATHWAYS

### 1. Employment Outcomes *(Answer the following questions)*

a. For what types of career paths (including entrepreneurial and/or self-employment paths) and employment opportunities does the proposed program/specialization prepare graduates?

None of the graduates of this program will directly enter the labour force in Alberta or in Canada after graduation. It is anticipated that following graduation students will proceed to graduate programs to pursue research or clinical medicine residency programs in China. Graduates of the program will have additional leadership skills, international experience and a broad perspective on health care and medical education.

b. In cases of regulated professions, how was the regulatory body consulted and what feedback did it provide in terms of labour market factors?

N/A Graduates of this program will not be regulated by regulatory bodies in Alberta or Canada.

c. Identify existing or planned program or institutional supports that enable transition from post-secondary institution to work for graduates.

N/A

**Reviewer’s Comment:**

### 2. Learner Pathways

a. To what extent will learners be able to transfer credits to and from other post-secondary institutions?

WMU will accept transfer credits for all courses as part of the Dual Degree Program

b. What types of further studies, if not within the same field, would graduates be most likely to pursue?

It is anticipated that following graduation from this Program, students will proceed directly to clinical medicine residency programs in China. Alternatively the students would be well prepared to pursue graduate studies and research in health and medicine.

**Reviewer’s Comment:**

### 3. Societal and Community Benefits *(if applicable)*

a. In cases where labor market demand is not the primary reason for this program, identify anticipated benefits from implementation of the proposed program to the wellbeing of communities in Alberta, particular those that your institutions serves:

Implementation of this program will strengthen the partnerships between University of Alberta and Wenzhou Medical University and connect to the University of Alberta’s strategic plan which encourages members of the UofA community to engage communities around the world to create reciprocal, mutually beneficial learning experiences, research projects, partnerships, and collaborations.

The additional revenues received as a result of this program will be used to support social accountability initiatives, Global Health programming, International and Northern



electives support, bursaries for students from populations underrepresented in medicine and strategic recruitment outreach initiatives to attract more diverse students into medicine. This funding will specifically support the University and the Faculty response to the Truth and Reconciliation Report recommendation to increase the number of Aboriginal professionals working in the health-care field.

**Reviewer's Comment:**

## SECTION E: FINANCIAL VIABILITY AND SUSTAINABILITY

### 1. Budget and Funding Sources *(Answer the following questions)*

- a. Describe how the institution plans to finance the program, (e.g. tuition, grants etc.):  
The program will be funded through a contractual agreement with Wenzhou Medical University
- b. Discuss risk mitigation plans should full revenue(s) not be achieved or should costs exceed amounts budgeted.

The revenues will be achieved through a contractual agreement with WMU. No money will move from UAlberta to WMU. The costs to deliver the program have been determined based on known costs for delivery of the Preclerkship Curriculum of the University of Alberta Medical School Program. As per the agreement between the University of Alberta and Wenzhou Medical University, "if the recruitment number in the Program falls below mutually-agreed targets, both parties agree to assess the situation together and determine appropriate responses."

**Reviewer's Comment:**

### 2. Tuition and Student Cost Considerations *(Answer the following questions)*

- a. Document tuition and fee projections for students (specify domestic student tuition fees, international student tuition fees, compulsory student fees, and other costs likely to be incurred by students (texts, equipment etc.). Provide rationale where appropriate such as comparisons with similar programs. (Consult with the Ministry as needed.):

There are no similar programs in the Campus Alberta system.

The program will be based on an exchange model for student tuition.

Wenzhou Medical University will transfer \$1,000,000 in the first year and \$2,000,000.00 annually for years 2-5, to the Faculty of Medicine and Dentistry to run the program.

Students will incur additional costs for books and computers.

- b. Does the proposed program align with the Tuition and Fees Regulation?  Yes; or  No
- c. Please elaborate on above answer, if necessary.

Ref:

<https://www.ualberta.ca/international/international-relations/international-agreements/shared-credential-agreement-development-guidelines1.html>

**Reviewer's Comment:**

**SECTION F: INSTITUTIONAL IMPACT**

**1. Institutional Capacity** (*Answer the following questions*)

- a. Briefly describe how the proposed program aligns with the institution's mandate and government priorities.

The Alberta Institute joint initiative between WMU and UAlberta aligns with the University of Alberta's strategic plan in several ways. First, it will allow the medical program to build and support an integrated, cross-institutional strategy that demonstrates and enhances the UofA's story internationally, while building and strengthening collaborations and partnerships with an international university. This initiative also advances University of Alberta International's vision to connect the university to the rest of the world and ensure that the UofA is seen as one of the leading universities in the world. Finally, the proposed program fulfills one of the Faculty of Medicine & Dentistry goals to attract and maintain international and global partners by collaborating with a prestigious medical university in China to deliver high quality and innovative curriculum to their students.

This partnership is the first collaboratively designed international medical school program in China. Implementation of this program will strengthen the partnerships between University of Alberta and Wenzhou Medical University and connect to the University of Alberta's strategic plan which encourages members of the UofA community to engage communities around the world to create reciprocal, mutually beneficial learning experiences, research projects, partnerships, and collaborations.

- b. To what extent does the program build on the institution's existing programs, infrastructure, resources and experience from offering programs in related fields?

Students in year 3 and 4 of the program will be in a parallel curriculum to the preclerkship curriculum for the medical students at the University of Alberta. Much of their program will be delivered (by UofA faculty) at a distance, with some faculty members teaching certain elements of courses in person at WMU. WMU will cover the cost for travel and accommodations for those faculty. In this way, the proposed Dual Degree Program builds upon the existing curricular materials developed for the pre-clerkship component of the MD Program. The program leadership will work with willing lecturers to adapt existing recorded lecture materials to be repurposed and leveraged in support of this proposed program. Students from WMU will participate in an in-person summer course in Edmonton between years 2 and 3 of their program to augment and enrich the online learning experience.

The existing curriculum delivery systems within the Faculty of Medicine and Dentistry are designed to run a parallel program such as this in a distributed fashion. Small group sessions are designed with materials that are available electronically. An extensive faculty development program has been developed to support this initiative. University of

Alberta facilitators will train faculty from WMU to deliver those sessions in person. We have assessment and evaluation systems that will allow us to assess student learning and evaluate the program at a distance. The Faculty of Medicine & Dentistry at the University of Alberta is well positioned and has the necessary experience to deliver the required courses to students in this program.

**Reviewer's Comment:**

## 2. Internal Review and Approval

a. Indicate which internal governance body recommended approval and specify date of approval.

Within the Faculty of Medicine this Program has been approved by:  
Faculty Council September 21, 2021

Within the University:  
GFC Programs Committee TBD  
Academic Planning Committee TBD

For the new credential  
The Board of Governors (The Board Learning, Research and Student Engagement Committee will need to recommend date TBD)

**Reviewer's Comment:**

## SECTION G: SYSTEM IMPACT

### 1. Program/Specialization Duplication *(Answer the following questions)*

a. Does the proposed program/specialization potentially duplicate existing programming in the Alberta Adult Learning System?  Yes; or  No

b. If yes, list these programs.  
N/A

c. If proposed program/specialization potentially constitutes program duplication, explain why such duplication is appropriate and beneficial in this circumstance.

N/A. This proposed dual degree program does not duplicate an existing program.

**Reviewer's Comment:**

## SECTION H: OTHER CONSIDERATIONS

### Other considerations

a. Are there other factors or considerations the Ministry should take into account when reviewing this proposal?

b. The Alberta Institute WMU was established as a joint medical education training program between WMU and the University of Alberta with the signing of Articles of Association in October, 2019. The first cohort of students began the program in September 2020. After a highly successful first year, learner demand has increased and the reputation of the

program is positive. The rigor of the proposed Dual Degree program meets the standard expected for a UAlberta Bachelor Degree. The creation of a Dual Degree Program will bring value and further interest to the Alberta Institute WMU Program enhancing desirability and sustainability. This initiative has the capacity to enhance the reputation of the Faculty of Medicine and Dentistry and the University of Alberta with international partners. It could possibly be scaled in the future to work at other universities and in other countries.

**Reviewer's Comment:**

**RECOMMENDATION (FOR DEPARTMENT USE)**

**Recommendation(s):**

**Rationale for Recommendation:**

**Reviewer(s):**

**Date Completed:**

## Appendix A Program Description

***Provide a 3-4 sentence calendar description of the program.***

This dual degree program is a collaboration between Wenzhou Medical University (WMU) and the Faculty of Medicine & Dentistry at the University of Alberta as part of the Alberta Institute Wenzhou Medical University (AIWMU). Students who complete all of the required credits and meet the academic standards of both universities, will be granted the degrees from each institution. Students from WMU will be eligible for a Bachelor of Biomedicine from the University of Alberta after they complete the first four years of the program. They will be eligible for the Bachelor of Clinical Medicine degree from Wenzhou Medical University after all 5 years of the program have been completed.

***Proposed program of study including course names, credits and year of study (specific course descriptions and objectives follow)***

<b>Year in Program</b>	<b>Courses</b>	<b>Credits</b>
<b>Years 1 and 2</b>	<b>Courses Taught by Wenzhou Medical University</b>	
	English Medical English	<b>9</b>
	Medical chemistry Molecular and cellular biology Normal structure and function of human body Biological basis of disease	<b>22</b>
	Modern Chinese History, Politics, Education & Fundamentals of Law	<b>12</b>
	Introduction to medicine Traditional Chinese Medicine Medical Ethics Social medicine and health service management Social Practice Policies Physical and Psychological Health Education Sanitary regulation Hygiene	<b>17</b>
	<b>Courses Taught by University of Alberta</b>	
	Health Systems Science 1	<b>3</b>
	Health Systems Science 2A	<b>3</b>
	Summer School: Health Systems Science 2B	<b>4</b>
	<b>Year 3</b>	<b>Courses Taught by University of Alberta</b>
Foundations Medicine		<b>9</b>
Endocrinology & Metabolism		<b>6</b>
Cardiovascular Medicine		<b>5</b>
Pulmonary Medicine		<b>3</b>
Renal Medicine		<b>3</b>
Health Systems Science 3		<b>4</b>

<b>Year 4</b>	Courses Taught by University of Alberta	
	Gastroenterology & Nutrition	5
	Reproductive Medicine & Urology	6
	Musculoskeletal System	6
	Neurosciences and Organs of Special Senses	9
	Psychiatry	3
	Oncology	3
<b>Year 5</b>	Clinical Courses Taught by Wenzhou Medical University	
	Internal Medicine	16
	Surgery	16
	Obstetrics and Gynecology	6
	Pediatrics	6
	Community Medicine	2
	Radiology and ECG	2

\*\*\*the courses from this year of the program are not required for the Bachelor of Biomedicine Degree

### Overview UAlberta courses taught for Alberta Institute WMU dual degree program

\*\*\* There are no prerequisites for the courses for students admitted into the program

COURSE NAMES	Credits	COURSE NAMES	Credits
<b>Year 1</b>		<b>Year 2</b>	
Health Systems Science	3	Health Systems Science	3
<b>Summer Program</b>	4		
<b>Year 3</b>		<b>Year 4</b>	
Foundations Medicine	9	Gastroenterology & Nutrition	5
Endocrinology & Metabolism	6	Reproductive Medicine & Urology	6
Cardiovascular Medicine	5	Musculoskeletal System	6
Pulmonary Medicine	3	Neurosciences and Organs of Special Senses	9
Renal Medicine	3	Psychiatry	3
Health Systems Science	4	Oncology	3
		Health Systems Science	3

### Summary Course Descriptions

COURSE NAME	COURSE DESCRIPTION	Year
Health Systems Science 1	Health systems science is a foundational platform and framework for the study and understanding of how care is delivered for patients and populations within systems of medical care, how health professionals work together to deliver that care, and how the health system can improve patient care and health care delivery. This	Year 1

	course introduces core domains including health care structures and processes; health care policy, economics, and management; clinical informatics and health information technology; population and public health; value-based care; health system improvement and systems thinking.	
Health Systems Science 2	Health systems science is a foundational platform and framework for the study and understanding of how care is delivered for patients and populations within systems of medical care, how health professionals work together to deliver that care, and how the health system can improve patient care and health care delivery. This course builds upon core domains introduced in Health Systems Science 1 including: health care structures and processes; health care policy, economics, and management; clinical informatics and health information technology; population and public health; value-based care; health system improvement and systems thinking.	Year 2
Foundations of Health and Medicine	The Foundations of Medicine course serves as a foundation for future learning and practice. This course will focus on integrating basic principles of medical and biological sciences as the foundation for the curriculum.	Year 3
Endocrinology & Metabolism	During the Endocrinology and Metabolism course, students will learn how the endocrine system integrates with the rest of the body. The course covers the different endocrine glands: how the hormones have profound effects on the cells and tissues of the body; and the feedback loops that are important in hormonal regulation. Students will have a chance to learn about basic endocrine anatomy, physiology, pathology and biochemistry, as well as clinical aspects of endocrine diseases. Discovery learning, team-based learning, in-class review sessions and self-study materials cover major endocrine topics.	Year 3
Cardiovascular Medicine	The Cardiology course will serve as a foundation for future learning and practice. The goal is to provide students with an introduction to the fundamentals of cardiology medicine. Topics to be covered include the <ul style="list-style-type: none"> <li>• basic structure and function of the cardiovascular system</li> </ul>	Year 3

	<ul style="list-style-type: none"> <li>● clinical picture of ventricular or valvular diseases, electrical diseases of the heart, including an approach to ECG reading</li> <li>● coronary and aortic / peripheral arterial diseases</li> <li>● congenital heart diseases</li> <li>● myocardial and pericardial disease</li> </ul>	
Pulmonary Medicine	The Pulmonary serves as a foundation for future learning and practice. The goal is to provide students with an introduction to the fundamentals of pulmonary medicine.	Year 3
Renal Medicine	<p>The Renal course will serve as a foundation for future learning and practice. The goal is to provide students with an introduction to the fundamentals of renal medicine.</p> <p>Topics to be covered include:</p> <ul style="list-style-type: none"> <li>● Basic anatomy, physiology, embryology and pathology of the renal system;</li> <li>● Acute and chronic renal failure;</li> <li>● Pharmacology of the kidney;</li> <li>● Diseases of the glomerulus;</li> <li>● Tubulointerstitial disease;</li> <li>● Renovascular disease;</li> <li>● Pediatric nephrology; and</li> <li>● Hereditary and cystic renal disease</li> </ul>	Year 3
Health Systems Science 3	Health systems science is a foundational platform and framework for the study and understanding of how care is delivered for patients and populations within systems of medical care, how health professionals work together to deliver that care, and how the health system can improve patient care and health care delivery. This course builds upon core domains introduced in Health Systems Science 1 and 2 including: health care structures and processes; health care policy, economics, and management; clinical informatics and health information technology; population and public health; value-based care; health system improvement and systems thinking.	Year 3
Gastroenterology & Nutrition	<p>The Gastroenterology and Nutrition Course will serve as a foundation for future learning and practice. The goal is to provide students with an introduction to the fundamentals of gastroenterology.</p> <p>Topics to be covered include:</p> <ul style="list-style-type: none"> <li>● The structure and function of the gastrointestinal tract</li> </ul>	Year 4



	<ul style="list-style-type: none"> <li>● Gastrointestinal health and nutrition</li> <li>● Common diseases of the gastrointestinal tract</li> <li>● Fundamentals of gastrointestinal disease management</li> <li>● The impact of gastrointestinal disease on patients and society.</li> </ul>	
Reproductive Medicine & Urology	<p>The Reproductive Medicine and Urology Course that provides students with a strong knowledge base in the fundamentals of reproductive medicine, urology. Topics to be covered include:</p> <ul style="list-style-type: none"> <li>● An overview of the anatomy, pathophysiology, presentation, diagnosis and treatment of common gynecologic, obstetric (including genetic), urologic, and sexually transmitted illnesses.</li> </ul>	Year 4
Musculoskeletal System	<p>The Musculoskeletal System course provides students with a strong knowledge base in the fundamentals of musculoskeletal medicine. The anatomy, embryology, histology and physiology of the musculoskeletal system and skin are studied. An approach to common and important conditions and disorders of the musculoskeletal system and skin are covered from the perspectives of rheumatology, physical medicine and rehabilitation, orthopedics, dermatology, plastic surgery, pediatrics and family medicine.</p>	Year 4
Neurosciences and Organs of Special Senses -	<p>The Neurosciences and Organs of Special Senses course provides students with a foundation in the areas of Neurology, Neurosurgery, Ophthalmology, ENT and Developmental Pediatrics. Throughout the course, students will learn the approach to a patient with common symptoms or important problems; the elements of the neurological, eye, and head and neck exam, as well as perform a developmental assessment; to develop the ability to localize lesions, all while being able to recognize serious processes requiring urgent referral.</p>	Year 4
Psychiatry	<p>The Psychiatry course provides students with foundational knowledge regarding mental health and illness. Students will learn how to describe why mental health is important and the cost to society of mental illness. They will also learn to describe the stigma of mental illness and its impact on physician health.</p>	Year 4

Oncology	The Oncology course is designed to help students to understand the principles of oncology and recognize the importance of a multidisciplinary approach to cancer care while caring for patients with cancer.	Year 4
Health Systems Science 4	Health systems science is a foundational platform and framework for the study and understanding of how care is delivered delivery for patients and populations within systems of medical care, how health professionals work together to deliver that care, and how the health system can improve patient care and health care delivery. This course builds upon core domains introduced in Health Systems Science 1, 2 and 3 including: health care structures and processes; health care policy, economics, and management; clinical informatics and health information technology; population and public health; value-based care; health system improvement and systems thinking.	Year 4

## **Course Objectives by course:**

### **Foundations of Medicine**

#### Course Objectives

#### **Medical expert**

- Explain fundamentals of key topics (anatomy, physiology, histology, genetics, pharmacology, immunology, embryology, microbiology)
- Describe a patient-centered approach to problem solving and clinical decision-making.
- Apply basic principles of hematology, pathology/laboratory medicine, medical genetics and infectious disease from basic science to clinical application.
- Demonstrate understanding of infectious diseases in the context of global health issues.

#### **Communicator**

- Demonstrate the ability to be facilitative in communication and interaction with others.
- Gather information about a patient's beliefs, concerns, expectations and illness experience.
- Explain the importance of effective patient-centered communication in the patient-physician relationship and its effect on patient outcomes.
- Deliver information in a professional manner and in such a way that is understandable, encourages discussion and participation in decision-making.
- Discuss patient encounters and the importance of treating patients with respect and maintaining patient confidentiality.
- Demonstrate awareness and sensitivity to human differences, including differences in age, gender, disability, sexual orientation, ethnicity, and cultural background, socioeconomic or psychosocial factors.
- Provide and be receptive to constructive and professional feedback to and from peers and preceptors about their communication practices and group work interactions.

#### **Collaborator**

- Describe the role and responsibilities of other healthcare professionals. ● Recognize one's own differences, biases, assumptions and limitations that may contribute to inter-professional tension.
- Work collaboratively with others.
- Explain how to work effectively in a team to achieve an appropriate outcome. ● Interact respectfully and professionally with small group and team members and describe the value of team members

#### **Leader**

- Make proficient use of technology assisted learning as it is deployed in this course. ● Explain the role of the physician with regards to helping patients navigate the healthcare system.
- Discuss the concept of resource allocation in the management of the individual patient's healthcare within the whole health system.

#### **Scholar**

- Facilitate the learning of self and others in various small-group and team-based settings.

- Demonstrate ability to engage in self-directed learning based on reflective practice and life-long learning principles.
- Understand how to formulate a clinical question and search the literature using the library website and other resources.
- Research the information required (including evidence-based resources and other resources) in order to prepare for presenting possible diagnostic and management options for discussion.
- Begin to critically appraise retrieved evidence and information and demonstrate integration of new learning.
- Apply the concepts of validity, importance and applicability to help clinicians answer clinical questions and patients' questions regarding therapy, harm, diagnosis, prognosis, and screening.
- Provide and receive effective feedback.

#### Health advocate

- Recognize different points of view regarding culture, religion, beliefs, illness, disease, medicine, and medical practices and discuss in an open and non-judgmental manner.
- Describe how different social determinants of health influence how the patient copes with an illness, influences health, disease and disability, influences access to health care services and how they may or may not receive support.
- Identify emerging and ongoing issues for populations who are vulnerable.
- Identify points of influence in the healthcare system and its structure.
- Explain the concept of social accountability, principles of community engagement in responding to the needs of the community.

#### Professional

- Adhere to the Wenzhou Medical University and University of Alberta, Faculty of Medicine and Dentistry Code of Conduct and to the Professional Standards for Students in the Faculty of Medicine and Dentistry.
- Define professionalism as the key values required in the profession, including honesty, integrity, maintaining appropriate patient boundaries, maintaining confidentiality, and a commitment to patient well-being.
- Define professionalism in the context of medical school, and within the medical profession, and to apply its principles to all activities, including during assignments, small group interactions, examinations, self-assessment, peer-assessment, faculty assessment, online in social media etc.
- Discuss the importance of context in the interpretation of professionalism.
- Describe how each physician has the obligation to actively maintain professional competence participate in peer/colleague assessment and self-assessment as applicable.
- Explain how self-reflection facilitates the student's professional identity formation, and shapes their approach to all patients.
- Discuss basic legal and ethical challenges that physicians face in practice, and begin to apply key concepts to navigate these challenges.
- Give constructive and professional feedback and assessment to their peers and colleagues about attitudes, behaviors, practices and group work interactions in a structured manner.
- Demonstrate a sense of responsibility: taking initiative, carrying out assigned duties exhibiting dependability and self-direction.

- Demonstrate punctuality.
- Recognize and appropriately respond to ethical issues encountered during the course. ●
- Recognize factors such as fatigue, stress, and competing demands/roles that impact on personal and professional performance. Seek assistance when professional or personal performance is compromised.
- Contribute to Team Based Learning (TBL) and Discovery Learning (DL) and small group discussion in a respectful manner.

## **Endocrinology & Metabolism**

### Course Objectives

#### **Medical expert**

- Obtain a history related to an endocrine case.
- Explain symptoms and signs encountered in common endocrine diseases:
  - polyuria and polydipsia
  - fatigue
  - weight loss
  - fractures and reduced bone density
  - hypertension/hypotension
  - weight gain/obesity
  - hirsutism
  - changes in growth and development
  - changes in pubertal onset or progression
  - erectile dysfunction, gynecomastia
  - nausea, headache, palpitations and sweating
  - vomiting
  - hypercalcemia/hypocalcemia
  - adrenal insufficiency
  - hypoglycemia/ hyperglycemia
  - hyperthyroidism/hypothyroidism
  - hypogonadism in males
  - panhypopituitarism
- Identify appropriate laboratory and imaging investigations used in the diagnosis and management of endocrine diseases.
- Explain the origin and biology of common endocrine disorders throughout the life span.
- Develop a reasonable systematic approach to the diagnosis and management of possible endocrine causes of common clinical presentations.
- Explain complications of diabetes.
- Describe nutritional principles as they apply to management of diabetes.

#### **Communicator**

- Demonstrate the ability to be facilitative with peers, patients, families, caregivers, community resources and interdisciplinary team members.
- Gather information about a patient's beliefs, concerns, expectations and illness experience.

- Explain the importance of effective patient-centered communication in the patient-physician relationship and its effect on patient outcomes.
- Recognize and demonstrate best practice on how the verbal and non-verbal cues affect the patient-physician relationship and patient outcomes.
- Deliver information in a professional, patient-centered manner and in such a way that is understandable and encourages discussion and participation in decision-making.
- Discuss patient encounters and the importance of treating patients with respect and maintaining patient confidentiality.
- Demonstrate awareness and sensitivity to human differences, including differences in age, gender, disability, sexual orientation, ethnicity, cultural background, socioeconomic or psychosocial factors.
- Provide and be receptive to constructive and professional feedback to and from peers and preceptors about their communication practices and group work interactions.

### **Collaborator**

- Discuss the role of gastroenterologists, general surgeons, dieticians, and other health professionals in the management of gastrointestinal disease in adult and children
- Describe the roles and responsibilities of other healthcare professionals.
- Recognize one's own differences, biases, assumptions and limitations that may contribute to interprofessional tension.
- Work collaboratively with others.
- Explain how to work effectively in a team to achieve an appropriate outcome.
- Interact respectfully and professionally with small group and team members and describe the value of team members.

### **Leader**

- Explain the leadership role of the physician with regards to helping patients navigate the healthcare system.
- Discuss the concept of resource allocation in the management of the individual patient's healthcare within the whole health system.
- Discuss and begin to incorporate cost perspectives into clinical decision-making.
- Make proficient use of technology assisted learning as it is deployed in this course.

### **Scholar**

- Facilitate the learning of self and others in various small-group and team-based settings.
- Demonstrate the ability to engage in self-directed learning based on reflective practice and life-long learning principles.
- Understand how to formulate a clinical question and search the literature using the library website and other resources.
- Identify the history of medical research as it applies to the discovery of insulin.
- Research the information required (including evidence-based resources and other resources) in order to prepare for presenting possible diagnostic and management options for discussion.
- Critically appraise retrieved evidence and information and demonstrate integration of new learning.

- Apply the concepts of validity, importance and applicability to help clinicians answer clinical questions and patients' questions regarding therapy, harm, diagnosis, prognosis, and screening.
- Provide and receive effective feedback.

### **Health advocate**

- Recognize different points of view regarding culture, religion, beliefs, illness, disease, medicine, and medical practices and discuss in an open and non-judgmental manner.
- Describe how different social determinants of health influence how the patient copes with an illness, disease and disability; and how they affect access to health care services.
- Identify emerging and ongoing issues for populations who are vulnerable.
- Identify points of influence in the healthcare system and its structure.
- Explain the concept of social accountability and principles of community engagement in responding to the needs of the community.
- Understand factors contributing to the obesity epidemic and describe prevention and treatment strategies for obesity.

### **Professional**

- Adhere to the Wenzhou Medical University and University of Alberta Faculty of Medicine and Dentistry Code of Conduct and to the Professional Standards for Students in the Faculty of Medicine and Dentistry.
- Define professionalism as the key values required in the profession, including honesty, integrity, maintaining appropriate patient boundaries, maintaining confidentiality, and a commitment to patient well-being.
- Define professionalism in the context of medical school, and within the medical profession, and apply its principles to all activities, including during assignments, small group interactions, examinations, self-assessment, peer-assessment, faculty assessment, online in social media, etc.
- Discuss the importance of context in the interpretation of professionalism.
- Discuss how each physician has the obligation to actively maintain professional competence and participate in peer/colleague assessment and self-assessment as applicable.
- Explain how self-reflection facilitates the student's professional identity formation and shapes their approach to all patients.
- Discuss basic legal and ethical challenges that physicians face in practice and begin to apply key concepts to navigate these challenges.
- Give constructive and professional feedback and assessment to their peers and colleagues about attitudes, behaviors, practices and group work interactions in a structured manner.
- Demonstrate a sense of responsibility: taking initiative, carrying out assigned duties, and exhibiting dependability and self-direction.
- Demonstrate punctuality.
- Recognize and appropriately respond to ethical issues encountered during the course.
- Recognize factors such as fatigue, stress, and competing demands/roles that impact on personal and professional performance. Seek assistance when professional or personal performance is compromised.
- Contribute to Discovery Learning (DL) discussion in a respectful manner.

## **Cardiovascular System**

### Course Objectives

#### **Medical expert**

- Describe the characteristics of cardiac anatomy & physiology of the cardiovascular system, normal heart function, how cardiovascular system adapts to various loads, heart dysfunction / failure, valve dysfunction and coronary artery disease.
- Demonstrate an understanding of endocardial diseases including valve diseases and basic arrhythmias and their effect on heart function.
- List the causes and definition of syncope, including the history and physical findings to suggest cause, and to differentiate from other causes of loss of consciousness.
- Demonstrate a systematic approach to the interpretation of electrocardiography (ECG), including rhythm interpretation, arrhythmias including their causes and classifications and use of anti-arrhythmic drugs.
- Correlate the embryology of great vessels and heart with congenital heart diseases including cyanotic and acyanotic causes.
- List the different types of cardiomyopathies and their causes: dilated, hypertrophic and restrictive (+rarer types).
- Demonstrate an understanding of atherosclerosis, coronary disease (stable and unstable), venous diseases, aortic syndromes and peripheral vascular disease including pathophysiology, signs, symptoms, diagnosis and management.
- Describe the clinical features, pathophysiology, investigations and principles of treatment of pericardial diseases including pericarditis, tamponade and pericardial constriction

#### Communicator

- Ability to formulate / challenge learning issues and research presented in discovery learning sessions

#### **Collaborator**

- Ability to work well in group format in discovery learning to help work through weekly discovery learning cases, encouraging group interaction and learning

#### Leader

#### **Scholar**

- Demonstrating ability to research learning issues raised during discovery learning but also in various labs / whole class learning

#### **Health advocate**

- Discuss the physical and psychosocial effects of cardiac disease on children and adults.

#### **Professional**

- Adhere to the WMU and University of Alberta, Faculty of Medicine and Dentistry Code of Conduct and to the Professional Standards for Students in the Faculty of Medicine and Dentistry.
- Give constructive and professional feedback and assessment to their peers and colleagues about attitudes, behaviors, practices and group work interactions in a structured manner.



- Demonstrate a sense of responsibility: taking initiative, carrying out assigned duties, exhibiting dependability and self-direction.
- Demonstrate punctuality.
- Recognize and appropriately respond to ethical issues encountered during the course.
- Recognize factors such as fatigue, stress, and competing demands/roles that impact on personal and professional performance. Seek assistance when professional or personal performance is compromised.
- Contribute to Discovery Learning (DL) discussion in a respectful manner.

## **Pulmonary System**

### Course Objectives

#### **Medical expert**

- Recognize a patient with life-threatening respiratory disease
- Discuss the potential communicability of specific respiratory disorders (as well as methods to prevent their spread within health care facilities and the community)
- Discuss the basic concepts of respiratory resuscitation, including airway management, ventilation and oxygenation
- Perform a physical examination focusing on the respiratory system
- Explain the pathophysiology of common respiratory physical signs
- Use physical findings to diagnose common respiratory disorders such as pleural effusion, consolidation, pneumothorax and pulmonary fibrosis
- Use data from an arterial blood gas to identify abnormalities of gas exchange
- Use data from an arterial blood gas to identify common acid-base disorders
- Interpret a spirogram and a simple pulmonary function test
- Demonstrate a systematic approach to the interpretation of a chest radiograph
- Identify normal anatomic structures on a chest radiograph and chest CT
- Identify chest radiograph manifestations of common respiratory pathology including atelectasis, COPD, lung nodules/masses, pleural effusion, pneumonia, pneumothorax and pulmonary edema
- Discuss the following procedures: airway management using a bag and mask device, thoracentesis and tube thoracostomy
- Describe the clinically relevant embryologic and fetal development of the respiratory system
- Explain how the respiratory system changes through the course of the human life cycle
- Describe the clinically relevant histology of the respiratory system
- Recognize clinically relevant anatomic components of the chest wall, pleural space, mediastinum, lung, neck and head
  - Demonstrate an understanding of surface anatomy of the respiratory system
  - Correlate anatomic knowledge with chest radiograph and chest CT images
  - Discuss the pharmacology of common respiratory medications such as
    - Short-Acting Beta-Agonists, Long-Acting Beta-Agonists, Short-Acting Anticholinergics, Long-Acting Muscarinic-Antagonists, Leukotriene-Receptor Antagonists and corticosteroids (Inhaled Corticosteroids, systemic steroids)
  - Describe the etiology, pathophysiology, epidemiology, clinical manifestations, diagnosis, prevention and treatment of the following clinical conditions:

- Asthma
- COPD
- Common congenital disorders of the respiratory system
- Cystic Fibrosis
- Recognize and demonstrate an approach to the following symptoms/clinical presentations:
  - Chest pain (cardiac and non-cardiac)
  - Cough (acute and chronic)
  - Dyspnea
  - Hemoptysis
  - Sputum
  - Stridor
  - Wheeze
- Recognize respiratory conditions common to pediatric, adult and geriatric patients and populations (describe the etiology, pathophysiology, epidemiology, clinical manifestations, diagnosis, prevention and treatment of the following clinical conditions (refer to session-specific objectives for details):
  - Asthma
  - COPD
  - Common congenital disorders of the respiratory system
  - Cystic Fibrosis
  - Hyaline membrane disease (respiratory distress syndrome)
  - Idiopathic Pulmonary Fibrosis (as the most common example of interstitial lung disease)
  - Lung cancer
  - Occupational/environmental lung disease (asbestosis, occupational asthma) o Otitis media
  - Pleural effusion
  - Pneumonia
  - Pneumothorax
  - Respiratory failure
  - Sleep disordered breathing (snoring, obstructive sleep apnea, central sleep apnea, narcolepsy)
  - Tobacco addiction
  - Tuberculosis
  - Upper respiratory tract infections
  - Venous thromboembolic disease

### **Communicator**

- Ability to formulate / challenge learning issues and research presented in discovery learning sessions

### **Collaborator**

- Ability to work well in group format in discovery learning to help work through weekly discovery learning cases, encouraging group interaction and learning

### **Leader**

- Managing time demands from course work

### **Scholar**

- Demonstrating ability to research learning issues raised during discovery learning but also in various labs / whole class learning

### **Health advocate**

- Consider the physical and psychosocial effects of cardiac disease on children and adults.

### **Professional**

- Adhere to the WMU and University of Alberta, Faculty of Medicine and Dentistry Code of Conduct and to the Professional Standards for Students in the Faculty of Medicine and Dentistry.
- Give constructive and professional feedback and assessment to their peers and colleagues about attitudes, behaviors, practices and group work interactions in a structured manner.
- Demonstrate a sense of responsibility: taking initiative, carrying out assigned duties, exhibiting dependability and self-direction.
- Demonstrate punctuality.
- Recognize and appropriately respond to ethical issues encountered during the course.
- Recognize factors such as fatigue, stress, and competing demands/roles that impact on personal and professional performance. Seek assistance when professional or personal performance is compromised.
- Contribute to Discovery Learning (DL) discussion in a respectful manner.

### **Renal System**

#### Course Objectives

#### **Medical expert**

- Describe features of the history and physical exam that are indicative of renal disease.
- Define the following signs and symptoms of renal disease: gross hematuria, peripheral edema, pulmonary edema, hypertension, flank pain, nocturia, foamy urine/proteinuria, costovertebral angle tenderness, abdominal masses, features of uremia.
- Identify methods used to screen for and investigate renal disease, including urinalysis and methods to assess GFR, urine culture, serum electrolytes, renal biopsy, and renal imaging.
- Demonstrate an approach to the following clinical presentations:
  - Hematuria
  - Proteinuria
  - Edema/Volume overload
  - Dysnatremias (hyponatremia and hypernatremia)
  - Hypokalemia and hyperkalemia
  - Acidosis and alkalosis
- Describe the pathophysiology, presenting signs and symptoms, differential diagnoses, clinical manifestations, complications, investigations and management for the following clinical conditions:
  - Acute renal failure

- Chronic renal failure in adults
- Hypertension
- Glomerulonephritis – nephritic
- Glomerulonephritis – nephrotic
- Diabetic nephropathy
- Tubulointerstitial disorders
- Vesicoureteric reflux (VUR) in children
- Pediatric chronic kidney disease (CKD)
- Hereditary and cystic renal disease
- Renovascular disease (RVD)
- Apply knowledge of early referral for education and access planning for dialysis patients
- Recognize the risks and disease prevention strategies for patients with ESKF.
- Describe the embryologic development of the genitourinary tract and some developmental abnormalities that could lead to congenital malformations of the kidneys, ureters and urinary bladder.
- Explain the histology of the nephron and how its structure relates to kidney function.
- Discuss the anatomy of the kidney and ureter.
- Discuss the physiology of the renal system, including:
  - GFR and tubular function
  - Sodium and water handling
  - Potassium handling
  - Acid base management
- Recognize the pathology associated with common renal diseases
- Discuss the relationship between pharmacology and renal function:
- Mechanism of action, clinical use, and side effects of diuretics drugs.
- Clearance and accumulation of medications: the impact of chronic kidney disease on drug pharmacokinetics and drug dosing, and common drug nephrotoxicity.
- Describe the basic science behind dialysis.

### **Communicator**

- Demonstrate the ability to be facilitative with peers, patients, families, caregivers, community resources and interdisciplinary team members.
- Gather information about a patient’s beliefs, concerns, expectations and illness experience.
- Explain the importance of effective patient-centered communication in the patient-physician relationship and its effect on patient outcomes.
- Recognize and demonstrate best practice on how the verbal and non-verbal cues affect the patient-physician relationship and patient outcomes.
- Deliver information in a professional patient-centered manner and in such a way that is understandable, encourages discussion and participation in decision-making.
- Discuss patient encounters and the importance of treating patients with respect and maintaining patient confidentiality.
- Demonstrate awareness and sensitivity to human differences, including differences in age, gender, disability, sexual orientation, ethnicity, cultural background, socioeconomic or psychosocial factors.

- Provide and be receptive to constructive and professional feedback to and from peers and preceptors about their communication practices and group work interactions.

### **Collaborator**

- Describe the role and responsibilities of other healthcare professionals.
- Recognize one's own differences, biases, assumptions and limitations that may contribute to interprofessional tension.
- Work collaboratively with others.
- Explain how to work effectively in a team to achieve an appropriate outcome.
- Interact respectfully and professionally with small group and team members and describe the value of team members.

### **Leader**

- Make proficient use of technology assisted learning as it is deployed in this course.
- Explain the role of the physician with regards to helping patients navigate the healthcare system.
- Discuss the concept of resource allocation in the management of the individual patient's healthcare within the whole health system.
- Discuss and begin to incorporate the cost perspectives into clinical decision-making.

### **Scholar**

- Facilitate the learning of self and others in various small-group and team-based settings.
- Demonstrate ability to engage in self-directed learning based on reflective practice and life-long learning principles.
- Understand how to formulate a clinical question and search the literature using the library website and other resources.
- Research the information required (including evidence-based resources and other resources) in order to prepare for presenting possible diagnostic and management options for discussion.
- Critically appraise retrieved evidence and information and demonstrate integration of new learning.
- Apply the concepts of validity, importance and applicability to help clinicians answer clinical questions and patients' questions regarding therapy, harm, diagnosis, prognosis, and screening.
- Provide and receive effective feedback.

### **Health advocate**

- Recognize different points of view regarding culture, religion, beliefs, illness, disease, medicine, and medical practices and discuss in an open and non-judgmental manner. ● Describe how different social determinants of health influence how the patient copes with an illness, influences health, disease and disability, influences access to health care services and how they may or may not receive support.
- Identify emerging and ongoing issues for populations who are vulnerable.
- Identify points of influence in the healthcare system and its structure.
- Explain the concept of social accountability, principles of community engagement in responding to the needs of the community.

### **Professional**

- Adhere to the WMU and University of Alberta, Faculty of Medicine and Dentistry Code of Conduct and to the Professional Standards for Students in the Faculty of Medicine and Dentistry.
- Define professionalism as the key values required in the profession, including honesty, integrity, maintaining appropriate patient boundaries, maintaining confidentiality, and a commitment to patient well-being.
- Define professionalism in the context of medical school, and within the medical profession, and to apply its principles to all activities, including during assignments, small group interactions, examinations, self-assessment, peer-assessment, faculty assessment, online in social media etc.
- Discuss the importance of context in the interpretation of professionalism.
- Discuss that self-regulation of the profession is a privilege and as such, each physician has the obligation to actively maintain professional competence participate in peer/colleague assessment and self-assessment as applicable.
- Explain how self-reflection facilitates the student's professional identity formation and shapes their approach to all patients.
- Discuss basic legal and ethical challenges that physicians face in practice and begin to apply key concepts to navigate these challenges.
- Give constructive and professional feedback and assessment to their peers and colleagues about attitudes, behaviors, practices and group work interactions in a structured manner.
- Demonstrate a sense of responsibility: taking initiative, carrying out assigned duties exhibiting dependability and self-direction.
- Demonstrate punctuality.
- Recognize and appropriately respond to ethical issues encountered during the course. ● Recognize factors such as fatigue, stress, and competing demands/roles that impact on personal and professional performance. Seek assistance when professional or personal performance is compromised.
- Contribute to Discovery Learning (DL) discussion in a respectful manner.

### **Gastroenterology & Nutrition**

#### Course Objectives

#### **Medical expert**

- Describe the presentation, pathophysiology, clinical findings, diagnosis and management or treatment of the following disorders in adults:
  - Gastroesophageal reflux disease
  - Gastrointestinal bleeding
  - Acute and chronic liver disease
  - Viral hepatitis (A-E)
  - Non-viral hepatitis (including alcoholic hepatitis, hemochromatosis, Wilson's disease, primary biliary cirrhosis, autoimmune hepatitis, primary sclerosing cholangitis, NASH) o Cirrhosis and hepatic failure
  - Gallstone disease
  - Acute and chronic diarrhea
  - Acute and chronic pancreatitis

- Celiac disease
  - Inflammatory bowel disease (Crohn's disease and ulcerative colitis)
  - Diverticular disease
  - Irritable bowel syndrome
  - GI cancers (esophageal, gastric, pancreatic, colon)
  - Rectal bleeding
  - Acute abdominal pain
  - Chronic lower abdominal pain
  - Fecal incontinence
  - Systemic disease that manifest in the oral cavity
  - Adverse food reactions (food hypersensitivity/allergy and anaphylaxis, food intolerance)
- Describe the presentation, pathophysiology, clinical findings, diagnosis, and management or treatment of the following disorders in children:
- Gastroesophageal reflux disease
  - Eosinophilic esophagitis
  - Peptic ulcer disease
  - Celiac disease
  - Congenital malformations (tracheoesophageal fistula, pyloric stenosis, intussusception, Meckel's diverticulum)
  - Neonatal jaundice and congenital liver abnormalities
  - Inflammatory bowel disease
  - Acute and chronic diarrhea
  - Constipation
  - Abdominal pain
  - Rectal bleeding
  - Adverse food reactions (food hypersensitivity/allergy and anaphylaxis, food intolerance)

Discuss principles of nutrition, and define and describe the following nutritional concepts:

- A normal diet
  - Malnutrition measurement
  - Indications for enteral or parenteral nutrition
- Describe principles of nutrition in the newborn, toddler and child, and discuss the following concepts:
- Benefits of breastfeeding in infants
  - Nutrition monitoring, e.g., growth charts
- Describe the general guidelines for screening of colon cancer.
- List the immunizations available for viral hepatitis.
- Provide a comprehensive targeted GI-symptom medical history.
- Perform a physical examination for focusing on the GI system.
- Define and develop an approach to common presenting symptoms and signs of GI disease in adults and children, including:
- Heartburn
  - dyspepsia
  - dysphagia

- chest pain
  - odynophagia
  - hematemesis
  - hematochezia
  - jaundice
  - ascites
  - hepatic encephalopathy
  - biliary colic
  - fatigue
  - nausea
  - vomiting
  - abdominal pain
  - diarrhea
  - constipation
  - anorexia
  - weight loss
  - anemia
  - tenesmus
  - fecal incontinence
- List the investigations, along with their main indicators, that are commonly used in gastroenterology, including endoscopy, radiography (abdominal x-rays, fluoroscopy studies, abdominal ultrasound, CT or MR), blood work, stool cultures, fecal occult blood testing, urea breath test.
  - Develop a systematic approach to the interpretation of abdominal x-rays.
  - Analyze and interpret liver function tests.
  - Describe the physiology of the gastrointestinal system, including:  
The oral cavity (salivary secretion)  
Esophagus (esophageal motility)  
Stomach (gastric motility and gastric acid secretion)  
Small intestine (absorption of nutrients)  
Large intestine (intestinal transport of fluid and electrolytes)  
Liver (role in drug metabolism and bilirubin metabolism)  
Pancreas (macronutrient digestion)
  - Describe the anatomy and identify key structures of the abdomen, including the anterior and posterior abdominal walls, inguinal region, abdominal cavity, peritoneum and abdominal viscera, and retroperitoneal structures.
  - Describe the embryological development of the abdominal cavity and gastrointestinal system and apply this knowledge to various congenital anomalies of the GI system.
  - Describe the histology of the gastrointestinal tract, in particular the oral cavity, esophagus, and gastroesophageal junction.
  - Describe the pharmacologic principles and the types of the drugs used in gastric acid suspension, laxatives and anti-diarrheal agents.

### **Communicator**



- Demonstrate the ability to be facilitative with peers during the Gastroenterology and Nutrition course
- Discuss patient encounters and the importance of treating patients with respect and maintaining patient confidentiality.
- Demonstrate awareness and sensitivity to human differences, including differences in age, gender, disability, sexual orientation, ethnicity, cultural background, socioeconomic or psychosocial factors.
- Provide and be receptive to constructive and professional feedback to and from peers and preceptors about their communication practices and group work interactions.

### **Collaborator**

- Discuss the role of gastroenterologists, general surgeons, dieticians, and other health professionals in the management of gastrointestinal disease in adult and children
- Describe the roles and responsibilities of other healthcare professionals.
- Recognize one's own differences, biases, assumptions and limitations that may contribute to interprofessional tension.
- Work collaboratively with others.
- Explain how to work effectively in a team to achieve an appropriate outcome.
- Interact respectfully and professionally with small group and team members and describe the value of team members.

### **Leader**

- Make proficient use of technology assisted learning as it is deployed in this course.
- Describe the role of physician as a steward of resources when selecting investigations.

### **Scholar**

- Facilitate the learning of self and others in various small-group and team-based settings.
- Demonstrate ability to engage in self-directed learning based on reflective practice and life-long learning principles.
- Understand how to formulate a clinical question and search the literature using the library website and other resources.
- Research the information required (including evidence-based resources and other resources) in order to prepare for presenting possible diagnostic and management options for discussion.
- Provide and receive effective feedback.

### **Health advocate**

- Recognize the impact of acute diarrhea due to poor sanitation as a global health problem.
- Recognize different points of view regarding culture, religion, beliefs, illness, disease, medicine, and medical practices and discuss in an open and non-judgmental manner.

### **Professional**

- Adhere to the WMU and University of Alberta, Faculty of Medicine and Dentistry Code of Conduct and to the Professional Standards for Students in the Faculty of Medicine and Dentistry.

- Give constructive and professional feedback and assessment to their peers and colleagues about attitudes, behaviors, practices and group work interactions in a structured manner.
- Demonstrate a sense of responsibility: taking initiative, carrying out assigned duties, exhibiting dependability and self-direction.
- Demonstrate punctuality.
- Recognize and appropriately respond to ethical issues encountered during the course.
- Recognize factors such as fatigue, stress, and competing demands/roles that impact on personal and professional performance. Seek assistance when professional or personal performance is compromised.
- Contribute to Discovery Learning (DL) discussion in a respectful manner.

## **Reproductive Medicine & Urology**

### Course Objectives

#### **Medical expert**

- Outline and perform the basic elements of a reproductive history in patients of both sexes.
  - Describe the indications and basic technique of procedures unique to reproductive medicine (pelvic examination, Pap smear, digital rectal examination, uncomplicated labour and delivery).
- Identify the differences between common benign and malignant scrotal lesions.
- List the presenting symptoms of and basic treatment principles in diagnosing genitourinary trauma (kidney, bladder & urethra).
- Demonstrate a basic understanding of the treatment of benign prostatic hyperplasia (BPH), prostate cancer and other common inflammatory disorders of the prostate.
- Demonstrate basic understanding of the diagnosis and treatment of common urologic malignancies (renal cell carcinoma, transitional cell carcinoma of the bladder, and testis cancer).
- Explain the basic causes and general treatment options for urinary incontinence.
- Learn to classify, diagnose and develop an approach to treatment of urinary tract infections (bacterial cystitis, pyelonephritis, epididymitis, and prostatitis).
- Recognize and discuss the basic diagnosis and management of common pediatric urologic diseases (nocturnal enuresis, vesicoureteral reflux, cryptorchidism, testicular torsion and hypospadias).
- Diagnose and manage basic clinical concepts in urinary calculus disease. · Outline the surgical and non-surgical management of prolapse and urinary incontinence. · Explain the pathogenesis and associated sequelae of endometriosis and describe the signs and symptoms, surgical findings, diagnosis and the management of endometriosis.
- Define chronic pelvic pain and discuss the incidence, causes, pathophysiology, diagnostic procedures, and management of the heterogeneous group of disorders.
- Define primary and secondary dysmenorrhea and describe the causes, evaluation and management of each.
- Define abnormal uterine bleeding and dysfunctional uterine bleeding, and describe the causes, pathophysiology, diagnosis and management options for each.
- Describe the physiologic changes in the hypothalamic-pituitary-ovarian axis related to the climacteric and menopause and the associated physical, emotional, and sexual signs and symptoms.

- Define primary and secondary male and female infertility, describing for each the causes and approach to diagnosis and management.
- Describe the indications, contraindications, risks, and benefits of the treatments for menopause, including hormonal replacement, nutrition, exercise, and non-hormonal therapeutic options.
- Describe the rationale and methods of Pap smear screening for cervical dysplasia including colposcopy.
- Explain the typical management of cervical premalignant diseases.
- Explain the common course, diagnosis, and management of cervical cancer.
- Describe the symptoms, physical findings of uterine leiomyomas (fibroids) including methods of diagnosis and treatment.
- Outline the approach to the patient with postmenopausal vaginal bleeding.
- List the risk factors and symptoms/physical findings characteristic of endometrial carcinoma, the methods used in diagnosis and staging of the disease, and the typical disease course.
- List the differential diagnosis and management of the adnexal mass depending on age and mass characteristics.
- Describe the symptoms, physical findings, risk factors, diagnostic methods, histological classification of functional, benign and malignant ovarian tumors.
- Formulate an approach to investigation of medical complications [diseases] in pregnancy including the importance of appropriate testing for fetal health and well as monitoring of the maternal condition.
- Explain the initial and ongoing elements of antepartum care, including methods to diagnose pregnancy and establish gestational age; determination of obstetric risk status; techniques to assess fetal growth, maturity and well-being; appropriate diagnostic studies; antepartum patient education; antepartum nutritional needs; adverse effects of drugs.
- Outline the basic complications and management of early pregnancy including spontaneous abortion, ectopic pregnancy, and gestational trophoblastic disease.
- Describe how pregnancy affects or is affected by medical conditions such as diabetes mellitus, chronic hypertension, heart disease, recurrent pregnancy loss, previous genetic abnormalities, maternal age over 35, substance abuse, medications, nutrition and exercise, immunizations, and the workplace (including environmental hazards).
- Discuss the potential complications of late pregnancy including: Pregnancy induced hypertension, antepartum vaginal bleeding, intrauterine growth retardation (IUGR), SPROM, preterm labour, postdates pregnancy, small and large for dates gestations, multiple gestations, and isoimmunization.
- Develop a basic understanding of the principles and interpretation of antepartum and intrapartum fetal monitoring including ultrasound and fetal heart tracing.
- Outline a basic understanding of the mechanisms of labour and delivery and the common problems encountered including CPD, dystocia, breech presentation, shoulder dystocia, etc.
- Synthesize basic knowledge of the normal 3rd stage of labour and puerperium and lactation, and the types of problems that can develop including postpartum hemorrhage and postpartum fever.

- Apply basic knowledge of the diagnosis, prevention and treatment of specific infectious agents that are transmitted sexually including: N. gonorrhoea, C. trachomatis, T. pallidum, H. simplex, HIV, T. vaginalis, and HPV.
- Elicit and interpret information from the history and physical examination to diagnose common syndromes associated with STI's.
- Diagram the mode of action, effectiveness, advantages, disadvantages, contraindications and complications of the reversible and non-reversible methods of birth control.
- Diagram the indications, alternatives, methods and complications of therapeutic abortion.
- Outline the basic assessment of newborn status and immediate postpartum care of the newborn, including situations requiring immediate intervention.
- Describe the basic embryology from fertilization to complete organ development (within the male & female urogenital systems).
- Apply this knowledge to various congenital abnormalities of the genitourinary tract.
- Identify & describe the anatomy and histological appearance of the male and female reproductive systems, external genitalia and bladder.
- Demonstrate an understanding of female physiology through the stages of reproductive life, with an emphasis on the menstrual cycle and its dysfunction.
- Describe the physiologic changes that occur in the pregnant woman from fertilization to puerperium.
- Outline male reproductive physiology beginning from puberty to adulthood. · Describe the physiology of bladder function (filling & emptying).
- Discuss the predisposing factors, anatomy and neuromuscular pathophysiology of female pelvic prolapse.
- Describe the basic anatomy, histology, and function of the placenta.
- Outline the changes in pharmacodynamics occurring in a pregnant woman and neonate
- Describe how disease frequency varies amongst ethnic groups and be able to identify ethnic groups at increased risk for fetal genetic disorders or maternal medical conditions that impact pregnancy outcome.

### **Communicator**

- Describe the considerations during initial counseling and support in situations involving potential or acute emotional reactions related to pregnancy loss, genitourinary surgery, and death/illness due to genitourinary cancer, sexual dysfunction, and abuse. · Demonstrate the ability to be facilitative with peers, patients, families, caregivers, community resources and interdisciplinary team members.
- Deliver information in a professional patient-centered manner and in such a way that is understandable, encourages discussion and participation in decision-making. · Discuss patient encounters and the importance of treating patients with respect and maintaining patient confidentiality.
- Demonstrate awareness and sensitivity to human differences, including differences in age, gender, disability, sexual orientation, ethnicity, cultural background, socioeconomic or psychosocial factors.
- Provide and be receptive to constructive and professional feedback to and from peers and preceptors about their communication practices and group work interactions.

### **Collaborator**

- Outline the role of physicians, nurses, psychologists, social workers, midwives and other health professionals in managing the spectrum of genitourinary illness and maintaining reproductive health
- Discuss the role of the physician, nurse, midwife and other health professionals in the care of the normal healthy pregnant woman and her newborn
- Recognize one's own differences, biases, assumptions and limitations that may contribute to interprofessional tension.
- Work collaboratively with others.
- Explain how to work effectively in a team to achieve an appropriate outcome. · Interact respectfully and professionally with small group and team members and describe the value of team members.

### **Leader**

- Make proficient use of technology assisted learning as it is deployed in this course. · Explain the Leader role of the physician with regards to helping patients navigate the healthcare system.
- Discuss the concept of resource allocation in the management of the individual patient's healthcare within the whole health system.

### **Scholar**

- Facilitate the learning of self and others in various small-group and team-based settings. · Demonstrate ability to engage in self-directed learning based on reflective practice and life-long learning principles.
- Understand how to formulate a clinical question and search the literature using the library website and other resources.
- Research the information required (including evidence-based resources and other resources) in order to prepare for presenting possible diagnostic and management options for discussion.
- Critically appraise retrieved evidence and information and demonstrate integration of new learning.
- Apply the concepts of validity, importance and applicability to help clinicians answer clinical questions and patients' questions regarding therapy, harm, diagnosis, prognosis, and screening.
- Provide and receive effective feedback

### **Health advocate**

- Demonstrate knowledge of the critical population and global health issues related to sexually transmitted infections, maternal and neonatal mortality, and Identify points of influence.
- Integrate knowledge of obstetrical health into health promotion and advocacy and identify points of influence in the healthcare system and its structure that could result in a decrease in worldwide maternal and neonatal mortality.
- Describe several options for mobilizing resources for the patient in need when concerning matters of reproductive health.

- Recognize different points of view regarding culture, religion, beliefs, illness, disease, medicine, and medical practices and discuss in an open and non-judgmental manner.
- Identify emerging and ongoing issues for populations who are vulnerable.

### **Professional**

- Explain and demonstrate with integrity and respect the physician's responsibility in caring for ethical matters in reproductive medicine (age of consent, therapeutic abortion, fetal rights, etc.).
- Demonstrate honesty and responsibility when caring for a patient with matters pertaining to reproductive health.
- Demonstrate respect and dignity when dealing with the psychosocial effects of genitourinary health and disease (such as puberty, pregnancy, contraception, malignancy or sexually transmitted illness).
- Be aware of his / her own attitude toward unique health problems involving reproductive health and disease.
- Discuss the principles of patient autonomy and decision making in reproductive medicine especially around the issues of contraception, abortion and intrapartum care.
- Apply key medical, ethical and legal principles to hypothetical clinical scenarios in reproductive medicine especially around the issues of contraception, abortion and intrapartum care.
- Respect patients' religious, moral, and ethical beliefs and biases, in regard to prenatal diagnostic tests and recognize the ethical, moral, and psychological implications of a positive prenatal screen.
- Explain and demonstrate with integrity and respect the physician's responsibility in caring for ethical matters in reproductive medicine (age of consent, therapeutic abortion, fetal rights, etc.).
- Demonstrate respect and dignity when dealing with the psychosocial effects of genitourinary health and disease (such as puberty, pregnancy, contraception, malignancy or sexually transmitted illness).
- Demonstrate punctuality.
- Give constructive and professional feedback and assessment to their peers and colleagues about attitudes, behaviors, practices and group work interactions in a structured manner.
- Demonstrate a sense of responsibility: taking initiative, carrying out assigned duties exhibiting dependability and self-direction.
- Recognize factors such as fatigue, stress, and competing demands/roles that impact on personal and professional performance. Seek assistance when professional or personal performance is compromised.
- Contribute to Discovery Learning (DL) discussion in a respectful manner.

### **Musculoskeletal System**

#### Course Objectives

The over-arching objectives for this course include the following:

- Understand the structure and function of the musculoskeletal system (including bone, joint, muscle, peripheral nerves, and skin) in terms of the anatomy, embryology, physiology, and pathophysiology of common musculoskeletal conditions.
- Develop a general approach to the clinical diagnosis of musculoskeletal and dermatological conditions, including but not limited to describing classifications and underlying mechanisms of musculoskeletal pain, identifying pertinent symptoms and clinical courses of typical presentations, and correlating pertinent physical examination findings with the underlying anatomy and pathophysiology.
- Develop an evidence-based and general approach to the use of appropriate investigation modalities with an understanding of indications and contraindications for use of different tests (blood work, imaging, pathology, etc.)
- Describe appropriate management options including conservative treatment, medications, and surgical interventions for common musculoskeletal and dermatological conditions.

### **Medical Expert**

Describe structure and function of the MSK system and skin particularly as they underlie normal processes and disease states

- Anatomy (including bones, joints, muscles and mechanics of movement, cutaneous and muscle nerve supply, vascular supply) of the musculoskeletal system:
  - Axilla and brachial plexus
  - Shoulder region
  - Arm, forearm and hand
  - Back
  - Gluteal region
  - Hip and thigh
  - Leg and foot
- Embryology:
- Outline the Embryological development of the limbs
- Physiology structure and organization of cartilage, bone, muscle and skin:
- Explain how the bone remodeling cycle occurs and apply this knowledge to relevant clinical scenarios (e.g., fracture healing stages, approximate fracture healing times, osteoporosis)
- Explain the skeletal muscle contractile cycle
- Describe the structure and function of the skin (including definition of the terms macule, papule, nodule, plaque, vesicle, cyst, ulcer)
- Describe a general approach to MSK pain including
- Describe the general classification of musculoskeletal diseases and compare and contrast the terms articular and non-articular MSK pain
- Compare and contrast inflammatory, mechanical, infectious, crystalline, traumatic, neoplastic and metabolic categories MSK pain
- Categorize joint pain using the terms non-articular pain, monoarthritis, oligoarthritis and polyarthritis; and acute arthritis, acute episodic arthritis and chronic arthritis
- Demonstrate an approach to broad musculoskeletal or skin presentations, including:
  - Joint pain

- Limp
- Neck/back pain
- Soft tissue pain
- Trauma
- Skin conditions and rash:
- Define and explain the relevance of common symptoms and signs encountered in MSK and rheumatologic histories and physical examinations including
- Constitutional and systemic symptoms (including weight loss, fever, fatigue)
- MSK symptoms (including morning stiffness, loss of function, loss of movement, arthralgia, proximal muscle weakness, limp and/or abnormal gait, joint crepitus, decreased range of motion, joint tenderness and effusions)
- Obtain a functional history (including definitions of impairment, disability and handicap, basic ADLs, instrumental ADLs)
- Perform common MSK examinations including:
  - Screening MSK Examination (including the Look, Move, Feel general approach and the GALS (gait arms legs spine) screening exam)
  - Orthopedic examination of the newborn
  - Knee Exam
  - Hip Exam
  - Shoulder Exam
  - Back exam
  - Neck exam
- Describe the clinical features, pathophysiology, investigations and principles of treatment of key MSK and skin diseases and
- Compare and contrast the clinical features of common and/or serious injuries and indications for referral to a specialist for:
- Rheumatologic Problems:
  - Osteoarthritis
  - Rheumatoid arthritis
  - Seronegative spondyloarthropathies (including ankylosing spondylitis, psoriatic arthritis, reactive arthritis (Reiter's syndrome), arthritis of inflammatory bowel disease)
  - Systemic Lupus Erythematosus (SLE)
  - Connective tissue diseases (including dermatomyositis and polymyositis, Sjogren's Syndrome, Scleroderma (systemic sclerosis))
  - Vasculitis (including temporal arteritis/giant cell arteritis)
  - Polymyalgia rheumatic
  - Fibromyalgia
  - Tendonitis, bursitis and overuse syndromes
  - Crystal-induced arthritis (including gout and pseudogout)
  - Septic arthritis
  - Axial disorders (including urgent back pain, mechanical back pain, neurological back pain, red flag back pain, soft tissue neck pain and whiplash disorder)



- Musculoskeletal presentations or complications of common endocrine, neurologic, hematologic and infectious diseases
- Orthopedic problems including: Fractures of the upper and lower extremities (including clavicle fracture, humerus, scaphoid fracture, radial fracture, femur fracture, Tibial/Fibular fracture)
- Describe fracture patterns, list the classification of fractures and list the potential complications of fractures, including those that are life-threatening (e.g, ARDS, shock, associated injuries), limb-threatening (e.g., arterial injury, compartment syndrome) and chronic (e.g., reflex sympathetic dystrophy, non-union, nerve injury)
- Dislocations, subluxations, sprains, ligament injuries
- Tendon injury or rupture
- Muscle trauma/injury, including muscle strain
- Specific shoulder problems (e.g., rotator cuff, frozen shoulder)
- Specific knee trauma and conditions (e.g., meniscal pathology, ligament injuries)
- Common orthopedic problems of the ankles and feet (e.g., hallux valgus, plantar fasciitis)
- Common and/or important bone tumors (including recognition of basic patterns of aggressive vs. non-aggressive lesions clinically and on standard radiographs)
- Pediatric problems
  - Scoliosis
  - Orthopedic problems of the newborn, infant and child (including developmental dysplasia of the hip, Legg Calve Perthes disease, slipped capital femoral epiphysis, genu varum and genu valgus, club foot , in-toeing and out-toeing and osteomyelitis)
  - Pediatric fractures and growth plate injuries
  - Pediatric Inflammatory Joint and muscle diseases (including recognition of how pediatric joint and muscle diseases such as juvenile idiopathic arthritis, juvenile ankylosing spondylitis and juvenile dermatomyositis differ in presentation and clinical course from disease in the adult)
  - Pediatric soft tissue and overuse syndromes (including apophysitis, patellofemoral syndrome)

#### Skin Conditions

- Erythematous skin lesions (including flushing, urticaria, erythema)
- multiforme, vasculitis, chronic wounds, erythema nodosum)
- Leg ulcers
- Skin infections (including common bacterial, common viral, superficial fungal, necrotizing fasciitis)
- Benign skin tumors (including seborrheic keratosis, benign melanocytic tumors)
- Common hair disorders
- Skin cancers (including melanoma, basal cell carcinoma, actinic keratosis, squamous cell carcinoma)
- Psoriasis
- Warts
- Acne vulgaris
- Atopic dermatitis /eczema

- Burn injuries
- Common skin manifestations of systemic diseases (including diabetes mellitus, hyper and hypo thyroidism, kidney and liver diseases, SLE, dermatomyositis, scleroderma)

Develop an approach to the interpretation of common and/or important investigations that are used in the evaluation of musculoskeletal or skin disease, along with their main indications, including:

- Blood work (including interpretation of ESR, CRP, rheumatoid factor, CK, ANA and synovial fluid analysis)
- Diagnostic imaging (including interpretation of simple plain radiographs and description of indications for CT, MRI, ultrasound, arthroscopy, arthrography and bone scans)
- Electromyography (EMG), nerve conduction studies (NCS)
- Pathology (e.g., muscle biopsy, temporal artery biopsy, skin biopsy)
- KOH preparation
- Develop an approach to key principles of management of common MSK diseases
- Outline the mechanism of action, indications, common and serious side effects of medications used in the treatment of musculoskeletal disease (e.g., non-steroidal anti-inflammatory medications (NSAIDs), acetaminophen, steroids and key disease modifying medications)
- Explain the importance of lifestyle modifications and physical therapies in the management of MSK disorders
- Discuss the role of physical activity in promoting a healthy lifestyle in musculoskeletal disorders
- List the steps involved in rehabilitation of musculoskeletal injuries and write an appropriate prescription for rehabilitation therapy
- Define the term orthosis and compare and contrast the functions of orthoses in MSK management plans
- Describe the use and potential impact of complementary and alternative practices in the treatment of musculoskeletal disease

Describe the characteristics of common bacteria, viruses, parasites and fungi that cause human infections.

- Correlate the structure and virulence factors of these organisms with their ability to cause infections.
- List the mechanism of action, spectrum of activity and side effects of commonly used antimicrobials and the basic means by which microorganisms may develop resistance to these agents.
- Describe the organization of the immune system and show understanding of its function in protection against infection including the consequences of immune deficiency and immune dysregulation (hypersensitivity and autoimmunity)
- Describe the basic events underlying the inflammatory response.
- Demonstrate understanding of infectious diseases in the context of global health issues
- Demonstrate a basic understanding of blood cells and transfusions.

### **Communicator**

- Communicate effectively with patients expressing musculoskeletal system concerns · Demonstrate consideration for the patient's comfort during physical examination of musculoskeletal system
- Discuss the potential ways in which lives of patients with musculoskeletal problems are affected by their conditions.
- Demonstrate the ability to be facilitative with peers, patients, families, caregivers, community resources and interdisciplinary team members.
- Gather information about a patient's beliefs, concerns, expectations and illness experience.
- Explain the importance of effective patient-centered communication in the patient-physician relationship and its effect on patient outcomes.
- Recognize and demonstrate best practice on how the verbal and non-verbal cues affect the patient-physician relationship and patient outcomes.
- Deliver information in a professional patient-centered manner and in such a way that is understandable, encourages discussion and participation in decision-making. Discuss patient encounters and the importance of treating patients with respect and maintaining patient confidentiality.
- Demonstrate awareness and sensitivity to human differences, including differences in age, gender, disability, sexual orientation, ethnicity, cultural background, socioeconomic or psychosocial factors.
- Provide and be receptive to constructive and professional feedback to and from peers and preceptors about their communication practices and group work interactions.

### **Collaborator**

- Describe and briefly outline the roles of health care professionals involved in the treatment of musculoskeletal and skin diseases, and the importance of interprofessional collaboration:
  - Family medicine physician
  - Rheumatologist (adult and pediatric)
  - Orthopedic surgeon (adult and pediatric)
  - Physical medicine and rehabilitation specialist (physiatrist)
  - Sport and Exercise Medicine Physician
  - Physical therapist
  - Occupational therapist
  - Dermatologist
  - Plastic surgeon
- Recognize one's own differences, biases, assumptions and limitations that may contribute to interprofessional tension.
- Work collaboratively with others.
- Explain how to work effectively in a team to achieve an appropriate outcome. · Interact respectfully and professionally with small group and team members and describe the value of team members.

### **Leader**

- Make proficient use of technology assisted learning as it is deployed in this course. · Explain the Leader role of the physician with regards to helping patients navigate the healthcare system.
- Discuss the concept of resource allocation in the management of the individual patient's healthcare within the whole health system.
- Discuss and begin to incorporate the cost perspectives into clinical decision-making.

### **Scholar**

- Facilitate the learning of self and others in various small-group and team-based settings. · Demonstrate ability to engage in self-directed learning based on reflective practice and life-long learning principles.
- Understand how to formulate a clinical question and search the literature using the library website and other resources.
- Research the information required (including evidence-based resources and other resources) in order to prepare for presenting possible diagnostic and management options for discussion.
- Critically appraise retrieved evidence and information and demonstrate integration of new learning.
- Apply the concepts of validity, importance and applicability to help clinicians answer clinical questions and patients' questions regarding therapy, harm, diagnosis, prognosis, and screening.
- Provide and receive effective feedback

### **Health advocate**

- Recognize different points of view regarding culture, religion, beliefs, illness, disease, medicine, and medical practices and discuss in an open and non-judgmental manner.
- Describe how different social determinants of health influence how the patient copes with an illness, influences health, disease and disability, influences access to health care services and how they may or may not receive support.
- Identify emerging and ongoing issues for populations who are vulnerable.
- Identify points of influence in the healthcare system and its structure.
- Explain the concept of social accountability, principles of community engagement in responding to the needs of the community.

### **Professional**

- Adhere to the WMU and University of Alberta, Faculty of Medicine and Dentistry Code of Conduct and to the Professional Standards for Students in the Faculty of Medicine and Dentistry.
- Define professionalism as the key values required in the profession, including honesty, integrity, maintaining appropriate patient boundaries, maintaining confidentiality, and a commitment to patient well-being.
- Define professionalism in the context of medical school, and within the medical profession, and to apply its principles to all activities, including during assignments,

- small group interactions, examinations, self-assessment, peer-assessment, faculty assessment, online in social media etc.
- Discuss the importance of context in the interpretation of professionalism.
  - Discuss that each physician has the obligation to actively maintain professional competence participate in peer/colleague assessment and self-assessment as applicable.
  - Explain how self-reflection facilitates the student's professional identity formation and shapes their approach to all patients.
  - Discuss basic legal and ethical challenges that physicians face in practice and begin to apply key concepts to navigate these challenges.
  - Give constructive and professional feedback and assessment to their peers and colleagues about attitudes, behaviors, practices and group work interactions in a structured manner.
  - Demonstrate a sense of responsibility: taking initiative, carrying out assigned duties exhibiting dependability and self-direction.
  - Demonstrate punctuality.
  - Recognize and appropriately respond to ethical issues encountered during the course.
  - Recognize factors such as fatigue, stress, and competing demands/roles that impact on personal and professional performance
  - Seek assistance when professional or personal performance is compromised.
  - Contribute to Discovery Learning (DL) discussion in a respectful manner.

## **Psychiatry**

### Course Objectives

#### **Medical expert**

- List DSM-5 definition criteria and important symptoms for schizophrenia, bipolar 1 and 2 disorders, major depressive disorder, anxiety disorders (social phobia, panic disorder, agoraphobia, and generalized anxiety disorder), obsessive-compulsive disorder, post-traumatic stress disorder, and the eating disorders (anorexia nervosa, bulimia nervosa).
- Describe for each disorder the:
  - Epidemiology
  - Etiology
  - Pathophysiology
- Describe investigations for a patient presenting with symptoms of each disorder.
- Discuss medication treatment for each disorder, emphasizing recent Canadian guidelines, and name the first-line treatments.
- Describe the serious and common side effects of medication treatments.
- Describe the monitoring and management of side effect common to the medication treatments.
- Discuss alternative & psychosocial treatments for each disorder.
- Discuss prognosis in each disorder.
- In terms of DSM-5 definition criteria and treatment, discuss disorders specific to:
  - child psychiatry
  - geriatric psychiatry
  - personality

- sleep-wake
  - sexual dysfunctions
  - gender dysphoria
  - substance-related
  - somatic symptoms
- Discuss ADHD as it relates to adults in terms of diagnosis and treatment.
  - Demonstrate awareness of how cultural diversity affects the diagnosis and treatment of mental illnesses.
  - Prioritize the management of a patient presenting with a mental health concern as the chief complaint.
  - Describe and perform a psychiatric interview, mental status examination, risk assessment, and formulation of a patient.
  - Evaluate the literature and create a 10-minute presentation and exam question on a topic of interest.
  - Describe how neuroanatomy relates to function and clinical problems.

### **Communicator**

- Demonstrate the ability to be facilitative with peers, patients, families, caregivers, community resources and interdisciplinary team members.
- Gather information about a patient's beliefs, concerns, expectations and illness experience.
- Explain the importance of effective patient-centered communication in the patient-physician relationship and its effect on patient outcomes.
- Recognize and demonstrate best practice on how the verbal and non-verbal cues affect the patient-physician relationship and patient outcomes.
- Deliver information in a professional patient-centered manner and in such a way that is understandable, encourages discussion and participation in decision-making.
- Discuss patient encounters and the importance of treating patients with respect and maintaining patient confidentiality.
- Demonstrate awareness and sensitivity to human differences, including differences in age, gender, disability, sexual orientation, ethnicity, cultural background, socioeconomic or psychosocial factors.
- Provide and be receptive to constructive and professional feedback to and from peers and preceptors about their communication practices and group work interactions.

### **Collaborator**

- Describe the role and responsibilities of other healthcare professionals.
- Recognize one's own differences, biases, assumptions and limitations that may contribute to interprofessional tension.
- Work collaboratively with others.
- Explain how to work effectively in a team to achieve an appropriate outcome.
- Interact respectfully and professionally with small group and team members and describe the value of team members.
- Make proficient use of technology assisted learning as it is deployed in this course.
- Explain the Leader role of the physician with regards to helping patients navigate the healthcare system.

- Discuss the concept of resource allocation in the management of the individual patient's healthcare within the whole health system.
- Discuss and begin to incorporate the cost perspectives into clinical decision-making.

### **Scholar**

- Facilitate the learning of self and others in various small-group and team-based settings.
- Demonstrate ability to engage in self-directed learning based on reflective practice and life-long learning principles.
- Understand how to formulate a clinical question and search the literature using the library website and other resources.
- Research the information required (including evidence-based resources and other resources) in order to prepare for presenting possible diagnostic and management options for discussion.
- Critically appraise retrieved evidence and information and demonstrate integration of new learning.
- Apply the concepts of validity, importance and applicability to help clinicians answer clinical questions and patients' questions regarding therapy, harm, diagnosis, prognosis, and screening.
- Provide and receive effective feedback

### **Health advocate**

- Recognize different points of view regarding culture, religion, beliefs, illness, disease, medicine, and medical practices and discuss in an open and non-judgmental manner.
- Describe how different social determinants of health influence how the patient copes with an illness, influences health, disease and disability, influences access to health care services and how they may or may not receive support.
- Identify emerging and ongoing issues for populations who are vulnerable.
- Identify points of influence in the healthcare system and its structure.
- Explain the concept of social accountability, principles of community engagement in responding to the needs of the community.

### **Professional**

- Adhere to the WMU and University of Alberta, Faculty of Medicine and Dentistry Code of Conduct and to the Professional Standards for Students in the Faculty of Medicine and Dentistry.
- Define professionalism as the key values required in the profession, including honesty, integrity, maintaining appropriate patient boundaries, maintaining confidentiality, and a commitment to patient well-being.
- Define professionalism in the context of medical school, and within the medical profession, and to apply its principles to all activities, including during assignments, small group interactions, examinations, self-assessment, peer-assessment, faculty assessment, online in social media etc.
- Discuss the importance of context in the interpretation of professionalism.
- Discuss how each physician has the obligation to actively maintain professional competence participate in peer/colleague assessment and self-assessment as applicable.

- Explain how self-reflection facilitates the student's professional identity formation and shapes their approach to all patients.
- Discuss basic legal and ethical challenges that physicians face in practice and begin to apply key concepts to navigate these challenges.
- Give constructive and professional feedback and assessment to their peers and colleagues about attitudes, behaviors, practices and group work interactions in a structured manner.
- Demonstrate a sense of responsibility: taking initiative, carrying out assigned duties exhibiting dependability and self-direction.
- Demonstrate punctuality.
- Recognize and appropriately respond to ethical issues encountered during the course. ● Recognize factors such as fatigue, stress, and competing demands/roles that impact on personal and professional performance. Seek assistance when professional or personal performance is compromised.
- Contribute to Discovery Learning (DL) and Team based learning (TBL) discussion in a respectful manner.

### **Neurosciences & Organs of the Special Senses**

#### Course Objectives

##### **Medical expert**

- List the elements of the Neurological, Eye, Otolaryngology (Ear, Nose and Throat (ENT) and developmental examination, and describe how to perform each element. · Localize lesions in patients who present with symptoms suggestive of a problem involving the nervous system or organs of special sense.
- List the most important causes of common neurological, or special sense symptoms or developmental disorders. Discuss the investigations required to make a specific diagnosis. · Develop an approach to the management of important neurological, ocular, ENT or developmental pediatric disorders, considering patient education, specific treatment, symptomatic treatment, psychological support, specialist referral and follow-up.
- Recognize serious neurological, ocular, or ENT presentations that are best handled by urgent referral to a specialist.

##### **Communicator**

- Demonstrate the ability to be facilitative with peers, patients, families, caregivers, community resources and interdisciplinary team members.
- Gather information about a patient's beliefs, concerns, expectations and illness experience.
- Explain the importance of effective patient-centered communication in the patient-physician relationship and its effect on patient outcomes.
- Recognize and demonstrate best practice on how verbal and non-verbal cues affect the patient-physician relationship and patient outcomes.
- Deliver information in a professional patient-centered manner and in such a way that is understandable, encourages discussion, as well as participation in decision-making. · Discuss patient encounters and the importance of treating patients with respect and maintaining patient confidentiality.



- Demonstrate awareness and sensitivity to human differences, including differences in age, gender, disability, sexual orientation, ethnicity, cultural background, socioeconomic or psychosocial factors.
- Provide and be receptive to constructive and professional feedback to and from peers and preceptors about their communication practices and group work interactions.

### **Collaborator**

- Describe the role and responsibilities of other healthcare professionals. · Recognize one's own differences, biases, assumptions and limitations that may contribute to interprofessional tension. · Work collaboratively with others.
- Explain how to work effectively in a team to achieve an appropriate outcome. · Interact respectfully and professionally with small group and team members and describe the value of team members.

### **Leader**

- Make proficient use of technology assisted learning as it is deployed in this course. · Explain the Leader role of the physician with regards to helping patients navigate the healthcare system.
- Discuss the concept of resource allocation in the management of the individual patient's healthcare within the whole health system.
- Discuss and begin to incorporate cost perspectives into clinical decision-making.

### **Scholar**

- Facilitate the learning of self and others in various small-group and team-based settings.
- Demonstrate ability to engage in self-directed learning based on reflective practice and life-long learning principles.
- Understand how to formulate a clinical question and search the literature using the library website and other resources.
- Research the information required (including evidence-based resources and other resources) in order to prepare for presenting possible diagnostic and management options for discussion.
- Critically appraise retrieved evidence and information and demonstrate integration of new learning.
- Apply the concepts of validity, importance and applicability, to help clinicians answer clinical questions and patients' questions regarding therapy, harm, diagnosis, prognosis, and screening.
- Provide and receive effective feedback

### **Health advocate**

- Recognize different points of view regarding culture, religion, beliefs, illness, disease, medicine, and medical practices and discuss in an open and non-judgmental manner.
- Describe how different social determinants of health influence how the patient copes with an illness, influences health, disease and disability, influences access to health care services and how they may or may not receive support.
- Identify emerging and ongoing issues for populations who are vulnerable.

- Identify points of influence in the healthcare system and its structure.

### **Professional**

- Adhere to the WMU and University of Alberta, Faculty of Medicine and Dentistry Code of Conduct and to the Professional Standards for Students in the Faculty of Medicine and Dentistry.
- Define professionalism as the key values required in the profession, including honesty, integrity, maintaining appropriate patient boundaries, maintaining confidentiality, and a commitment to patient well-being.
- Define professionalism in the context of medical school, and within the medical profession, and to apply its principles to all activities, including during assignments, small group interactions, examinations, self-assessment, peer-assessment, faculty assessment, online in social media etc.
- Discuss the importance of context in the interpretation of professionalism.
- Discuss why each physician has the obligation to actively maintain professional competence, participate in peer/colleague assessment, and self-assessment as applicable.
- Explain how self-reflection facilitates the student's professional identity formation and shapes their approach to all patients.
- Discuss basic legal and ethical challenges that physicians face in practice and begin to apply key concepts to navigate these challenges.
- Give constructive and professional feedback and assessment to their peers and colleagues about attitudes, behaviors, practices and group work interactions in a structured manner.
- Demonstrate a sense of responsibility: taking initiative, carrying out assigned duties exhibiting dependability and self-direction.
- Demonstrate punctuality.
- Recognize and appropriately respond to ethical issues encountered during the course. Recognize factors such as fatigue, stress, and competing demands/roles that impact on personal and professional performance. Seek assistance when professional or personal performance is compromised.
- Contribute to Discovery Learning (DL) discussion in a respectful manner.

### **Oncology**

#### Course Objectives

#### **Medical Expert**

- Discuss the pathogenesis of cancer, from initial transformation of the cancer cell to metastatic potential.
- Discuss the principles behind surgery, radiation, and systemic therapy and how they may be used to cure or palliate patients with cancer.
- Describe how comorbid medical conditions may impact on the ability of the clinician to successfully treat cancer.
- Describe differences in gender specific cancers, including gender predisposition to certain malignancies.
- Describe how pediatric and adult cancer patients differ in terms of risk factors, types of diseases that present, and treatment principles.

- Discuss the common toxicities of treatment for cancer and therapeutic strategies that can be used to minimize them.
- Recognize how patients present with cancer, including key clinical symptoms and signs
  - Discuss the clinical presentation, diagnostic work up, and treatment principles related to the following:
    - Breast neoplasms
    - Prostate neoplasms
    - Testicular neoplasms
    - Gastric neoplasm
    - Lung neoplasms
    - Colorectal neoplasms
    - Spinal cord compression
    - Malignant hypercalcemia
    - Kidney and bladder neoplasms
    - Hematologic conditions
    - Leukemia
    - Lymphoma
    - Multiple myeloma
    - Neutropenia
    - Anemia
    - Thrombocytopenia
    - Waldenstrom's Macroglobulinemia
    - Polycythemia
    - Stomatitis
- Demonstrate the ability to obtain a proper pain history and order analgesics appropriately
- Demonstrate the ability to perform a proper breast examination
- Explain the principles of screening for cancer and discuss the pros and cons of screening programs currently available for the most common cancers
- Demonstrate the ability to rationally order and interpret laboratory or other tests in managing the patient with cancer
- Interpret a complete blood count and describe an appropriate secondary work up for abnormalities discovered.
- Demonstrate the ability to break bad news in a simulated setting
- Recognize patients experiencing an oncology emergency and demonstrate appropriate management skills related to the problem at hand
- Demonstrate an understanding of the relationship between the following clinical presentations and oncology:
  - Nausea
  - Vomiting
  - Diarrhea
  - Hair loss (alopecia)
  - Mucositis
  - Xerostomia
  - Delirium
  - Dyspnea

- Infertility
- Dyspnea
- Altered bowel habit
- Constipation
- Demonstrate the ability to develop a differential diagnosis in determining the etiology behind symptom presentation in cancer patients
- Discuss the diagnostic work up and treatment principles related to the following common and/or important solid tumors:
  - Genitourinary cancers, with a particular emphasis on prostate and testicular cancers
  - Breast cancer
  - Gastrointestinal cancers, with a particular emphasis on colorectal cancer
  - Lung cancer (small and non-small cell)

Discuss the diagnostic work up and treatment principles related to the following common and/or important hematologic diseases:

- Acute myeloid leukemia
- Acute lymphoblastic leukemia
- Chronic lymphocytic leukemia
- Hodgkin's lymphoma
- Non-Hodgkin lymphoma
- Multiple myeloma
- Myeloproliferative disorders

### **Communicator**

- Demonstrate the ability to recognize and diagnose delirium and discover its root cause, as well as manage the acute delirium situation.
- Demonstrate the ability to break bad news.
- Demonstrate the ability to be facilitative with peers, patients, families, caregivers, community resources and interdisciplinary team members.
- Gather information about a patient's beliefs, concerns, expectations and illness experience.
- Explain the importance of effective patient-centered communication in the patient-physician relationship and its effect on patient outcomes.
- Recognize and demonstrate best practice on how the verbal and non-verbal cues affect the patient-physician relationship and patient outcomes.
- Deliver information in a professional patient-centered manner and in such a way that is understandable, encourages discussion and participation in decision-making.
- Discuss patient encounters and the importance of treating patients with respect and maintaining patient confidentiality.
- Demonstrate awareness and sensitivity to human differences, including differences in age, gender, disability, sexual orientation, ethnicity, cultural background, socioeconomic or psychosocial factors.
- Provide and be receptive to constructive and professional feedback to and from peers and preceptors about their communication practices and group work interactions.

Collaborator

- Discuss the role that the physician and other members of the health care team play in the multi-disciplinary management of the cancer patient
- Understand the dual role of the clinician in managing individual patients as well as the cancer treatment system as a whole
- Demonstrate understanding of roles and responsibilities in a multidisciplinary health care team.

### **Leader**

- Discuss the importance of continuity of care with other health care professionals and community organizations to provide coordinated care for patients.
- Discuss considerations when planning management and coordination of care, being aware of the community resources including home care and long-term care.
- Explain the role of the physician with regards to helping patients navigate the healthcare system.

### **Scholar**

- Demonstrate the ability to use knowledge previously acquired in other courses in diagnosis and management of the cancer patient.
- Describe the role that clinical trials play in the development of new cancer treatments.
- Facilitate the learning of self and others in various small-group and team-based settings. ● Demonstrate ability to engage in self-directed learning based on reflective practice and life-long learning principles.
- Understand how to formulate a clinical question and search the literature using the library website and other resources.
- Research the information required (including evidence-based resources and other resources) in order to prepare for presenting possible diagnostic and management options for discussion.
- Critically appraise retrieved evidence and information and demonstrate integration of new learning.
- Apply the concepts of validity, importance and applicability to help clinicians answer clinical questions and patients' questions regarding therapy, harm, diagnosis, prognosis, and screening.
- Provide and receive effective feedback

### **Health Advocate**

- Demonstrate an understanding of the impact of cancer on a global perspective, including differences in cancer rates and types between the developing and the developed world.
- Recognize the importance of public health promotion programs, such as tobacco cessation, in reducing the risk of cancer development.
- Identify community resources including home care and long-term care.
- Recognize the psychosocial aspects of cancer care delivery related to the ethical dilemmas and cancer treatment, including end-of-life decision making
- Recognize different points of view regarding culture, religion, beliefs, illness, disease, medicine, and medical practices and discuss in an open and non-judgmental manner.
- Identify points of influence in the healthcare system and its structure.

### **Professional**

- Discuss key principles and dilemmas related to end-of-life care and decision making.
- Demonstrate respect, compassion, honesty, and caring in all activities related to the Oncology course.
- Adhere to the WMU and University of Alberta, Faculty of Medicine and Dentistry Code of Conduct, and to the Professional Standards for Students in the Faculty of Medicine and Dentistry.
- Give constructive and professional feedback and assessment to their peers and colleagues about attitudes, behaviors, practices and group work interactions in a structured manner.
- Demonstrate a sense of responsibility: taking initiative, carrying out assigned duties exhibiting dependability and self-direction.
- Demonstrate punctuality.
- Recognize and appropriately respond to ethical issues encountered during the course.
- Recognize factors such as fatigue, stress, and competing demands/roles that impact on personal and professional performance. Seek assistance when professional or personal performance is compromised.
- Contribute to Discovery Learning (DL) discussion in a respectful manner.

### **Health Systems Science 1, 2, 3 and 4**

#### Course Objectives

Health systems science is a foundational platform and framework for the study and understanding of how care is delivered for patients and populations within systems of medical care, how health professionals work together to deliver that care, and how the health system can improve patient care and health care delivery. This course continues over 4 years and builds knowledge of core domains including health care structures and processes; interprofessional care; health care policy, economics, and management; clinical informatics and health information technology; global, population and public health; value-based care; health system improvement, design and systems thinking.

#### **Medical expert**

- Explain the fundamentals of how care is delivered to patients and populations within systems of medical care.
- Explain the fundamentals of how health professionals work together to deliver that care.
- Explain the fundamentals of how the health system can improve patient care and health care delivery.
- Explain the fundamentals of health care structures and processes; health care policy, economics, and management; clinical informatics and health information technology including the application of Artificial Intelligence and Big Data in medicine; population and public health; evidence-based medicine; value-based care; health system improvement, design and systems thinking.

#### **Communicator**

- Demonstrate the ability to be facilitative in communication and interaction with others.
- Deliver information in a professional manner and in such a way that is understandable, encourages discussion and participation in decision-making.

- Discuss patient encounters and the importance of treating patients with respect and maintaining patient confidentiality.
- Demonstrate awareness and sensitivity to human differences, including differences in age, gender, disability, ethnicity, and cultural background, socioeconomic or psychosocial factors.
- Provide and be receptive to constructive and professional feedback to and from peers and preceptors about communication practices and group work interactions.

### **Collaborator**

- Describe the role and responsibilities of other healthcare professionals.
- Recognize one's own differences, biases, assumptions, and limitations that may contribute to inter-professional tension.
- Work collaboratively with others.
- Explain how to work effectively in a team to achieve an appropriate outcome.
- Interact respectfully and professionally with small group and team members and describe the value of team members

### **Leader**

- Make proficient use of technology assisted learning as it is deployed in this course.
- Explain the role of the physician with regards to helping patients navigate the healthcare system.
- Discuss the concept of resource allocation in the management of the individual patient's healthcare within the whole health system.

### **Scholar**

- Facilitate the learning of self and others in various small-group and team-based settings.
- Demonstrate ability to engage in self-directed learning based on reflective practice and life-long learning principles.
- Understand how to formulate a question and search the literature using the library website and other resources.
- Research the information required (including evidence-based resources and other resources) to prepare for discussions.
- Begin to critically appraise retrieved evidence and information and demonstrate integration of new learning.
- Apply the concepts of validity, importance, and applicability to help clinicians answer clinical questions and patients' questions regarding therapy, harm, diagnosis, prognosis, and screening.
- Provide and receive effective feedback.

### **Health advocate**

- Recognize different points of view regarding culture, religion, beliefs, illness, disease, medicine, and medical practices and discuss in an open and non-judgmental manner.
- Describe how different social determinants of health influence how the patient copes with an illness, influences health, disease, and disability, influences access to health care services and how they may or may not receive support.
- Identify emerging and ongoing issues for populations who are vulnerable.

- Identify points of influence in the healthcare system and its structure.
- Explain the concept of social accountability, principles of community engagement in responding to the needs of the community.

### **Professional**

- Adhere to the Wenzhou Medical University and University of Alberta, Faculty of Medicine and Dentistry Code of Conduct and to the Professional Standards for Students in the Faculty of Medicine and Dentistry.
- Define professionalism as the key values required in the profession, including honesty, integrity, maintaining appropriate patient boundaries, maintaining confidentiality, and a commitment to patient well-being.
- Define professionalism in the context of medical school, and within the medical profession, and to apply its principles to all activities, including during assignments, small group interactions, examinations, self-assessment, peer-assessment, faculty assessment, online in social media etc.
- Discuss the importance of context in the interpretation of professionalism.
- Describe how each physician has the obligation to actively maintain professional competence participate in peer/colleague assessment and self-assessment as applicable.
- Explain how self-reflection facilitates the student's professional identity formation and shapes their approach to all patients.
- Discuss basic legal and ethical challenges that physicians face in practice and begin to apply key concepts to navigate these challenges.
- Give constructive and professional feedback and assessment to their peers and colleagues about attitudes, behaviors, practices, and group work interactions in a structured manner.
- Demonstrate a sense of responsibility: taking initiative, carrying out assigned duties exhibiting dependability and self-direction.
- Demonstrate punctuality.
- Recognize and appropriately respond to ethical issues encountered during the course.
- Recognize factors such as fatigue, stress, and competing demands/roles that impact on personal and professional performance. Seek assistance when professional or personal performance is compromised.
- Contribute to Team Based Learning (TBL) and Discovery Learning (DL) and small group discussion in a respectful manner.



### ***Program location***

The students will complete most of the program at Wenzhou Medical University. The courses taught by UAlberta faculty will be in a blended format including both on campus in person and online synchronous and asynchronous sessions. Students will attend the UofA in person for a summer program between the second and third years of the program.

### ***Program learning outcomes***

Graduates of this degree program will be able to:

- Demonstrate clinical decision-making skills that integrate best evidence and acknowledge patient values.
- Apply basic knowledge of the etiology, pathogenesis, clinical features, complications, principles of prevention and management with emphasis on common and life-threatening illnesses across the age spectrum.
- Demonstrate knowledge on approaches to diagnosis and treatment with emphasis on common and urgent problems.
- Perform both complete and organ system-specific examinations appropriate to the age of the patient and nature of the clinical problem(s).
- Recognize and prioritize the urgency of a patient's clinical problems.
- List and prioritize a meaningful differential diagnosis with emphasis on common and urgent clinical presentations.
- Demonstrate the ability to select and interpret commonly employed investigations.
- Demonstrate appropriate use of selected procedural skills (diagnostic and therapeutic).
- Apply the principles of pharmacology and evaluate options for safe, rational, and appropriate drug therapy.
- Apply the scientific principles underlying evidence-based approaches to health maintenance, preventive screening, therapeutic, rehabilitative, and palliative interventions.
- Demonstrate a basic understanding of the psychological, interpersonal, family, cultural, societal, and environmental determinants of health and illness across a diverse population.
- Recognize and cope with uncertainty and ambiguity in clinical decision-making and care.
- Demonstrate critical reflection and inquiry to enable practices of life-long and self-directed learning.
- Assist in teaching others and facilitate learning where appropriate.
- Demonstrate knowledge of forms of rigorous inquiry in research methodologies and describe an appropriate methodology to a specific research question.
- Demonstrate an understanding of ethics as it relates to medical research.
- Demonstrate knowledge of the professional practices and scholarly activities required of the profession.
- Receive, incorporate, and provide feedback in an appropriate and timely manner in their daily learning and practice.

**APPENDIX B1**

Meeting Minutes				
Committee	FoMD Faculty Council			
Members:	Dr. B Hemmelgarn (Chair) As per list attached <i>Quorum is represented by those faculty members member present.</i>	Date :	September 21, 2021	
		Time:	4:00pm	
Called to Order:	4:01pm	Location:	Via Zoom	
Guests	Elder Rick Lighting; Wendy Rodgers; Michael Ironside; Lise Warick; Tyler Kuhnert;	Scribe:	Erin Neil	
	Elder Rick Lighting – provided opening prayer			
Approval of agenda	Approved by consensus with no additions.			
Approval of previous meeting Minutes	Date: May 18, 2021 MOVED by K. Aitchison and SECONDED by G. Funk to approve the agenda as circulated. ALL IN FAVOUR. CARRIED.			
Meeting Attachments:	Provided via email -			
Topic	Summary	Action by whom	Target Date	Status

<p>1. Dean's Report</p>	<p>Dr. B. Hemmelgarn provided updated:</p> <ul style="list-style-type: none"> <li>· Thanked everyone and Elder Rick Lighting for opening the meeting in a very special way.</li> <li>· Introductions of new faculty will be done at the November, 2021 meeting.</li> <li>· October 4, 2021 – Town Hall – College of Health Sciences – more information to follow.</li> <li>· Strategic Planning stage for College of Health Sciences.</li> </ul>	
<p>2. Vice-Dean Faculty Affairs</p>		
<p>a. FAR Demo</p>	<p>Dr. Kunimoto provided updated:</p> <ul style="list-style-type: none"> <li>· Do not feel that in the future the Faculty will be able to have its own Annual Report Online system, as the supports will not be available.</li> <li>· The University of Alberta has developed the FAR system for annual reporting.</li> <li>· Comparison of the current ARO and the new FAR system were provide.</li> <li>· Dr. Wendy Rodgers, Deputy Provost and Michael Ironside presented a demo of the FAR system.</li> <li>· FAR would be used for the next reporting cycle.</li> </ul> <p>Motion - Faculty Council approves the Faculty of Medicine and Dentistry moving to the University's Faculty Annual Report (FAR) replacing the current Annual Report Online (ARO) starting with the July 1 2022 - June 30, 2023 academic year. MOVED BY: N. Kassam and SECONDED BY: V. Daniels. (139 Votes: Yes 124 No 4 Abstained 11) CARRIED.</p>	

<p>b. FoMD Guiding Principles for International Engagement</p>	<p>Dr. Hemmelgarn presented:</p> <p>Opened for discussion.</p> <p>International Engagement Principles changes to:</p> <ul style="list-style-type: none"> <li>· Add in wording about not engaging with countries with sanctions imposed by the Federal Government.</li> <li>· Work with NGO's and various countries.</li> <li>· Global Health – umbrella – International Engagement – purpose is to guide education – can be used to guide Global Health.</li> <li>· On principles statement that was shared – the statement from the office of International Engagement office is Incorporated.</li> <li>· Modifications will be made.</li> <li>· International Engagement Advisory Committee will be created.</li> </ul> <p>Motion: To approve the Faculty of Medicine &amp; Dentistry Guiding Principles for International Engagement pending review by the International Engagement Advisory Committee and to be brought back to Faculty Council for further approval. Moved by: M. Lang. Seconded by: C. Fernandez-Patron (123 Votes: Yes 97 No 12 Abstained 13). CARRIED</p>	
<p>c. Bachelor of Biomedicine Dual Degree</p>	<p>Dr. Hemmelgarn presented:</p> <p>Opened for discussion.</p> <p>Motion: Faculty Council supports the creation of a new Bachelor of Biomedicine degree program for students registered in the Alberta Institute at Wenzhou Medical University. Moved by: T. Hillier. Seconded by: S. Persard. (110 Votes: Yes 57 No 22 Abstained 31). CARRIED.</p>	
<p>d. Gender &amp; salaries; Census Results for EDI – FoMD, U of A</p>	<p>Postponed to be November 2021 meeting.</p>	
<p>e. GFC Update</p>	<p>Dr. J. White provided update:</p> <ul style="list-style-type: none"> <li>· GFC has been discussing COVID.</li> <li>· 3 College Deans has been discussed.</li> <li>· Policies and procedures with respect to graduate student supervision have been established.</li> </ul>	
<p>3. Vice Dean Education</p>		

<p>a. Radiation Therapy Program – Class of 2021</p>	<p>Dr. Schipper presented:</p> <p>Motion: That Faculty Council Approve the proposed Radiation Therapy Program Class of 2021 Fall Graduands list that appears in this presentation. Moved by: M. Lewis. Seconded by: A. Underhill. (100 Votes: Yes 96 No 0 Abstained 4). CARRIED.</p>			
<p>b. MD Curriculum Program Committee – Terms of Reference</p>	<p>Dr. Schipper presented:</p> <p>Motion: That Faculty Council Approve the MD Curriculum and Program Committee (MDCPC) Terms of Reference as presented in the meeting attachments. Moved by: V. Daniels. Seconded by: L. Sonnenberg. (97 Votes: Yes 86 No 0 Abstained 11). Carried.</p>			
<p>c. MD Admissions Report</p>	<p>Postponed to November 2021 meeting.</p>			
<p>d. Accreditation Update</p>	<p>Dr. J. Rodgers and Dr. R. Kearney presented:</p>			
<p>4. Vice Dean Research</p>	<p>Dr. R. Lenher provided update:</p> <ul style="list-style-type: none"> <li>· Masking and distancing required in all research spaces.</li> <li>· Research funding – the Faculty has been very successful in receiving close to \$38Million in research funding for 412 projects.</li> <li>· Successful from the Canadian Research Institute of Health research competition Faculty has been successful with 14 projects.</li> <li>· Successful grants worth \$11Million for early career investigators.</li> </ul>			
<p>5. Other Business</p>	<p>None</p>			
<p>6. Announcements</p>	<p>Adjourned at 5:53pm</p>			
<p>Next Meeting</p>	<p>November 16, 2021</p>			

**APPENDIX B2**

**MD CURRICULUM AND PROGRAM COMMITTEE (MDCPC)**

**MINUTES**

Date: 2021 September 16  
 Time: 1000 to 1200 hours  
 Location: Zoom

*Voting members indicated with underline. Chair votes only in the event of a tie. (28 voting Members- 14 needed for Quorum)*

**Chair:** Dr. Darryl Rolfsen

**Members:** Dr. Lillian Au, Dr. Lana Bistriz, Dr. Vijay Daniels, Dr. Brock Debenham, Dr. Cathy Flood, Ms. Angie Hill, Dr. Hollis Lai, Dr. Frances Plane, Dr. Mark Prins, Dr. Anna Rissanen, Dr. Joanne Rodger, Dr. Eniola Salami, Dr. Jenny Souster, Ms. Sietske Speerstra, Dr. Laura Stovel, Dr. Jaime Yu

**Recorder:** Angie Hill

**Call to Order:** 10:05am

**Adjourned:** 12:08pm

**Student Reps:** Ms Fisyayo Aruleba, Mr. Jesse Lafontaine, Ms. Auriele Volk

**Regrets:** Dr. Brenda Hemmelgarn, Dr. Shirley Schipper, Dr. Cheryl Goldstein, Dr. Carol Hodgson Birkman, Dr. Nicole Cardinal, Mr. Murray Diduck, Dr. Daniel Livv, Dr. Rebecca Mitchell, Dr. Steven Patterson, Ms. Chiemerle Chris-Iwuru, Dr. Peggy Sagle

**Guests:** Dr Tracey Hillier

**PURPOSE: Oversight of the MD Program & Curriculum**

#	Agenda Item	Summary	Action	Assigned to	Deadline
1	Call to Order	11:02am			
2	Approval of Agenda	Added item f. Q&A new restrictions and move to online  Motion to accept agenda as presented with the added item: Dr Joanne Rodger, seconded by Dr Lillian Au	All in favor, no opposed, no abstained Agenda Approved		
3	Approval of Minutes	Motion to accept meeting minutes as presented: Dr Hollis Lai, seconded by Dr Lillian Au	All in favor, no opposed, no abstained Minutes Approved		
4	Announcements				
5	Standing Items				
	a. Accreditation Update	Dr Joanne Rodger: <ul style="list-style-type: none"> <li>All of the subcommittees have met for their first meeting by next week meaning the cycle of work is picking up for all of us in terms of meetings.</li> <li>There have been a few recommendations made already with the information being</li> </ul>	Just a quick reminder to all that if there has been information requested to please respond in a timely manner, so that we are not holding up the subcommittees and the work that is needed to be done.		

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	<p>shared with the groups in which they pertain to.</p> <ul style="list-style-type: none"> <li>The accreditation website has launched and the link is also on the main MD Program website.</li> </ul>			
b. Policy Review	<p><b>Electives Policy</b> : Dr Lana Bistriz  <a href="https://docs.google.com/document/d/1jUNleA-D3vatV-K_QVF1PQHH_igrZpjfcErI2FTdEo/edit?usp=sharing">https://docs.google.com/document/d/1jUNleA-D3vatV-K_QVF1PQHH_igrZpjfcErI2FTdEo/edit?usp=sharing</a></p> <ul style="list-style-type: none"> <li>This policy exists to define everything about electives, the length, the application procedure.</li> <li>It is the responsibility of the students to organize their own electives (we do not do that for them).</li> <li>Every student has to complete a minimum of 10 weeks of electives before the end of clinical term of year four. A total of 10 weeks have to be completed at a CaCMS or LCME accredited medical school. The electives has to be at least 2 weeks of duration, none can be more than 4 weeks.</li> <li>The Third year electives are a four week requirement and the fourth year requirement is a 10 week requirement. They can carry forward some of their credits from summer electives between year two and three to apply to their year three and four electives.</li> <li>We have subscribed to the national policy to limit the number of clerkship electives in one CaRMS entry discipline to a maximum of 8 weeks. This is the Elective diversification policy.</li> <li>Students have to submit the name of the preceptor who they worked with prior to the end of the elective through the UME office. You can cancel up to six weeks prior to the start of the elective.</li> </ul>	<p>Dr Brock Debenham moves to approve the revisions to the Electives policy as presented.          Seconded by Dr Laura Stovel.          All in favor, no opposed, no abstained.</p> <p><b>Motion carried.</b></p>		



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	<ul style="list-style-type: none"> <li>All students have to submit an evaluation within 21 days which has been changed from 14 days</li> <li>Add- what happens when a student can't find an elective for their two week block, or if their elective gets cancelled last minute. What are the backup plans or what support does a student receive? - We know that Norma handles this is the background, but we should have the steps explicitly added.</li> <li>Director, Electives- change to Coordinator for Electives and Selectives throughout the document to state current role name.</li> </ul> <p><b>Quality Review of Electives Procedure:</b> Dr Lana Bistriz  <a href="https://docs.google.com/document/d/100bidZ1y26Hwi-fukLkSHTO8tWG-u-ogaFulr9QR3ns/edit?usp=sharing">https://docs.google.com/document/d/100bidZ1y26Hwi-fukLkSHTO8tWG-u-ogaFulr9QR3ns/edit?usp=sharing</a></p> <ul style="list-style-type: none"> <li>The quality review of electives procedure is to make sure that these are actually quality outcomes standard that it is trying to meet.</li> <li>Update Director, Electives to Coordinator for Electives and Selectives throughout the document to state current role name.</li> <li>New electives go to the Coordinator for Electives to review objectives, level of supervision, working conditions etc. The Coordinator for Electives can request additional information if needed. When the Coordinator of Electives is satisfied with it, it can be added to the electives catalog.</li> <li>Then assessing the quality of current electives, the students have to complete an evaluation within 21 days and there is an automatic flag in MedSIS. If there is a</li> </ul>	<p>Dr Brock Debenham moves to approve the amended document as presented.          Seconded by Dr Joanne Rodger.          All in favor, no opposed, no abstained.</p> <p><b>Motion Carried.</b></p>		
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		<p>poor rating for anything, the Coordinator of Electives would then follow up with the student or the elective site.</p> <ul style="list-style-type: none"> <li>Electives that are not listed in the electives catalog, we assume they are satisfactory because they are provided at accredited schools in North America. Same evaluation process, same follow-up process, poor ratings would again go to the Coordinator for Electives following the same process.</li> </ul> <p><b>Booking &amp; Confirming Electives Procedure</b>  <a href="https://docs.google.com/document/d/1hM0bbjUCFv80RBA318dcMuTr1Op1Xkm5N4X9s-NM4/edit?usp=sharing">https://docs.google.com/document/d/1hM0bbjUCFv80RBA318dcMuTr1Op1Xkm5N4X9s-NM4/edit?usp=sharing</a></p> <p><b>Global Health International Electives Policy</b>  <a href="https://docs.google.com/document/d/1Wo516vI0bV3kOx57AIVaYipvuLIMDoUueCFvpxeZkrA/edit?usp=sharing">https://docs.google.com/document/d/1Wo516vI0bV3kOx57AIVaYipvuLIMDoUueCFvpxeZkrA/edit?usp=sharing</a></p>	<p>Deferred to next meeting</p> <p>Deferred to next meeting</p>		
6	<p>Old Business</p> <p>a. Technical Standards Policy</p>	<p><b>Technical Standards Policy</b> : Dr Brock Debenham  <a href="https://docs.google.com/document/d/1Oi0A33p5CBBKMjaBTz5U_xow1QtNJ-/edit?usp=sharing&amp;oid=102705638666900098181&amp;rtpof=true&amp;sd=true">https://docs.google.com/document/d/1Oi0A33p5CBBKMjaBTz5U_xow1QtNJ-/edit?usp=sharing&amp;oid=102705638666900098181&amp;rtpof=true&amp;sd=true</a></p> <ul style="list-style-type: none"> <li>Feedback from the last meeting was to include explicitly our accommodations and process with individuals with disabilities. We have used what UBC has used and changed it to our local context and we have also as suggested, updated the definition of technical standards from the CaCMS website listed in the CaCMS accreditation.</li> <li>Dr Jaime Yu notes that we should move away from the term disabilities per se and focus on maybe individuals with noted in comments or sometimes a</li> </ul>	<p>Dr Lana Bistriz motions to approve this amended policy as presented. Seconded by Dr Jaime Yu.            All in favor, no opposed, no abstained.</p> <p><b>Motion Carried.</b></p>		

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		language if implied if its consistent enough for one reason.		
	b. Mandatory Vaccinations	We can confirm that all but one of our medical students in all four years are vaccinated. We were very happy to see the announcement last Monday that vaccinations have been made mandatory, not just at the UofA but in all major universities in the province.		
7	Reports			
	a. MSA, BMSA, IMDSA	MSA: There is a little uncertainty with preclerkship returning back to online learning, but know our programing is in a good place for that and we can easily adapt. MSA VP Educ: No current updates BMSA: No current updates IMDSA: No current updates		
	b. Curriculum	Item d. Hybrid delivery of curriculum, so will cover update there.		
	c. OAW	Dr Goldstein is not here today, but Dr Rolfson offered a quick update on the White coat ceremony. Unfortunately we had to cancel the student white coat ceremonies for both year one and year two class. This was a very difficult decision, but hope to offer this spring and will be very intentional about cancelling it early if we have any concerns that it might be cancelled.		
	d. Assessment	No update today as Dr Daniels is unavailable to attend today's meeting.		
	e. Admissions	Dr Stovel: There are a number of initiatives underway and will bring it back to the next meeting with more details. At the next Faculty Council meeting we will be giving a brief overview of the composition of the current class and a look at the numbers of applicants over the last cycle.		
	f. Program Evaluation	Ms Sietske Speerstra: A quick update is that Dr Livy has been updating the terms of reference, so he will be bringing that here soon. <ul style="list-style-type: none"> <li>We have also been working on improvements to our evaluation process</li> </ul>		

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		<p>to make it more transparent and the performance process of evaluating courses, and our clerkship evaluation reports are coming out soon.</p> <ul style="list-style-type: none"> <li>We are in the midst of some data collection; the diversity data on our students and we are also collecting alumni data and GQ data is underway as well.</li> </ul>			
	g. Academic Affairs	<p>Dr Brock Debenham: Showed the Professionalism terms of reference to vote on at the next meeting:</p> <ul style="list-style-type: none"> <li>For background, there used to be an undergraduate medical education professionalism committee that was run by Dr Gourishankar. The work was transferred to the Assessment committee and Associate Dean.</li> <li>After reviewing this process, we would like to bring it back, the reason being that if there is a concern regarding a student there are multiple voices at the table- not just the Assistant Dean as it stands right now.</li> <li>We are proposing to bring this committee back with a varied membership of faculty, students and residence and it would be to review major concerns- higher consequence professionalism concerns.</li> </ul>	<p>Note from students: Please update the student governments to reflect the changes with the BMSA, IMDSA and MSA</p> <p>Share the updated professionalism policy prior to the next MDCPC meeting.</p> <p>Add to the next meeting agenda.</p>	<p>Dr Brock Debenham</p> <p>Ms Angie Hill</p>	<p>10/21/2021</p> <p>10/21/2021</p>
8	New Business				
	a. Communications	<p>UME is currently working through communications planning and we've asked Jordan Carson to train on the ramping strategy that the university is using for the branding movement.</p> <ul style="list-style-type: none"> <li>You might see websites that are changing, and we should be adjusting our email signatures, PowerPoint presentations should be updated and so on.</li> </ul>			

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	<ul style="list-style-type: none"> <li>The UME is working on sending out Weekly updates on Tuesdays where we are trying to capture all of the quick snap shots of information for students.</li> <li>If you have anything that you would like us to include, to limit the number of emails being sent to the students. Please send any items to Angie by Friday each week, and we will add it to the communication to be sent on the following Tuesday.</li> </ul>			
b. Strategic Planning Preparation	<p>October 5th &amp; 6th is the MD Program Strategic Planning for 2021.</p> <ul style="list-style-type: none"> <li>Dr Darryl Rolfson has been meeting with Don Winn who is the consultant group assisting us over the last three months.</li> <li>The technique is to start the design phase with a lot of the dialogue: the Mission, the vision, values and a five year strategic roadmap and we'll spend most of the time to look at the definitions for six strategic focus areas, and a five year headline that goes with each one.</li> <li>We are focusing on the first three stages: October 5th &amp; 6th with the purpose defined to think that the first half of the day is to define the vision, mission and values and then the remaining day and a half is working on what they call the roadmap.</li> <li>The idea with the design is to create something for discussion, a living document that needs to be challenged and revised certain strategic focus areas may simply drop entirely</li> </ul>	Dr Darryl Rolfson to share a word document that summarizes the slides that were shared. Please send any suggestions via email to Darryl.	Angie Hill	10/21/2021
c. Proposal for Omnibus Course	The Omnibus course was approved in October of 2020, and what it did was it took everything that we used to be of course in the MD program and we now call them course elements. Those course elements belong to one of four courses or omnibus courses that represent each of the four			

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	<p>years in the program that was presented to faculty council for approval last year. Based on the discussions, we were given temporary approval for two years and were to come back in one year and report on progress.</p> <ul style="list-style-type: none"> <li>• Feedback has been good. People want to continue with the omnibus course and recommend that for the coming year.</li> <li>• Dr Jaime Yu states: The delivery of the curriculum and instruction and flexibility, it's been a very strong positive for those reasons. The only thing that has come up is that at the end of last year, is on a student assessment side of things when we have a large omnibus course, and the fact that we are following primarily calendar policies. The issues about course elements and course components and what constitutes a pass versus a remediation. Those types of details need to be very clear and transparent and capable for coordinators as well as for students, because the danger of a big course is the majority of people are doing well and go through. It's our student who is having difficulties where we want to be able to adequately support them, but also need to have adequate policy in place to both provide that remediate or provide more feedback about your progress when needed.</li> <li>• Dr Brock Debenham states: It would be nice if there was a course outline for all four years that lays everything out and makes it easier to defend if there are any issues during ASC time. We do have year one and two omnibus course outlines currently.</li> <li>• Early in the new year we should be looking at whether this is going to be an ongoing, more permanent change and</li> </ul>	<p>Dr Bistriz and the curriculum team to work on the omnibus course outline for years three and four itemizing the elements that must be passed. To be brought back to a future MDCPC meeting.</p>		
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	then we'll have to get some discussions going with other stakeholders and across the preclerkship and clerkship courses.	Dr Hollis Lai motion regarding the continuing the omnibus course. Seconded by Dr Joanne Rodger. All in favor, no opposed. <b>Motion Carried</b>		
d. Hybrid delivery of Curriculum	Deferred to next meeting			
e. Alberta Institute proposal	<p>This topic is being brought to Faculty Council and this does have implications for us, and although the decisions about approving this degree program that will be discussed is not our final decision. I would ask that people think about the following three things during the presentation from the MD perspective:</p> <ol style="list-style-type: none"> <li>1. What are the potential benefits</li> <li>2. What are the risks</li> <li>3. Stewardship</li> </ol> <p>Dr Tracey Hillier Presenting the Alberta Institute which is an existing collaboration between our faculty and the Medical university in China. There are several initiatives:</p> <ul style="list-style-type: none"> <li>• Faculty development program where department chairs and other senior leaders were matched up with senior leaders in our faculty and spent 3-6 months in partnership learning how leadership and management is done here.</li> <li>• Graduate student part of the institute which is primarily involving dentistry and psychiatry for Masters and PhD students (still in the works)</li> <li>• Medical school collaboration (which is of most interest to MDCPC). There has been elements of this relationship going on since 2017. In 2019, there was discussion of this at MDCPC.</li> </ul> <p>Essentially the faculty is leveraging the work, and the stored values of the curricular materials in the preclerkship curriculum, and using that building a</p>	<p>Link to information re: Alberta Institute proposal:</p> <p><a href="#">Sept 2021 UAlberta WMU Dual Degree Program Template A.pdf</a></p>		

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		<p>program together with partners at Wenzhou Medical University in China, also with being a source of revenue for the faculty.</p> <ul style="list-style-type: none"> <li>• We are submitting a proposal to develop a Dual Degree program</li> <li>• 60 students will enter the program each year.</li> <li>• We have one or two courses at a time that are being taught by our faculty, students are enhancing their English language abilities, lots of active learning.</li> <li>• Years 3 &amp; 4 for them are our preclerkship curriculum.</li> <li>• We would offer them a degree to these students at that point. If the degree does not go through the institute doesn't go away. The proposal is then to offer them a degree and then they will do their fifth year as a clerkship. At that point they can get an MD degree from WMU. An important point is that we are not giving an MD degree.</li> <li>• The students go back and practice in China</li> <li>• The only time that the students would be here in person would be in the summer between their years 2 &amp; 3 when they finish doing their preclerkship. To have a chance to come and really be embedded in our learning environment.</li> </ul> <p>This has been in the works with the University of Alberta advisory team since 2019, and was brought to MDCPC in 2019. Once this moves through the faculty council, if their support for it, it will go through the GFC committee, academic planning committee and ultimately the board of governors- so the same rigorous program any other degree would undergo</p> <ul style="list-style-type: none"> <li>• because the teaching will be after hours there will be a stipend offered. It is deliberately planned in a way that is not</li> </ul>			
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		<p>taking away from medical student experience.</p> <ul style="list-style-type: none"> <li>• \$5m-\$6m costs but \$8-10 million coming in. A large portion of the money will be going to social accountability initiatives and bursaries for students</li> </ul> <p>To wrap up, Dr Rolfson states the final note: Faculty Council provides the stewardship of our external relationships, including the disposition of the funding, the vetting of proposals and the criteria upon which decisions are made. This will be addressed in the upcoming Faculty Council meeting.</p>			
	<p>f. Q&amp;A new restrictions and move to online</p>	<p>With the announcement made yesterday:</p> <ul style="list-style-type: none"> <li>• The pressure on surgery is the one that is being impacted the most by the current changes within the health system. Dr Jenny Souster updated that Surgery has approximately 150 students that are supposed to come through surgical electives and rotations in the next couple of months. The goal is to make sure that, specifically the year fours, do get their electives. If the year threes end up having to be rescheduled they would certainly get priority in the coming scheduling times.</li> <li>• There are some students that are cancelling electives, and there is some concern over the professionalism flag being put on students if they were dropping their electives before the six weeks of notifications- As already noted this will not be a concern.</li> <li>• The normal surgical caseload is 55% urgent emergent where right now we are down to 30% which includes the pediatric side as well. So everything is affected right now.</li> </ul> <p>Curriculum: Already has mostly hybrid learning in place, so there are zoom links for both large and</p>			

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		<p>small classrooms. The curriculum team is finalizing the last details with the zoom links and making sure that the emails have been distributed to all of the DL preceptors, lecturers, and instructors.</p> <ul style="list-style-type: none"> <li>Physical exams: we were already anticipating virtual delivery, we've already done live demos of all the appropriate physical exam.</li> </ul>			
9	Adjournment	12:08pm			
10	Next Meeting	November 18, 2021			

Dr Darryl Rolfsen, Chair

Ms Angie Hill, Recorder

## Appendix B3

Minutes of MD Program Meeting discussing the collaboration with Wenzhou Medical University and the sharing of curriculum and assessments. This collaboration will go on to be known as the Alberta Institute: (relevant section highlighted in yellow)

Date: 2019 June 20  
 Time: 1100 to 1300 hours  
 Location: Katz 1-004

**Chair:** Dr Tracey Hillier

Lucia  
 Popovici  
 1110  
 1200

**Attending:** Dr Lana Bistriz, Dr Ron Damant, Mr Martin Marshall, Dr Tammy McNab, Dr Joanne Rodger, Ms Jodi Hawthorne, Dr Hollis Lai, Dr Peggy Sagle, Ms Tibetha Kemble, Ms Brittany Lissinna, Dr Steven Patterson, Mr Andrew Volk, Dr Lillian Au, Dr Dan Livy

**Regrets:** Dr Curtiss Boyington, Dr Cheryl Goldstein, Mr Quinn McLellan, Mr Adam Mullan, Dr Helly Goetz, Dr Sita Gourishankar, Dr Vijay Daniels, Dr Carol Hodgson, Mr Taylor Heinzlmeir, Dr Andrew Holt, Dr Karen Forbes, Ms Joanna Gye, Mr Murray Diduck

**Calling In:** Dr Jill Konkin

**Delegate:** Dr Melanie Lewis

**Guest:** Mr Kenton Boutillier

### PURPOSE: Oversight of the MD Program & Curriculum

#	Agenda Item	Summary	Action	Assigned to
1	Call to Order	Dr Tracey Hillier called meeting to order at 1105		
2	Treaty Acknowledgement	The University of Alberta acknowledges that we are located on Treaty 6 territory, and respects the histories, languages, and cultures of First Nations, Metis, Inuit, and all First Peoples of Canada, whose presence continues to enrich our vibrant community		Dr. Tracey Hillier
3	Approval of Agenda		Approved	
4	Approval of Minutes		Approved	
5	Announcements			Dr. Tracey Hillier
6	Presentation			
7	Updates			Dr. Tracey Hillier
	a. Integration Update	Dr Tracey Hillier updated the committee that the pilot integration courses are foundations block, endocrine block and MSK block. We are coordinating the content that has previously been known as systems block and physicianship into one coherent course.		Dr. Tracey Hillier
	b. Working Group Update	Dr Tracey Hillier updated the committee that clerkship and preclerkship content (including objectives, assessments, etc.) is being		Dr. Tracey Hillier

		reviewed at a series of working groups that are being organized over the spring, summer, and into the fall. The working groups include subject specialists, generalists, students, and MD Program staff.		
	c. MD/PhD	<p>Dr Tracey Hillier introduced the idea of a longitudinal MD/PhD program that will be piloted beginning in Fall 2019. This type of program has been the goal of the MD Program for a number of years and was previously discussed at Faculty Council in 2016. This longitudinal approach will align with the research learning community that we talked about last year. Some traction has been made in the last couple of months and there is a continuum of student involvement and interest in research. We may have students who want to pick up a project to help them with the CaRMS application. Then we have the students who are more committed who would like to do the MD/STIR program. We have a bit of a gap around MD/MSc which the faculty is exploring how that could go. Dr Underhill had talked about an MD post-Doctorate for students who have completed their PhD and would like to continue to do research. We will work with the CIP program for residents and what does that content look like. Dr Michelakis has a lecture series that he does. We are going to consolidate those and try using existing things that are happening and look at a timeline and have a 2 year cycle.</p> <p>For this upcoming academic year we have a cohort of students who are in progress with a PhD program and are near completion. We will pilot a longitudinal integration of their research and the MD program. This will be done in parallel. The PhD program runs year round. There might be elements of clinical skills and LCE which the students do off cycle from other students.</p>		Dr. Tracey Hillier
	d. China	Dr Tracey Hillier shared that the Global Summer Medical Program (which is presented in collaboration with the FoMD's International Office and several universities in China, including Wenzhou University) will begin in mid-July with about 50 students who will be participating in 4 weeks of programming. We have students coming in mid-July. As well, in the fall there will be a cohort of graduate students and faculty coming from universities in China for faculty		Dr. Tracey Hillier

		development. There will be opportunities for our faculty to go do some teaching if there is interest. The Interim Dean has signed an agreement to share elements of our pre-clerkship curriculum that will include assessment and core content. There are more details to be worked out.		
	e. IHIP	Ms Tibetha Kemble informed the group that 11 Indigenous students have been admitted to the program this year.		Ms Tibetha Kemble
7	MSA Report	No update		Mr. Taylor Heinzlmeir Mr. Andrew Volk Mr. Quinn McLellan
8	Old Business			
	a. Professionalism Forms	Tabled		Dr. Vijay Daniels Dr. Daniel Livy
	b. Policy Compliance (8556) (Integration)	Tabled		Dr. Helly Goetz
	c. Unmatched Medical Learner Policy & Student Category	Tabled		Dr. Tracey Hillier Mr. Murray Diduck
	d. 5 <sup>th</sup> Year Students from other programs for electives	Tabled		Dr. Tracey Hillier
	e. Grande Prairie Update	The 4 <sup>th</sup> year Grande Prairie program is being piloted next year. Dr Johan Bolton is the clerkship coordinator. 6 students have been confirmed.  Dr Moran is supportive and that the geriatrics component and is available to help in whatever capacity.		Dr. Jill Konkin
9	New Business			
	a. Assessment Committee Update	Dr. Tammy McNab discussed that students in year 1 and 2 of the program have up to and including the last business day prior to the next academic year to complete outstanding coursework.  Dr. Tammy McNab discussed that students in all years of the MD program will have two	Motion by Dr Tammy McNab and seconded by Mr Andrew Volk.  <b>MOTION PASSED</b>	Dr. Tammy McNab

		attempts to achieve a passing grade on each assessment or examination, throughout the program.	Motion by Dr Tammy McNab and seconded by Mr Andrew Volk.  <b>MOTION PASSED</b>	
10	Adjournment	12:50		
11	Next Meeting	<b>Thursday, July 25, 2019, 12 am to 2 pm, Katz 1-004</b>		

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Dr Tracey Hillier, Chair  
Associate Dean, MD Program

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Lucia Popovici, Recorder  
Executive Assistant, MD Program



## Part B: Campus Alberta Quality Council Review

As noted at the beginning of Part A, given a positive outcome from the System Coordination Review, the Minister may refer the proposed program to the Campus Alberta Quality Council for quality assessment, the second stage of review.

The onus is on the applicant institution to satisfy Council that the level of learning to be achieved is consistent with that which is expected at the proposed degree level, that the program has sufficient breadth and rigour to meet national and international standards as outlined in, for example, the Canadian Degree Qualifications Framework (CDQF), and that the program is comparable in quality to similar programs (if any) offered in Alberta and elsewhere. The program proposal should demonstrate how Council's program quality standards and any applicable guidelines have been addressed and describe any unique dimensions that set the program apart from similar programs thus providing new educational opportunities for students.

NOTE: Part A of the program proposal may undergo changes as a result of the System Coordination Review. It is important that Part A be up-to-date and complete before it is forwarded to Council. Building on the information provided in Part A, the program proposal that is sent to Council should contain the following additional information. When possible, links to existing policy documents and institutional policies should be provided, rather than recopying them in response to questions.

### SECTION 5: PROGRAM SPECIFICS

#### 5.1 Program Structure and Learning Outcomes

5.1.1 *Describe the program's learning outcomes and how they were established. How will the achievement of the learning outcomes be evaluated? Providing a mapping of the courses to the learning outcomes, particularly in professional programs, is helpful:*

##### Learning Outcomes

By the end of the program students will be able to:

- Demonstrate clinical decision-making skills that integrate best evidence and acknowledge patient values.
- Apply basic knowledge of the etiology, pathogenesis, clinical features, complications, principles of prevention and management with emphasis on common and life-threatening illnesses across the age spectrum.
- Demonstrate knowledge on approaches to diagnosis and treatment with emphasis on common and urgent problems.
- Perform both complete and organ system-specific examinations appropriate to the age of the patient and nature of the clinical problem(s).
- Recognize and prioritize the urgency of a patient's clinical problems.
- List and prioritize a meaningful differential diagnosis with emphasis on common and urgent clinical presentations.
- Demonstrate the ability to select and interpret commonly employed investigations.
- Demonstrate appropriate use of selected procedural skills (diagnostic and therapeutic).
- Apply the principles of pharmacology and evaluate options for safe, rational, and appropriate drug therapy.



- Understand the scientific principles underlying evidence-based approaches to health maintenance, preventive screening, therapeutic, rehabilitative, and palliative interventions.
- Demonstrate a basic understanding of the psychological, interpersonal, family, cultural, societal, and environmental determinants of health and illness across a diverse population.
- Recognize and cope with uncertainty and ambiguity in clinical decision-making and care.
- Demonstrate critical reflection and inquiry to enable practices of life-long and self-directed learning.
- Assist in teaching others and facilitate learning where appropriate.
- Demonstrate knowledge of forms of rigorous inquiry in research methodologies and describe an appropriate methodology to a specific research question.
- Demonstrate an understanding of ethics as it relates to medical research.
- Demonstrate knowledge of the professional practices and scholarly activities required of the profession.
- Receive, incorporate, and provide feedback in an appropriate and timely manner in their daily learning and practice.

**How the learning outcomes were established:**

The learning objectives of this program align with the objectives of the University of Alberta MD Program for the Preclerkship curriculum. The objectives were developed through an iterative Delphi process involving faculty, current and former students with input from allied health professionals. The resulting objectives were then shared with the Faculty for input and further refinement.

**How the achievement of the learning outcomes be evaluated:**

Achievement of learning outcomes will be evaluated through a process of continual education quality improvement which includes regular review of feedback from learners, review of student performance on objectives, linking of learning objectives to low and high stakes assessment items and annual course objective and faculty teaching performance review.

- 5.1.2 *Students are expected to demonstrate independent scholarly activity applicable to the degree level and expectations of its graduates (see the CDQF). Describe the academic culture that will nurture and support student scholarly and creative activity.*

Students in this dual degree program will be taught by University of Alberta FoMD faculty and held to the same curricular expectations as undergraduate students in similar programs in the Faculty of Medicine and Dentistry including students in the MD Program. The curriculum will be delivered in a way that presents material in a progression from basic science to clinical application, building on foundational knowledge in a sequential way, which will nurture and support student inquiry as well as scholarly and creative activity. This program will emphasize lifelong learning, problem solving skills, teamwork, and collaboration.

- 5.1.3 *For undergraduate degrees, demonstrate (in a table, if possible) how the program meets the relevant section of CAQC's Expectations for Design and Structure of Undergraduate Degrees.*

*Standard* How CAQC's Expectations for Design and Structure of Undergraduate Degrees will be met

1. **Faculty and staff** – The program is supported by an appropriate number of suitably qualified academic faculty and instructional staff to develop and deliver the degree program. Faculty

have an appropriate level of scholarly output and/or research or creative activity for the baccalaureate program.

2. **Academic policies** – The program has academic policies including dealing with admissions, promotion and graduation requirements, appeals, and academic dishonesty consistent with the level of the degree program.
3. **Resource capacity** – The program is supported by the physical resources, both start-up and development, needed to assure the quality of the degree program. These include, equipment, library and learning resources (physical and electronic), laboratories, computing facilities, specialized equipment, etc. There is an institutional commitment to maintaining and supplementing resources and equipment as needed to meet standards applicable to the field.
4. **Credential recognition** – The credential can be recognized and accepted by other post-secondary institutions, employers, and professional bodies, where applicable. There is an appropriate fit between the nomenclature of the credential and the content of the degree.
5. **Program delivery** – Learning methodologies are the methods of delivery that will be used to achieve the desired learning outcomes at an acceptable level of quality. The faculty has demonstrated that it has the expertise and resources to support the proposed methods of delivery and ensure their effectiveness. The faculty has experience attending to the learning needs of students in similar health sciences programs and supports their engaged and active learning.
6. **Program content** – The program offers education of sufficient breadth and rigour to meet relevant national and international standards. The content of the program, in both subject matter and outcome standards, is appropriate to the level of the degree program and the field of study. Its curriculum is current and reflects the state of knowledge in the field. There is an established program evaluation process to maintain the currency of the program and the quality of its learning outcomes.
7. **Program structure** – The structure of the degree is similar to the “2 + 2” design. The first 2 years are based on the curriculum of the medical school at Wenzhou Medical University, a robust curriculum well regarded in China. Graduates of the program have a pass rate among the top 10% in China, ranking 5th among colleges and universities nationwide in 2015. UAlberta is responsible for teaching a 3-credit course during the first year and 7 credits during the 2nd year of the program. The 3<sup>rd</sup> and 4th years are based on the curriculum of the first two academic years, the “Preclerkship” of the MD Program at the University of Alberta. The students complete a 5<sup>th</sup> year in clinical medicine. The credits from that 5<sup>th</sup> year of study are not included in the requirements for the UAlberta degree component of the proposed Dual Degree Program. However, students must complete all of the requirements of the 5 year program to receive either degree.
8. **Program evaluation** – The program is subject to a formal, approved policy and procedure requiring a periodic review and improvement process. The procedure includes assessment of the program against the institution’s own learning outcome standards for the program, and assessment of individual student work in the terminal stage of the program against program outcomes.

The proposed program also meets the following standards for blended, distributed or distance learning.

### ***Institutional commitment***

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**Institutional commitment** – The mandate of the University of Alberta is: “*Within a vibrant and supportive learning environment, the University of Alberta discovers, disseminates, and applies new knowledge for the benefit of society through teaching and learning, research and creative activity, community involvement, and partnerships. The University of Alberta gives a national and international voice to innovation in our province, taking a lead role in placing Canada at the global forefront*”. The academic plan for the proposed Dual Degree Program and these goals of the institution and its policies are well matched. Both WMU and the Faculty of Medicine and Dentistry within the University of Alberta agree to create and sustain the program for a period sufficient to enable all admitted learners to complete a degree in the published time frame. That time frame is appropriate and relevant for the learners for whom the program is intended and for the specific area of study addressed by the program.

### **Institutional ownership of the program**

**Collaboration and joint delivery** –The responsibility for program quality will be shared jointly, even though the onus for quality rests ultimately with the University of Alberta with negotiated permission to amend materials if changes are necessary to meet institutional standards of quality.

**Risk management and mitigation** – The Faculty has in place appropriate risk management provisions, including those that ensure that technological infrastructure is stable, reliable, well maintained and secure, that a disaster recovery plan is available in the event that servers or other technologies fail, and that learners will not be adversely affected should an agreement with a partner or contractor be abrogated. The program will be using a learning management and delivery technology developed by a team in the Faculty of Medicine and Dentistry which included the Program lead, that system has been robust in the synchronous, asynchronous and distance delivery of the MD Program Preclerkship curriculum for the past 8 years including extensive distance delivery during the past 1.5 academic years during the COVID pandemic. The new Dual Degree Program will hire dedicated staff to manage and mitigate risk to support this infrastructure and work collaboratively with that team on an ongoing basis to ensure stable delivery of the program.

**Privacy, identity and confidentiality** – Working with the Office of the Registrar, appropriate safeguards are in place to assure the authentication of learner identity. The Faculty has experience to assure the authentication and the integrity of learner work in blended, distributed and distance programs. Documented procedures and appropriate storage protocols are in place to assure that security of personal information is protected in conducting assessments and evaluations and in the dissemination of results with procedures and timelines by which personal data no longer needed for authentication purposes will be destroyed.

**Accessibility** – The program will follow institutional protocols and procedures to assure that the diverse needs of learners are appropriately addressed, and when necessary, accommodated.

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**Intellectual property** – The institution has policies to deal with the requirements of copyright and intellectual property laws and to address issues pertaining to digital rights management and appropriate use of learning object repositories.

**Technology and renewal** – The technology used to administer and deliver the program, both pedagogically and administratively, is adequate to facilitate program delivery, and the Faculty is committed to appropriate updating of any technologies employed, and the identification and evaluation of emerging technologies. Sufficient resources will be available for development and sustainability with the hiring of dedicated staff. The support for the building and maintenance of the technology for learning activities is maintained and supported and is as fail safe and secure as possible.

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### *Program planning and design*

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**Appropriate planning** – There is a clear, well-understood process by which the program evolves from conception to approval to implementation to institutional review to continuous improvement. The instructional methods, modes of delivery and assessments of learning and feedback used are aligned with articulated learning outcomes for the program.

**Team/collaborative/networked learning** – Due consideration has been given to the substantial amount of learning that comes from peers, and to the implications of cohort models and other team, collaborative and networked learning environments. The program curriculum includes extensive small group and team-based learning pedagogies. Near peer student teaching assistants will be hired to further support this.

**Course development and evaluation** – Instructional and course materials will be reviewed regularly to ensure that they continue to meet the requirements and standards for the program. The intended learning outcomes will be reviewed regularly to ensure clarity and appropriateness, and their effectiveness evaluated through appropriate methods.

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### *Learners*

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**Advice to learners** – Learners are fully advised about the competencies, the self-discipline and the equipment they will need to have in order to participate in the program, and are provided with information about the programs, courses, required texts and/or materials and other requirements in a timely manner to enable them to acquire the materials for their course as it begins. Learners are also informed of the costs associated with the mode of delivery of their program.

**Learner support** – Learners are provided with training in how to use on-line tools, and are updated when changes are planned or implemented.

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**Hardware and software** – Procedures are in place to ensure that learners are supported in their use of the hardware and software required and have access to advice on these matters. In particular, before starting the program, learners are advised of the technical and time requirements for synchronous, asynchronous and self-directed learning sessions).

**Learner services** – Learners are informed about what learner services (e.g., academic advising, counseling) are available to assist them, and to address any complaints they have.

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### *Academic Staff*

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**Oversight of program curricula** – Program curricula, assessment and oversight are the responsibility of the Program Director who previously held the position of Associate Dean for the MD Program as well as supporting cross institutional committees with appropriate academic qualifications and experience delivering comparable programs. The presentation, management, assessment and evaluation of the program are the responsibility of these committees.

**Technology training** – All those involved in course design and delivery are adequately trained and assisted in the technology and pedagogy of on-line learning. Academic staff are assisted and supported in making the transition from classroom to online teaching and are assessed and mentored as they progress in their online teaching.

**Technical support** – Academic staff are provided with an orientation to, and sufficient ongoing training/technical support for any hardware and software resources required in the program and are also updated in a timely manner about any impending or actual changes that could affect their access to or involvement in their online programs.

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5.1.4 *Provide an outline of the program structure and requirements (major, minor, cognates, core, general education, etc.) including credits in each category, and a summary description of the curriculum. Note any new courses. Course outlines must be available for reviewers but are NOT to be included with the proposal. (See sample table below - note that this is provided as a guideline only for a typical baccalaureate program, and will be different for other baccalaureate and graduate programs).*

**Program structure – all courses are required**

*Proposed program of study including course names, credits and year of study (specific course descriptions and objectives follow)*

<b>Year in Program</b>	<b>Courses</b>	<b>Credits</b>
<b>Years 1 and 2</b>	<b>Courses Taught by Wenzhou Medical University</b>	
	English Medical English	<b>9</b>
	Medical chemistry Molecular and cellular biology Normal structure and function of human body Biological basis of disease	<b>22</b>
	Modern Chinese History, Politics, Education & Fundamentals of Law	<b>12</b>
	Introduction to medicine Traditional Chinese Medicine Medical Ethics Social medicine and health service management Social Practice Policies Physical and Psychological Health Education Sanitary regulation Hygiene	<b>17</b>
	<b>Courses Taught by University of Alberta</b>	
	Health Systems Science 1	<b>3</b>
	Health Systems Science 2A	<b>3</b>
	Summer School: Health Systems Science 2B	<b>4</b>
	<b>Year 3</b>	<b>Courses Taught by University of Alberta</b>
Foundations Medicine		<b>9</b>
Endocrinology & Metabolism		<b>6</b>
Cardiovascular Medicine		<b>5</b>
Pulmonary Medicine		<b>3</b>
Renal Medicine		<b>3</b>
Health Systems Science 3		<b>4</b>
<b>Year 4</b>	<b>Courses Taught by University of Alberta</b>	
	Gastroenterology & Nutrition	<b>5</b>
	Reproductive Medicine & Urology	<b>6</b>
	Musculoskeletal System	<b>6</b>
	Neurosciences and Organs of Special Senses	<b>9</b>
	Psychiatry	<b>3</b>
	Oncology	<b>3</b>
Health Systems Science	<b>3</b>	
<b>Year 5</b>	<b>Clinical Courses Taught by Wenzhou Medical University</b>	
	Internal Medicine	<b>16</b>
	Surgery	<b>16</b>
	Obstetrics and Gynecology	<b>6</b>
<b>***the courses from this year of the</b>		

<i>program are not required for the Bachelor of Biomedicine Degree</i>	Pediatrics	<b>6</b>
	Community Medicine	<b>2</b>
	Radiology and ECG	<b>2</b>

### Summary Course Descriptions

COURSE NAME	COURSE DESCRIPTION	Year
Health Systems Science 1	Health systems science is a foundational platform and framework for the study and understanding of how care is delivered for patients and populations within systems of medical care, how health professionals work together to deliver that care, and how the health system can improve patient care and health care delivery. This course continues over 4 years and builds knowledge of core domains including health care structures and processes; interprofessional care; health care policy, economics, and management; clinical informatics and health information technology; global, population and public health; value-based care; health system improvement, design and systems thinking.	Year 1
Health Systems Science 2	Health systems science is a foundational platform and framework for the study and understanding of how care is delivered for patients and populations within systems of medical care, how health professionals work together to deliver that care, and how the health system can improve patient care and health care delivery. This course continues over 4 years and builds knowledge of core domains including health care structures and processes; interprofessional care; health care policy, economics, and management; clinical informatics and health information technology; global, population and public health; value-based care; health system improvement, design and systems thinking.	Year 2
Foundations of Health and Medicine	The Foundations of Medicine course serves as a foundation for future learning and practice. This course will focus on integrating basic principles of medical and biological sciences as the foundation for the curriculum.	Year 3
Endocrinology & Metabolism	During the Endocrinology and Metabolism course, students will learn how the endocrine system integrates with the rest of the body. The course covers the different endocrine glands: how the hormones have profound effects on the cells and tissues of the body; and the feedback loops that are important in hormonal	Year 3

	regulation. Students will have a chance to learn about basic endocrine anatomy, physiology, pathology and biochemistry, as well as clinical aspects of endocrine diseases. Discovery learning, team-based learning, in-class review sessions and self-study materials cover major endocrine topics.	
Cardiovascular Medicine	<p>The Cardiology course will serve as a foundation for future learning and practice. The goal is to provide students with an introduction to the fundamentals of cardiology medicine. Topics to be covered include the</p> <ul style="list-style-type: none"> <li>● basic structure and function of the cardiovascular system</li> <li>● clinical picture of ventricular or valvular diseases, electrical diseases of the heart, including an approach to ECG reading</li> <li>● coronary and aortic / peripheral arterial diseases</li> <li>● congenital heart diseases</li> <li>● myocardial and pericardial disease</li> </ul>	Year 3
Pulmonary Medicine	The Pulmonary serves as a foundation for future learning and practice. The goal is to provide students with an introduction to the fundamentals of pulmonary medicine.	Year 3
Renal Medicine	<p>The Renal course will serve as a foundation for future learning and practice. The goal is to provide students with an introduction to the fundamentals of renal medicine.</p> <p>Topics to be covered include:</p> <ul style="list-style-type: none"> <li>● Basic anatomy, physiology, embryology and pathology of the renal system;</li> <li>● Acute and chronic renal failure;</li> <li>● Pharmacology of the kidney;</li> <li>● Diseases of the glomerulus;</li> <li>● Tubulointerstitial disease;</li> <li>● Renovascular disease;</li> <li>● Pediatric nephrology; and</li> <li>● Hereditary and cystic renal disease</li> </ul>	Year 3
Health Systems Science 3	Health systems science is a foundational platform and framework for the study and understanding of how care is delivered for patients and populations within systems of medical care, how health professionals work together to deliver that care, and how the health system can improve patient care and health care delivery. This course continues over 4 years and builds knowledge of core domains including health care structures and	Year 3



	processes; interprofessional care; health care policy, economics, and management; clinical informatics and health information technology; global, population and public health; value-based care; health system improvement, design and systems thinking.	
Gastroenterology & Nutrition -	The Gastroenterology and Nutrition Course will serve as a foundation for future learning and practice. The goal is to provide students with an introduction to the fundamentals of gastroenterology. Topics to be covered include: <ul style="list-style-type: none"> <li>• The structure and function of the gastrointestinal tract</li> <li>• Gastrointestinal health and nutrition</li> <li>• Common diseases of the gastrointestinal tract</li> <li>• Fundamentals of gastrointestinal disease management</li> <li>• The impact of gastrointestinal disease on patients and society.</li> </ul>	Year 4
Reproductive Medicine & Urology	The Reproductive Medicine and Urology Course that provides students with a strong knowledge base in the fundamentals of reproductive medicine, urology. Topics to be covered include: <ul style="list-style-type: none"> <li>• An overview of the anatomy, pathophysiology, presentation, diagnosis and treatment of common gynecologic, obstetric (including genetic), urologic, and sexually transmitted illnesses.</li> </ul>	Year 4
Musculoskeletal System	The Musculoskeletal System course provides students with a strong knowledge base in the fundamentals of musculoskeletal medicine. The anatomy, embryology, histology and physiology of the musculoskeletal system and skin are studied. An approach to common and important conditions and disorders of the musculoskeletal system and skin are covered from the perspectives of rheumatology, physical medicine and rehabilitation, orthopedics, dermatology, plastic surgery, pediatrics and family medicine.	Year 4
Neurosciences and Organs of Special Senses -	The Neurosciences and Organs of Special Senses course provides students with a foundation in the areas of Neurology, Neurosurgery, Ophthalmology, ENT and Developmental Pediatrics. Throughout the course, students will learn the approach to a patient with common	Year 4

	symptoms or important problems; the elements of the neurological, eye, and head and neck exam, as well as perform a developmental assessment; to develop the ability to localize lesions, all while being able to recognize serious processes requiring urgent referral.	
Psychiatry	The Psychiatry course provides students with foundational knowledge regarding mental health and illness. Students will learn how to describe why mental health is important and the cost to society of mental illness. They will also learn to describe the stigma of mental illness and its impact on physician health.	Year 4
Oncology	The Oncology course is designed to help students to understand the principles of oncology and recognize the importance of a multidisciplinary approach to cancer care while caring for patients with cancer.	Year 4
Health Systems Science 4	Health systems science is a foundational platform and framework for the study and understanding of how care is delivered for patients and populations within systems of medical care, how health professionals work together to deliver that care, and how the health system can improve patient care and health care delivery. This course continues over 4 years and builds knowledge of core domains including health care structures and processes; interprofessional care; health care policy, economics, and management; clinical informatics and health information technology; global, population and public health; value-based care; health system improvement, design and systems thinking.	Year 4

To assist in demonstrating that the program curriculum is clear and well integrated with the objectives and outcomes, provide one or more typical student programs by year of program (see sample table below).

**Typical student program**

Year in Program	Courses
<b>Years 1 and 2</b>	English Medical English Medical chemistry Molecular and cellular biology Normal structure and function of human body Biological basis of disease Modern Chinese History, Politics, Education & Fundamentals of Law Introduction to medicine Traditional Chinese Medicine Medical Ethics Social medicine and health service management Social Practice Policies Physical and Psychological Health Education Sanitary regulation Hygiene Health Systems Science 1 Health Systems Science 2A Summer School: Health Systems Science 2B
<b>Year 3</b>	Foundations Medicine Endocrinology & Metabolism Cardiovascular Medicine Pulmonary Medicine Renal Medicine Health Systems Science 3
<b>Year 4</b>	Gastroenterology & Nutrition Reproductive Medicine & Urology Musculoskeletal System Neurosciences and Organs of Special Senses Psychiatry Oncology Health Systems Science
<b>Year 5</b> ***not required for students to get UAlberta Bachelor of Biomedicine Degree	Internal Medicine Surgery Obstetrics and Gynecology Pediatrics Community Medicine Radiology and ECG

## **5.2 Criteria / Requirements for Admission and Academic Progression**

*State the admission criteria (including any provision for prior learning assessment), residency requirements, academic performance progression requirements, and graduation requirements applicable to the program, along with the grading scheme. Note any program specific regulations (e.g., for doctoral programs, note any candidacy or dissertation requirements, examination requirements, time to completion requirements, etc.).*

### **Admissions requirements**

Admissions requirements for students to be accepted into this dual degree program include:

- English Language IELTS of 6.5 with no band less than 6
- Successful completion of the first year of the WMU medical program

### **Residency requirements**

There are no residency requirements for the program

### **Grading Scheme**

The means of assessing a student's progress and determining a student's grades may vary from one course to another in accordance with the nature of the course. Factors other than examination results may be used to a variable extent by instructors in determining grades. Students are informed at the beginning of each course how grades are to be determined. Students are also advised of the procedures for appeal established within the Faculty and the University.

### **Academic performance progression requirements**

Students may only proceed to a subsequent year of the medical program if they have passed all courses for the current academic year. The program lead may approve exceptions to this requirement when it is not possible to meet this requirement.

Students enrolled in the program are under the obligation to meet the expected competencies through achieving learning objectives as distributed throughout the courses in the program. The program is sequentially designed to provide students with the opportunity to ultimately demonstrate satisfactory completion of all necessary requirements and competencies to graduate.

Promotion from year to year and ultimately graduation requires full completion of all program requirements in that current year before being able to progress in the program.

### **Academic Probation**

Academic Probation is assigned to a student who at the end of the year or term, fails to achieve a pass in all courses. A student on Academic Probation will have academic progress regularly reviewed and reported upon at the end of each term. A student on Academic Probation may be required by the program to participate in a structured learning program. Students with more than two failed courses in the academic year may be allowed to continue on Academic Probation at the discretion of the Program Lead

A student who has been assigned Academic Probation may be either granted an opportunity to enroll in a repeat of the year, an opportunity to remediate failed coursework before advancing to the next year of the program or may be Required to Withdraw from the program.

To clear Academic Probation and to qualify for promotion or graduation, the student must achieve Satisfactory Standing in the probationary or repeat year at assessment checkpoints at the end of each term during that year.

Students who fail to perform satisfactorily at any of those assessment points will be Required to Withdraw immediately and subsequent registration will be cancelled.

### **Graduation requirements**

Students will be eligible for graduation when they have successfully completed all of the program requirements.

### **5.3 Engaged and Active Learning / Delivery Methods**

5.3.1 *Demonstrate the ways in which the institution identifies and attends to the learning of students in the program and what pedagogies will be used to encourage their engaged and active learning, as per Council's program quality assessment standard #5 (Program delivery).*

The program will support active student learning in a variety of ways. Problem-based learning (Discovery Learning) takes place in small groups, facilitated by faculty preceptors to encourage students to apply basic science and foundational knowledge to clinical cases. Team-based learning similarly encourages small groups of students to work together to apply their knowledge to cases that are relevant to their courses. A flipped classroom approach will be used to deliver lecture-based material online as a vodcast, and then live sessions (synchronous) will be used to apply and consolidate that material, engage in conversations and Q&A style sessions with faculty members, and to integrate the information in clinical-based scenarios. All of these approaches support a constructivist approach to learning and are common teaching and learning strategies in medical education.

5.3.2 *Include a description of the teaching/learning approaches to be used, a description of the rationale for using the approach and evidence of adequate support for the approach. Where applicable, demonstrate how CAQC's Additional Quality Assessment Standards for Programs Delivered in Blended, Distributed or Distance Modes will be met.*

The program will use a variety of teaching and learning approaches. As this program will primarily be delivered to students while they are on campus at Wenzhou Medical University, blended learning approaches and pedagogies will be used. Problem-based learning (Discovery Learning), case-based learning and team-based learning sessions will be done with students and WMU faculty on site in China, supported by faculty and academic staff from the University of Alberta online. A variety of platforms will be used, including Zoom, to ensure this facilitation can be done in real time (synchronous) from a distance. Vodcasts and other learning materials will be available to students through infrastructure developed and currently used within the Faculty of Medicine and Dentistry. This will encourage and support resource delivery, and online interactions with faculty and staff from both institutions. University of Alberta faculty members will travel to WMU to deliver some core content in person, and to augment the virtual delivery of curriculum. Students will also complete one summer course on campus at the University of Alberta, learning with and from faculty, staff, and students in Edmonton. All of these approaches support a constructivist approach to learning and are common teaching and learning strategies in medical education.

The technology used to administer and deliver the program, both pedagogically and administratively, is adequate to facilitate program delivery, and the Faculty is committed to appropriate updating of any technologies employed, and the identification and evaluation of emerging technologies. Sufficient resources will be available for development and sustainability with the hiring of dedicated staff. The support for the building and maintenance of the technology for learning activities is maintained and is as fail safe and secure as possible. Both students and faculty will receive ongoing support in the use of the system with appropriate on-boarding.

## 5.4 Program Comparison

5.4.1 *Provide a comparative analysis of the proposed program (curriculum, structure, admission requirements, etc.) with similar programs offered elsewhere (if any), especially in Alberta and Canada (see sample table below). What process was used to determine which programs were deemed to be the most comparable? Illustrate the similarities and differences.*

There are no similar/comparable dual degree programs in Alberta or Canada. The content of the curriculum of the third and fourth year of the proposed dual degree program is similar to the current Preclerkship curriculum for year 1 and 2 of the UAlberta MD Program. The Faculty has a proven track record for successful delivery of this curriculum in a blended fashion.

The programs are otherwise significantly different. The educational background of learners is different in that students entering the MD Program are experienced learners who have completed undergraduate degrees at a minimum. Students in the Dual Degree program will not have this same educational background. The other and most significant difference is regarding the delivery of clinical Work Integrated Learning (WIL) which constitutes more than 50% of the UAlberta MD Program. In the proposed Dual Degree program the WIL will occur during the summer course between years 2 and 3 and in the 5th year of the Program. The 5th year WIL will be delivered according to the requirements typical of WMU to prepare students for clinical practice in China.

Program component	Applicant institution	Institution A*	Institution B**
Name of credential	WMU	Bachelor of Biomedicine	Bachelor of Clinical Medicine
Entrance requirements	WMU	Additional English language requirements IELTS(Academic) (International English Language Testing System) At least 6.5 with no band less than 6.0	Applicants must meet the normal admission requirements for WMU degree program
Areas of study / Curriculum	WMU	Years 3 and 4	Years 1,2 and 5
Graduation requirements		Successful completion of the Year 1-4 curriculum	Successful completion of the additional 5 <sup>th</sup> year of clinical studies
Total credits	183	135	+48

\*Institution A is University of Alberta

\*\*Institution B is Wenzhou Medical University (WMU)

5.4.2 *If a similar program is currently offered at the institution, compare the structure, admission requirements and learning outcomes to the proposed program. If this is a conversion of an existing program (e.g., conversion of an applied degree to a new degree program), provide a table similar to the sample shown below.*

The overall learning outcomes of this program are similar to those of the Preclerkship Curriculum of the UAlberta MD Program. However, there are significant differences between the programs. Students enter the UAlberta MD Program after completing an undergraduate degree (at a minimum). Students will join the proposed Dual Degree Program after completing their secondary education and meeting the English language requirements. The students will complete two years of foundational content primarily based on the WMU medical school curriculum prior to starting the UAlberta Preclerkship Courses. The students will not complete the same two year WIL clinical clerkship required of students in the MD Program prior to receiving an MD Degree from the University of Alberta.

#### **Comparison by course – existing program to new program**

N/A

#### **5.5 Other elements affecting quality**

*Note any other relevant aspects of the proposed program that might affect quality (e.g., fast-tracking, individual study, parts of the program to be offered in cooperation with another institution, etc.).*

The quality of the program may be affected by the following factors:

- The blended approach may affect that quality of the educational experience because students will be learning at a distance, with both asynchronous and synchronous sessions. This will require student self-motivation. We hope to mitigate this by scheduling regular ‘live’ synchronous sessions, as well as having UofA staff and faculty teach in person at WMU regularly. As well, extensive faculty development will be provided to WMU faculty to ensure they can facilitate and support students in the University of Alberta approaches to learning.
- The time differences between WMU and UofA could be challenging when planning and delivering live sessions to students at WMU.
- Internet connectivity may be unstable from time to time requiring the rescheduling of sessions if no other means of connectivity is available.

## **SECTION 6: IMPLEMENTATION AND RESOURCES**

### **6.1 Program Implementation Plan**

*Provide a program implementation plan by academic year (start to maturity) that includes any elements to be phased in (e.g., new academic staff hires, courses, minors, co-op option). If introduction of this program is*

dependent on a similar program being phased out, the implementation plan should include how both programs are being supported until the phase out and start up are completed.

Program Year	Implementation Plan
Year 1	<ul style="list-style-type: none"> <li>-WMU begins recruitment of the first cohort of students</li> <li>-students work on year 1 of the AIWMU curriculum with one course being taught by UAlberta faculty.</li> <li>-hiring UofA staff for the joint institute, including a Director</li> <li>-establishment of the joint institute agreement</li> <li>-establishment of committee structures</li> <li>-building relationships within the joint institute</li> </ul>
Year 2	<ul style="list-style-type: none"> <li>-students work on year 2 of the AIWMU curriculum with one course being taught by UAlberta faculty.</li> <li>-recruitment continues with students being interviewed and selected to participate in the joint institute</li> <li>-planning for upcoming summer school to take place at the University of Alberta continues</li> <li>-all curricular materials will be reviewed for transcultural safety and geographic relevance</li> <li>- all staff hires occur for administrative, technical and program staff</li> <li>-curriculum delivery for the summer school program between years 2 and 3 of the program</li> </ul>
Year 3	-blended curriculum delivery for the year three content of the program
Year 4	-blended curriculum delivery for the year four content of the program

### ***Faculty Development to support the dual Degree Program***

To support the Alberta Institute Wenzhou Medical University Program a dedicated and specific Faculty Development program called the “Teaching Scholars Program – Alberta Institute” has been developed. Over 144 hours will be spent on working with WMU faculty to develop a mutual understanding about the curriculum and to allow for opportunities for collaborative development and enhancement of the curriculum.

The following courses will be taught by faculty leaders from the University of Alberta to faculty from WMU who teach in the first, second and fifth year of the program. These faculty may help with small group facilitation of courses led by University of Alberta faculty in the third and fourth years to enhance continuity across all 5 years of the program.

<b><i>Course</i></b>	<b><i>Time Commitment</i></b>	<b><i>Type of Course</i></b>
<b><i>TSP-AI 01: Introduction to Medical Education Theory &amp; Practice*</i></b>	<b><i>2 sessions/week, 2 hrs/session for 12 weeks online Fall 2021</i></b>	<b><i>Prerequisite for all other courses</i></b>



<b>TSP-AI 02: Improving Classroom Teaching Skills</b>	2 sessions/week, 2 hrs/session for 12 weeks online Winter 2022	Teaching
<b>TSP-AI 03: Introduction to Assessment</b>	2 sessions/week, 2 hrs/session Hybrid: 5 weeks online 5 sessions (1 week) in Alberta Spring 2022	Teaching
<b>TSP-AI 04: Introduction to Medical Education Scholarship</b>	2 sessions/week, 2 hrs/session for 12 weeks online Fall 2022	Scholarship
<b>TSP-AI 05: Introduction to Program Evaluation as Scholarship</b>	2 sessions/week, 2 hrs/session for 12 weeks online Winter 2023	Scholarship
<b>TSP-AI 06: Fostering a Humanistic Approach to Clinical Teaching</b>  <b>Elective Teaching Course</b>	1 session/week, 2 hrs/session 1 session/week, 1 hr/session Hybrid: 5 weeks online 5 sessions (1 week) in Alberta Spring 2023 (campus tour)	Teaching Elective

18 WMU faculty members have successfully completed TSP-AI 01, Introduction to Medical Education Theory & Practice. These same faculty members are currently enrolled in the second TSP-AI course, TSP-AI 02 Improving Classroom Teaching Skills.

<b>TSP-AI 01: Introduction to Medical Education Theory &amp; Practice*</b>				
	<b>Beijing Time Small Groups</b>	<b>Beijing Time</b>	<b>Content*</b>	<b>Number of Hours</b>
1.		09/23/21 9:00 - 11:00 Session 1	<b>Course &amp; Participant Introductions</b> Dr. Hodgson, Dr. Hillier, & Dr. Brett-MacLean Receive readings for 9/25/21	2

2.	09/25/21 9:00-11:00 AM Session 2a	09/30/21 9:00 - 11:00 Session 2b	<b>Curriculum Development</b> Dr. Carol Hodgson Receive readings for 10/2/21 small group prep session	4
	10/02/21 HOLIDAY	10/07/21 HOLIDAY	<b>NO CLASS: National Day Holiday</b>	0
3	10/09/21 9:00-11:00 AM Session 3a	10/14/21 9:00 - 11:00 Session 3b	<b>Searching the Learning Management Database</b> Dr. Hollis Lai Receive readings for 10/16/21 small group prep	4
4.	10/16/21 9:00-11:00 AM Session 4a	10/21/21 9:00 - 11:00 Session 4b	<b>Curriculum Models</b> Dr. Carol Hodgson Receive readings for 10/23/21 small group prep	4
5.	10/23/21 9:00-11:00 AM Session 5a	10/28/21 9:00 - 11:00 Session 5b	<b>Learning Theories &amp; Accreditation Standards</b> Dr. Carol Hodgson Receive readings for 10/30/21 small group prep session	4
6.	10/30/21 9:00-11:00 AM Session 6a	11/04/21 9:00 - 11:00	<b>Case-based Learning</b> Dr. Carol Hodgson Receive readings for 10/30/21 small group prep	4
7.	11/06/21 9:00-11:00 AM Session 7a	11/11/21 9:00 - 11:00	<b>Teaching with Technology</b> Dr. Hollis Lai & Mr. Patrick von Hauff Receive readings for 11/20/21 small group prep	4
8.	11/13/21 9:00-11:00 AM Session 8a	11/18/21 9:00-11:00 AM	<b>Simulation in Teaching &amp; Deliberate Practice</b> Dr. Carol Hodgson & Mr. Patrick von Hauff Receive readings for 11/13/21 small group prep	4
9.	11/20/21 9:00-11:00 AM Session 9a	11/25/21 9:00-11:00 AM	<b>Curriculum Evaluation</b> Dr. Carol Hodgson Receive readings for 11/27/21 small group prep	4
10.	11/27/21 9:00-11:00 AM Session 10a	12/02/21 9:00-11:00 AM	<b>Narrative Reflective Practice</b> Dr. Pamela Brett-MacLean	4

11.	12/04/21 9:00-11:00 AM Session 11a	12/09/21 9:00-11:00 AM	<b>Making Your Everyday Work Scholarly</b> Dr. Carol Hodgson Small group prep session (12/4/22) for class presentations	4
12.	12/11/21 9:00-11:00 AM Session 12a	12/16/21 9:00-11:00 AM Session 12b	<b>Project Preparation</b>	4
13.	12/18/21 8:30 am - 12:00 pm		<b>Project Presentations</b> Dr. Carol Hodgson (Note longer class time)	4
*Prerequisite for all other TSP-AI courses			<b>TOTAL HOURS</b>	<b>50</b>

<b>TSP-AI 02: Improving Classroom Teaching Skills</b>				
	<b>Beijing Time Small Groups</b>	<b>Beijing Time</b>	<b>Content</b>	<b>Number of Hours</b>
1		01/13/22 9:00 - 11:00	<b>Course Introduction &amp; Overview</b> Dr. Carol Hodgson	2
2		01/20/22 9:00 - 11:00	<b>The lecture and making it interactive</b> Dr. Carol Hodgson Receive readings for 1/22/22 small group prep	2
3	01/22/2022 9:00-11:00	01/27/22 9:00 - 11:00	<b>Developing a Case (e.g., PBL/DL, patient-based basic science case, simulation, etc.)</b> Dr. Carol Hodgson	4
4	01/29/22 9:00-11:00			2
	02/01/22-02/15/22	02/01/22-02/015/22	<b>NO CLASS: New Year and Spring Festival</b>	0

5		02/17/22 9:00 - 11:00	<b>Being a Successful Small Group Facilitator</b> Dr. Carol Hodgson	4
6	02/19/22 9:00 - 11:00 am	02/24/22 9:00 - 11:00	<b>Narrative Approaches to Reflection</b> Dr. Pamela Brett-MacLean	4
7	02/26/22 9:00 - 11:00 am	03/03/22 9:00 - 11:00	<b>Visual Reflection - Learning to See</b> Dr. Pamela Brett-MacLean	4
8	03/05/22 9:00 - 11:00 am	03/10/22 9:00 - 11:00	<b>Developing a TBL Session</b> Dr. Tracey Hillier & Dr. Hodgson	4
Change in Canada to daylight savings time - Canada class time change from 6:00-8:00 pm to 7:00 to 9:00 pm				
9	03/12/22 9:00 - 11:00 am	03/17/22 9:00 - 11:00	<b>Facilitating a TBL Session</b> Dr. Tracey Hillier	4
1	03/19/22 9:00 - 11:00 am	03/24/22 9:00 - 11:00	<b>Developing a flipped classroom session</b> Dr. Carol Hodgson	4
1	03/26/22 9:00 - 11:00 am	03/31/22 9:00 - 11:00	<b>Facilitating a flipped classroom session</b> Dr. Tracey Hillier	4
1	04/02/22 9:00 - 11:00 am	04/07/22 9:00 - 11:00	<b>Teaching Effectively Online &amp; Teaching with Technology</b> Mr. Patrick von Hauff	4
1	04/09/2022 9:00 - 11:00 am	04/14/22 9:00 - 11:00 am	<b>Project Presentations - 2 groups present each day</b> <i>Note extra class session (if possible in-person in the AI area at WMU and in-person at the UofA FoMD)</i>	4
			<b>TOTAL HOURS</b>	<b>46</b>

### TSP-AI 03: Introduction to Assessment

	<i>Beijing Time Small Groups</i>	<i>Beijing Time</i>	<i>Content</i>	<i>Number of Hours</i>
1		05/12/22 9:00 - 11:00	<b>Course Introduction and Overview</b> Dr. Hodgson Readings provided for 05/14/22	2
2	05/14/22 9:00 - 11:00	05/19/22 9:00 - 11:00	<b>Assessment methods</b> Dr. Hodgson Readings provided for 05/21/22	4
3	05/21/22 9:00 - 11:00	05/26/22 9:00 - 11:00	<b>Measurement issues: validity, reliability, and statistics of testing</b> Dr. Hollis Lai Readings provided for 05/28/22	4
4	05/28/22 9:00 - 11:00	06/02/22 9:00 - 11:00	<b>Standard Setting</b> Dr. Hollis Lai Readings provided for 06/04/22	4
5	06/04/22 9:00 - 11:00	06/09/22 9:00 - 11:00	<b>Written Exams</b> Dr. Carol Hodgson	4
6	06/11/22 9:00 - 11:00		<b>Small Group Project Work</b>	2
	<b>In-person Sessions Depending on Travel Restrictions</b>	<i>Edmonton Time</i>		
7		06/14/22 09:00 am-12:00 pm	<b>UAlberta Campus Campus/Faculty of Medicine &amp; Dentistry Tour Catered Lunch</b>	2
8	<b>In-person</b>	06/14/22 12:30-2:30 pm	<b>Simulation for assessment (ECHA simulation centre) TBA</b>	2

9	In-person	06/14/22 3:00-5:00 pm	Small Group Project Work	2
1	In-person	06/15/22 9:00 - 1:00 pm	Travel to Jasper & Talk on Jasper Park History	0
1	In-person	06/15/22 2:30 - 4:30 pm	Small Group Project Work	2
1	In-person	06/16/22 8:00 - 10:00 am	Observational assessment TBA	2
1	In-person	06/16/22 10:15 am-12:15 pm	Performance Assessment TBA	2
1	In-person	06/16/22 1:00-3:00 pm	Small Group Project Work	2
			Optional Maligne Lake Tour	
1	In-person	06/17/22 8:00 - 10:00 am	Peer assessment Dr, Tracey Hillier	2
1	In-person	06/17/22 10:15 am-12:15 om	Performance Portfolios Dr. Tracey Hillier	2
1	In-person	06/17/22 1:00-4:00 pm	Small Group Project Work	3
1	In-person	06/18/22 9:00 am - 2:00 pm	Project Presentations, Lunch, & Awarding of Certificates Note longer class time	5
	In-person	6/19/22	Return to Edmonton	
			<b>TOTAL HOURS</b>	<b>46</b>

## 6.2 Staffing Plan

6.2.1 *Show how the number (head count and FTE), distribution and qualifications of teaching staff meet Council's requirements and the objectives of the program as a whole (as described in s. 1.6 above). Include the academic staff expertise to be recruited, if new staff are contemplated. Provide summary information of current academic staff and new hires who will be teaching in the proposed program in the following format (see sample table below).*

The UAlberta curricular component of the proposed Dual Degree Program will be delivered in a similar fashion to the MD program. The MD Program works with many clinical and academic faculty from across the Faculty of Medicine and Dentistry every year to deliver the program successfully. Every educator who is involved in the assessment of a student in the program will have a faculty appointment.

Based on the MD Program we expect:

- Approximately 300 UAlberta faculty will teach in the Dual Degree Program. As a point of reference, as many as **1092** different faculty members teach (and facilitate, examine, and tutor) in the MD Program.
- **1009** whole class sessions will be delivered by 300 unique lecturers in years 3 and 4 of the program

### Courses taught by academic staff by credential and specialization

- Faculty members teach across many courses to ensure a high level of continuity and integration across the curriculum therefore they are not assigned to a single course. The table below contains credentialing information from a subset of the teaching faculty who provided their information on request.

Name	University where the highest degree is obtained	Specialty for the highest Degree	Highest Degree	Academic staff status
Michael Houghton	King's College	Biochemistry	PhD	Professor
Xin-Min Lee	Norman Bethune China	Medicine Pharmacology	MD PhD	Professor
Dilini Vethanayagam	University of Alberta	Medicine	MD	Associate Professor
Rabin Persad	University of the West Indies	Medicine	MBBS	Associate Professor
Nirupan Vipulanathan	University of Saskatchewan	Medicine	MD	Clinical Lecturer and CME director
Pamela Brett-MacLean	University of British Columbia	Medical Humanities	PhD	Associate Professor
Clarence Wong	University of Alberta	Medicine	MD	Associate Professor
Daniel Livy	University of Alberta	Biological Sciences	PhD	Associate Professor

Karen Forbes	University of Calgary	Medicine (Pediatrics)	MD	Associate Professor
Elizabeth Rosolowsky	University of California, San Francisco	Medicine	MD	Associate Professor
Lillian Au	University of Alberta	Medicine	MD	Associate Professor
Andrew Holt	Queen's College, Cambridge	Pharmacology	PhD	Associate Professor
Helly Goez	Tel Aviv University	Medicine	MD	Associate Professor
Joanne Rodger	University of Alberta	Education	PhD	Curriculum Specialist
Tracey Hillier	McMaster University	Medicine	MD	Assistant Professor, Associate Dean
Hollis Lai	University of Alberta	Education Psychology	PhD	Associate Professor
Sukhvinder Dhillon	University of Liverpool	Medicine	MD	Associate Professor
Ann Lee	University of British Columbia	Medicine	MD	Assistant Professor
Carol Hodgson Birkman	University of California, Los Angeles (UCLA)	Biochemistry	PhD	Associate Professor, J Allan Gilbert Chair in Medical Education Research
Andrew Scarfe	University of Alberta	Medicine	MD	Associate Professor
Steven Caldwell	University of Edinburgh	Medicine	MBCHB (Hons)	Clinical Professor
Tim Winton	Queen's University	Medicine	MD	Associate Professor
Ronald W. Damant	University of Alberta	Medicine	MD	Professor
Zhixiang Wang	Simon Fraser University	Biochemistry	PhD	Professor



6.2.2 *Include brief explanations of academic staff categories (e.g., continuing, sessional, term) and workload expectations.*

Academic staff will be faculty members in the FoMD with 0.1 to 0.3 FTE for their teaching load with this program, sessional teachers will also be used as is done for the delivery of the MD Program. This program will draw upon existing resources developed for the preclerkship component of the MD Program.

6.2.3 *Provide a proposed teaching rotation that outlines the academic staff at launch and to maturity of the program (see sample table below) and shows clearly the plan for any cycling of courses. List also any non-academic staff who will teach in the program.*

The UAlberta curricular component of the proposed Dual Degree will be delivered in a similar fashion to the MD program. The MD Program works with many clinical and academic faculty from across the Faculty of Medicine and Dentistry every year to make the program successful. Every educator who is involved in the assessment of a student in the program will have a faculty appointment. Faculty members teach across many courses to ensure a high level of continuity and both horizontal and vertical integration across the curriculum therefore they are not assigned to a single course.

6.2.4 *For graduate programs, provide a detailed plan to organize the academic advising, supervision and monitoring of graduate students, and state the credentials, graduate teaching experience, master's committee work/supervision and PhD supervision experience of academic staff. For doctoral programs, a summary table such as the following would be helpful.*

N/A

6.2.5 *Include CVs of core academic staff teaching in the program as well as key administrators (see CAQC's CV template). Be sure their permission has been given.*

As many as **300** different faculty members will teach (and facilitate, examine, and tutor) in years 3 and 4 of the Dual Degree Program with a demonstrated track record of being able to deliver the curriculum. The CV of the Director of the Dual Degree Program is attached as Appendix C.

### **6.3 Scholarly and Creative Activity**

6.3.1 *Describe what constitutes scholarship and/or creative activity for academic staff teaching in this program, and summarize the institutional expectations of academic staff with respect to scholarship and professional development as well as how these are assessed. Describe plans for supporting scholarly activities and professional development of academic staff (see Council's expectations regarding scholarship, research and creative activity in s. 3.7.3 of Council's Handbook).*

All forms of scholarship currently recognized within the FoMD will be equally recognized for work done in support of this Dual Degree Program. Scholarship for faculty teaching in the Dual Degree Program will be recognized as a multi-faceted activity involving the creation, integration and dissemination of knowledge. Scholarship can take many forms including the following:

- Independent or collaborative research across the full spectrum (basic, applied, educational, policy, quantitative, qualitative, etc)
- Staying current and maintaining competency in the content and methodology in one's field and related fields
- Inquiry and reflective practice
- Innovation in pedagogy
- Knowledge translation and reformulation for new applications
- Composition and creative activity
- Publication
- Presentation at scholarly conferences or expert groups
- Applied scholarship through problem solving practices, innovation, product development (handbooks, manuals, software, etc)
- Technology development, patents, technology transfer and commercialization
- Developing standards, guidelines, and best practices

6.3.2 *For doctoral proposals, include a tabular summary of research grants held by key academic staff involved in the program, both (i) in aggregate form, and (ii) by academic staff member, years of tenure of each grant, and source and amount of the grant.*

N/A

#### **6.4 Physical and Technical Infrastructure**

*Describe the facilities, laboratory and computer equipment (as applicable) available to meet the specialized demands of the program, as well as plans to address any deficiencies in what might be required.*

The physical space and laboratories are at the WMU site.

Learning management systems have been developed within the Faculty of Medicine and Dentistry to deliver and manage the curriculum and assessment activities. The learning management systems have been developed and successfully used to deliver online synchronous and asynchronous learning activities. These specific systems will be licensed for use with this Dual Degree Program.

#### **6.5 Information Services**

*Provide an inventory and analysis of information resources to support the program (using standard library reference guides) and plans to deal with any deficiencies, and a description of student access to other information services.*

Students will have access to the University of Alberta Libraries and existing online resources and will also benefit from the information services of Wenzhou Medical University.

## **SECTION 7: CONSULTATION AND ASSESSMENT**

### **7.1 Program Evaluation**

*Describe the criteria and methods which will be used to ensure the ongoing quality of the program. Include mechanisms for periodic review using external evaluation. Include the expected outcomes, key performance indicators and performance targets for the program.*

A regular process of continuous quality improvement including annual course review will occur involving faculty and learners from both Wenzhou Medical University and UAlberta. This will be supported using existing curriculum management infrastructure. Student academic success on assessments will be measured against learning objectives. Student feedback regarding lectures and courses will be considered. Student portfolios will constitute a record of activity. At the end of the program, student achievement of program learning outcomes will be evaluated. Faculty development and curricular changes will be made where needed.

## **7.2 Consultation / Accreditation or Regulatory Approval**

7.2.1 *Building on s. 2.3, outline the consultation that has occurred with other institutions, organizations or agencies, including advisory bodies formed by the applicant institution to assist in program design, implementation and evaluation. This should include, where appropriate, professional associations, regulatory agencies and/or accrediting bodies, and prospective employers.*

N/A

7.2.2 *If the program is subject to accreditation or approval of a regulatory body, provide a description of the review process, requirements of the body and timing of the review (if in process). If possible, a chart or table may be useful to outline accreditation or regulatory approval requirements.*

N/A

7.2.3 *If not already covered in 7.2.2., indicate how graduates will meet professional or regulatory expectations.*

N/A

## **7.3 Reports of Independent Academic Experts**

*CAQC views external peer review, which can be both formative and summative, as foundational to ensuring the quality of academic programs. In order to strengthen the proposal, before the proposal is finalized, the institution should consult with one or more independent academic experts it selects from outside the institution to provide advice regarding all aspects of the program. The report(s) of these external independent academic experts should be provided, along with the institution's response to the report(s). If an institution wishes a program proposal to be exempted from the normal requirement of an assessment by an external expert, it must provide a compelling case as part of its request for a Fully Expedited Review. Short résumés of the academic experts involved and a rationale as to why they were selected should be provided (see CAQC's guidelines with respect to the selection and use of Independent Academic Experts in Appendix I of the CAQC Handbook).*

The curriculum of this program is based on the Preclerkship curriculum of years 1 and 2 of the MD Program. The MD Program curriculum has undergone three successful external reviews since 2014 and has had no substantive change since the last comprehensive external review in 2018.

- 2014 Comprehensive Accrediting Body Review by the Committee on Accreditation of Canadian Medical Schools (CaCMS) and the Liaison Committee on Medical Education (LCME) of the American Association of Medical Colleges (AAMC)
- 2018 Interim accreditation review by CaCMS Committee on Accreditation of Canadian Medical Schools
- 2018 Campus Alberta Quality Council Review

The curriculum of the Wenzhou Medical University Program has also had successful external review by an International Medical School Accrediting body.

Students from both medical programs are highly successful on national licencing exams with a pass rate of more than 99% reflecting the quality of the education provided by the medical program of each of the collaborating Universities.

The CV of the Director and Executive Dean of the Alberta Institute who is the Program Lead for the Dual Degree Program is attached as Appendix C.

## **SECTION 8: OTHER**

### **8.1 Adverse Claims or Allegations**

*Disclose any adverse claims or allegations that might affect this application or be of concern to Council.*

*We are not aware of any adverse claims or allegations.*

### **8.2 Statement of Institutional Integrity**

*Include a signed Statement of Institutional Integrity (see Council template on web site).*

**See attached as Appendix D.**

### **8.3 Other documentation**

*Provide any other supporting documents such as the Graduate Program Handbook, Faculty Handbook, current calendar, cyclical review of programs policy, etc. that would add support to the applicant's case and would help reviewers (provide website links, if available).*

N/A

## Appendix C Template CV

NAME

**Dr Tracey Hillier**

### COMPLETED ACADEMIC DEGREES

Degree Name	Subject Area	Where Completed	Date of Completion
Master of Education	Health Sciences Education	University of Alberta	November 2016
Doctor of Medicine (MD)	Medicine	McMaster University	June 1997
Bachelor of Science (Honours)	Nursing	St Francis Xavier University	May 1990

### OTHER ADVANCED STUDIES

Fellowship	Emergency Trauma and Cardiac Radiology	University of British Columbia	June 2011
Post Graduate Medical Residency	Diagnostic Imaging	University of Alberta	June 2007
Post Graduate Medical Residency	Family Medicine	McMaster University	December 1999

### ACADEMIC APPOINTMENTS

Appointment Level	Institution	Dates	Subject Area
Associate Professor, with Tenure	University of Alberta	July 2019-Present	Diagnostic Imaging
Assistant Professor, Tenure Track	University of Alberta	July 2015-June 2019	Diagnostic Imaging
Assistant Professor, Special Continuing	University of Alberta	Jan 2012-July 2015	Diagnostic Imaging
Assistant Clinical Professor	University of Alberta	July 2011-2012	Diagnostic Imaging

Clinical Lecturer	University of Alberta	Jul 2009-Jun 2011	Diagnostic Imaging
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#### ADMINISTRATIVE APPOINTMENTS

Appointment Level	Institution	Dates
Director and Executive Dean Alberta Institute	University of Alberta	July 2020-Present
Co-Director Situated Knowledges: Indigenous Peoples and Place (SKIPP) Signature Area	University of Alberta	July 2021-Present
Associate Dean MD Program	University of Alberta	July 2015-June 2020
Associate Dean Curriculum, MD Program	University of Alberta	July 2013-June 2015
Assistant Dean Curriculum, MD Program	University of Alberta	Jan 2012-Jun 2013

#### TEACHING EXPERIENCE

Institution	Dates	Courses Taught
University of Alberta	Feb 2021-Mar 2021	Course Preceptor: Discovery Learning MED 524 Psychiatry
University of Alberta-AIWMU	Sept 2020-Dec 2020	Course Coordinator and Lecturer: Global Health
University of Alberta	Oct 2020-Dec 2020	Course Preceptor: Discovery MED 512 Endocrinology
University of Alberta	Aug 2020-Oct 2020	Course Preceptor: Discovery Learning MED 511 Foundations of Medicine, Faculty of Medicine and Dentistry, University of Alberta
University of Alberta	Sept 2013-May 2017	Lecturer MD Program

University of Alberta	Oct 2013-Nov 2013	Course Planning Committee and Preceptor MED 522 Reproductive Medicine and Urology
University of Alberta	Nov 2014-Jan 2015 Nov 2013-Jan 2014 Nov 2012-Jan 2013 Nov 2011-Jan 2012 Nov 2010-Jan 2011 Nov 2009-Jan 2010	Course Planning Committee Member; Course Preceptor-Discovery Learning and Lecturer MED 523 Musculoskeletal Medicine
University of Alberta	Sept 2008-2009	Course Preceptor: Discovery Learning MED 522 Reproductive Medicine and Urology
University of Alberta	Sept 2009-Present	Clinical Teaching Preceptor

## SCHOLARLY PARTICIPATION

### Refereed Publications

Date	Activity
2021	Daniels V, Ortiz S, Sandhu G, Lai H, Yoon M, Bulut O, <b>Hillier, T.</b> Effect of Detailed OSCE Score Reporting on Learning and Anxiety in Medical School. <i>Journal of Medical Education and Curriculum Development</i> , (2021). DOI: 10.1177/2382120521992323
2021	Underschultz JG, Barber P, Richard D, <b>Hillier, T.</b> What drives resistance to Public Health measures in Canada's COVID-19 pandemic? An online survey of Canadians' knowledge, attitudes, and practices. <i>UTMJ</i> . 2021; 98(1):35-40. Available at SSRN: <a href="https://ssrn.com/abstract=3605193">https://ssrn.com/abstract=3605193</a> or <a href="https://doi.org/10.2139/ssrn.3605193">https://doi.org/10.2139/ssrn.3605193</a>
2020	Wei L, Goetz H, <b>Hillier T.</b> , & Brett-MacLean P. A Visiting Professorship in Undergraduate Medical Education at the University of Alberta: Reflections on possibilities for medical humanities in China, and elsewhere. <i>MedEdPublish</i> , 2020;9(1). DOI: <a href="https://doi.org/10.15694/mep.2020.000190.1">https://doi.org/10.15694/mep.2020.000190.1</a>
2020	Goetz H, Lai H, Rodger J, Brett-MacLean P & <b>Hillier, T.</b> The DISCuSS model: creating connections between community and curriculum – a new lens for curricular development in support of social accountability. <i>Medical Teacher</i> 2020: DOI: 10.1080/0142159X.2020.779919
2020	<b>Hillier, T.</b> , Lai, H., Sonnenberg, L., Lewis, M., Goetz, H., Schipper, S. University of Alberta Faculty of Medicine and Dentistry. <i>Academic Medicine</i> : September 2020 - Volume 95 - Issue 9S - p S563-S565. DOI: 10.1097/ACM.0000000000003292

- 201 Wang XR, **Hillier, T.**, Oswald A, & Lai H. Patterns of performance in students with  
9 frequent low stakes Team Based Learning assessments: do students change behavior?  
Medical Teacher 2019 DOI: 10.1080/0142159X.2019.1670339
- 201 Daniels VJ, Strand AC, Lai H, & **Hillier, T.** Impact of tablet-scoring and immediate score  
9 sheet review on validity and educational impact in an internal medicine residency  
Objective Structured Clinical Exam (OSCE). Medical Teacher. 2019;41(9):1039-1044
- 201 Tran UE, Kircher J, Jaggi P, Lai H, **Hillier, T.**, Ali S. Medical students' perspectives of  
8 their clinical comfort and curriculum for acute pain management. Journal of Pain  
Research 2018;11:1479-1488
- 201 Brett-MacLean P, Birkman C, Shapiro J, Rosenal T, Schafenacker N, & **Hillier, T.**  
8 Exploring the potential of online approaches to teaching the "human side of  
medicine": A scoping review. EDULEARN 2018: 18, 8688-8697.  
<https://library.iated.org/view/BRETTMACLEAN2018EXP>
- 201 Tan A, Babenko O, England A, Humphries P, **Hillier, T.** A novel resident as teacher  
7 curriculum: the role of experiential learning and coaching. MedEd Publish, September  
22, 2017
- 201 Deutscher J, Miazga S, Goetz H, **Hillier, T.**, Lai H. Human trafficking awareness, a  
7 learning module for improved recognition of victims in the emergency room. Can J  
Emerg Med 2017;19(S1):93
- 201 Fatmi M, Hartling L, **Hillier T.**, Campbell S, Oswald A. The Effectiveness of Team Based  
3 Learning in Health Professions Education: BEME Guide No 30. Medical Teacher  
2013;35(12)e1608-e1624
- 201 Talbot M, Meunier B, Tottier V, Christian M, **Hillier, T.**, Berger C, McAlister V, Taylor S.  
2 1 Canadian Field Hospital in Haiti: surgical experience in earthquake relief. Can J Surg  
2012 Aug;55(4):271 DOI: 10.1503/cjs.039010
- 199 Sheehan D, Bridle B, **Hillier, T.**, Feightner K, Hayward S, Leek S, Krueger P, Sword W,  
9 James B. Breastfeeding outcomes of women following uncomplicated birth in  
Hamilton-Wentworth. Canadian Journal of Public Health 1999; 90(6): 408-411

### Refereed Abstracts and Presentations:

#### Activity

Kaiser, J., Khan, M., Rashid, M., 2, Konkin, J., **Hillier, T.**, Goetz, H. How Can Physicians Support Survivors of Intimate Partner Violence? Family Medicine Forum 2020.



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Brett-MacLean, P., Lai, H., **Hillier, T.** & Goez, H. Health Humanities and Social Accountability in Action: Working Collaboratively across Disciplines and Communities. Canadian Medical Education Journal, 11(2). DOI: <https://doi.org/10.36834/cmej.v11i2>

Speerstra, S., Livy, D., Lai, H. & **Hillier, T.** A concerted approach to curriculum mapping by summer students. Canadian Medical Education Journal, 11(2). DOI: <https://doi.org/10.36834/cmej.v11i2>

Portnoy, D., Moran, M. & **Hillier, T.** Addressing Barriers to Learning Geriatric Medicine in Preclerkship. Canadian Medical Education Journal, 11(2). DOI: <https://doi.org/10.36834/cmej.v11i2>

Cox, A., Lai, H., **Hillier, T.**, Rodger, J. & Jeffery, T. Applying Appreciative Inquiry to Promote Medical Student Diversity. Canadian Medical Education Journal, 11(2). DOI: <https://doi.org/10.36834/cmej.v11i2>

Borle, S., **Hillier, T.**, Andrew, S., Surgin, C., Lai, H. A Quality Improvement Initiative to Improve Timeliness of Feedback. Canadian Medical Education Journal, 11(2). DOI: <https://doi.org/10.36834/cmej.v11i2>

Volk, A., Lai, H., **Hillier, T.** A theoretical model to determine how CaRMS variables impact medical student matching rates. Canadian Medical Education Journal, 11(2). DOI: <https://doi.org/10.36834/cmej.v11i2>

Barber, P., Mathura, P., Croden, J., Halasz, J., Truong, L., Raffael, K., Phan, C., , **Hillier, T.**, Kassam, N. Evaluation of a Summer Healthcare Improvement Program (SHIP) in Undergraduate Medical Education. Canadian Medical Education Journal, 11(2). DOI: <https://doi.org/10.36834/cmej.v11i2>

**Hillier, T.**, Lunardon, D., Daniels, V., Oswald, A., Surgin, C., Lai, H. Three applications of learning sciences in medical education. Canadian Medical Education Journal, 11(2). DOI: <https://doi.org/10.36834/cmej.v11i2>

Brett-MacLean P, **Hillier, T.**, Goez H, Lai H (Feb 2020). "Illuminating Health Humanities in Undergraduate Medical Education through Curricular Mapping" Innovations in Medical Education Conference 2021: Transforming Health Professions Education through Innovation. Los Angeles, CA.

Anderson M., Fehr D., Goez H., Rodger J., Daniels L., Lai H., Daniels V., **Hillier, T.** (Apr 2019). A Human Library Intervention to Address Bias Towards LGBTQ Individuals. Canadian Conference on Medical Education, Niagara Falls, ON. Canadian Medical Education Journal, 10(2), e58-e59. <https://doi.org/10.36834/cmej.v10i2>

Simin I., Naidu D., **Hillier, T.** (Apr 2019). Implementing Exercise as Medicine into the Undergraduate Medical Curricula. Canadian Conference on Medical Education, Niagara Falls, ON.

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Duggal A., Jeffrey T., Rodger J., Von Hauff P., **Hillier, T.** (Apr 2019). Using Think-Aloud Method to Evaluate & Re-Design the University of Alberta MD Program Website. Canadian Conference on Medical Education, Niagara Falls, ON.

Lai H., Daniels V., **Hillier, T.**, Forbes K. (Apr 2019). Adapting Comment Prompts to Improve Narrative Feedback for Learners. Canadian Conference on Medical Education, Niagara Falls, ON.

Goetz V., Do V., **Hillier, T.** (Apr 2019). Improving Undergraduate Instruction in Evidence Based Medicine (EBM): Mapping the University of Alberta Undergraduate EBM Curriculum to National Competencies as a Tool to Facilitate Curriculum Development. Canadian Conference on Medical Education, Niagara Falls, ON.

Daniels V., Lai H., Forbes K., **Hillier, T.** (Apr 2019). Evaluating the Impact of Reducing Clerkship Form Length and Nudging Face-to-Face Assessments on Validity. Canadian Conference on Medical Education, Niagara Falls, ON.

Ortiz S., Daniels V., Lai H., Yoon M., Bulut O., **Hillier, T.** (Apr 2019). Effect of Detailed OSCE Score Reporting on Student Learning. Canadian Conference on Medical Education, Niagara Falls, ON.

Lai H., **Hillier, T.**, Daniels V. (Apr 2019). Developing a framework for adapting narrative feedback prompts. Annual Meeting of the National Council on Measurement in Education (NCME) Toronto, ON.

May, Z., Lam, B., **Hillier, T.**, Goez, H., Brett-MacLean, P. (Nov 2018). Creation of a Curriculum Mapping Approach for Medical/Health Humanities in Undergraduate Medical Education. University of Alberta Faculty of Medicine and Dentistry 51st annual Summer Students' Research Day. FoMD, Edmonton, AB.

Fehr, D., Anderson, M., **Hillier, T.**, Daniels, L., Daniels, V., Lai, H., Rodger, J., Goez, H. (Nov 2018). A Human Library Intervention to Address Bias towards LGBTQ individuals. University of Alberta Faculty of Medicine and Dentistry 2018 Excellence in Medical Student Research. Edmonton, AB.

Lengkeek, C., Goez, H., **Hillier, T.**, Brett-Maclean P. (Nov 2018). Patient Immersion Experience: Impact of a Mirrored Perspective in Medical Education. University of Alberta Faculty of Medicine and Dentistry 2018 Excellence in Medical Student Research. Edmonton, AB.

Brett-MacLean P., Birkman C., Shapiro J., Rosenal T., Schafenacker N., **Hillier, T.** (Jul 2018). Exploring the potential of online approaches to teaching the "Human side of medicine": A scoping review. EDULEARN18 - 10th Annual International Conference on Education and New Learning Technologies, Palma de Mallorca, Spain.

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Fehr D., Goez H., **Hillier, T.**, Daniels L., Daniels V., Lai H., Anderson M. (May 2018). A Human Library Intervention to Address Bias towards LGBTQ Individuals. LGBT Health Workforce Conference, New York City, NY.

Lam B., **Hillier, T.**, Goez H., Rodger J., Brett-MacLean P. (Apr 2018). 'Mapping' health humanities in undergraduate medical education: Results of a preliminary exploration. Creating Space VIII Conference, Halifax, NS.

Fehr D, Lai H, **Hillier T.**, Daniels V, Daniels L, Goez H. (Feb 2018). A Human Library Intervention to Address Bias towards LGBTQ Individuals. AMA Advocacy Night, University of Alberta, AB.

Lam B, **Hillier T.**, Goez H, & Brett-MacLean P. (Nov 2017). Developing a Curriculum Mapping Approach for Health Humanities in Undergraduate Medical Education. Celebration of Teaching and Learning, University of Alberta, AB.

Lai H., Wang R., Oswald A., **Hillier, T.** (Aug 2017). Evaluation of student performance patterns in team-based learning. AMEE 2017, Helsinki, Finland.

Tan A., Kelly M., **Hillier, T.** (May 2017). "Please don't make me open up Pandora's Box!" Empowering learners by linking shared decision-making communication skills to advance care planning. Workshop presented to the Canadian Conference on Medical Education, Winnipeg, MB.

Hackett F., Burton McLeod S., **Hillier T.**, Goez, H. (May 2017). Indigenous health in undergraduate medical curricula: a student-led group-based learning curriculum innovation. Canadian Conference on Medical Education, Winnipeg, MB.

Kruhlak I., Davies M., Oswald R., Aulakh, A., **Hillier, T.**, Goez, H. (May 2017). Fentanyl crisis from the molecule to Public Health integrative team-based learning module. Poster presented at the Canadian Conference on Medical Education, Winnipeg, MB.

Christensen J., Deutscher J., Goez H., **Hillier, T.**, Lai, H., Laboucane-Benson, P. (May 2017) A Student led Curriculum Innovation to Raise Awareness of Indigenous Mental Health in Undergraduate Medical Education. Poster presented at the Canadian Conference on Medical Education, Winnipeg, MB. *Medical Education* 2017;51(Suppl.1)22-117. doi.org/10.1111/medu.13284.

Deutscher J., Fehr D., Christensen J., Hackett F., Goez H., **Hillier, T.**, Lai H., Miazga, S. (May 2017) A Student led Curriculum Innovation to Implement Human Trafficking Awareness into Undergraduate Medical Education. Poster presented at the Canadian Conference on Medical Education, Winnipeg, MB.

Wang R., Lai H., Oswald A., **Hillier, T.** (May 2017). The Trajectory of Student Academic Performance in the Setting of Team-based Learning. Oral Presentation given at the Canadian

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Conference on Medical Education, Winnipeg, MB. *Medical Education* 2017;51(Suppl.1)22-117. doi.org/10.1111/medu.13284

Gourishankar S., Hawthorne J., Surgin C., Lai H., **Hillier, T.** (May 2017). Professionalism Assessment and Remediation: Trials and Tribulations. Poster presented at the Canadian Conference on Medical Education, Winnipeg, MB.

Kruhlak I, Gargoum A, Goetz H, **Hillier, T.**, Caine V, Abdulmalik A, Rashid M. (Feb 2017). Exploring Barriers in Accessing Care and Analyzing the Pre and Post Migration Health Status of Refugee Youth in Canada. AMA Advocacy Night. Edmonton, AB.

Uyen T., Kircher J., Jaggi P., Lai H., **Hillier, T.**, Ali S. (Nov 2016). Acute pain management: The medical students' perspective. Abstract presented at the Women and Children's Health Research Institute Research Day, Edmonton, AB.

**Hillier, T.**, Lai H. (Aug 2016). A purpose-built system to facilitate Team-Based Learning: Lessons learned. Oral Presentation accepted at the annual meeting of the Association on Medical Education in Europe, Barcelona, Spain.

Lai H., **Hillier, T.** (Jun 2016). Lessons learned from a development of an electronic OSCE scoring system. Poster presented at the Meeting of the Information Resource Group of the American Association of Medical Colleges, Toronto, ON.

Lai H., Daniels, V., Tan, A., **Hillier, T.** (May, 2016). Developing an electronic objective structured clinical examination system: progress and outcomes. Invited presentation at the Festival of Teaching, University of Alberta, Edmonton, AB.

Lai H., Gierl M., Tan A., Daniels V., **Hillier, T.** (Apr 2016). Framework for Feedback and Remediation with Electronic Objective Structured Clinical Examinations. Paper Presented at the annual meeting of the National Council on Measurement in Education. Washington, DC.

Tan A., Ahn, T., Webb A., **Hillier, T.**, Lai, H. (Apr 2016). Evaluation of an Academic Service Learning Experience. Poster Presented at the Canadian Conference on Medical Education, Montreal, QC.

**Hillier, T.**, Oswald A., Lai H. (Apr 2016). A Pilot Study to Investigate the Effectiveness of Team Based Learning for Improving Learning Outcomes. Oral Presentation at the Canadian Conference on Medical Education, Montreal, QC.

Ali S., Lai H., **Hillier, T.**, Gourishankar, S. Implementation of a Faculty Professionalism Assessment Process in Undergraduate Medical Education. Oral Presentation at the Canadian Conference on Medical Education, Montreal, QC.

Davila-Cervantes A., Surgin C., Lorencs M., Tan, A., **Hillier, T.**, Lai, H. (Apr 2016). Development of Electronic Attendance Tracking Process at the Faculty of Medicine and Dentistry. Poster Presented at the Canadian Conference on Medical Education, Montreal, QC.

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Tan A., Lee J., **Hillier, T.**, Lai H., Forbes K., Au L. (Jan 2016). An innovative integrated patient-centered communications curriculum, and assessment and remediation framework for medical students. Presentation at the 42nd Annual STFM Conference on Medical Student Education. Phoenix, AR.

Tan A., Au L., Lee J., **Hillier, T.**, Lai H. (Aug 2015). An innovative integrated communications curriculum, and assessment and remediation framework for medical students. Oral presentation at the International Conference on Communication in Healthcare, New Orleans, LA.

**Hillier, T.**, Lai H., & Davila-Cervantes, A. (Apr 2015). Evaluating Curriculum Planning Using a Topic Group Consensus Process. Oral presentation at the Annual meeting of the Canadian Conference on Medical Education. Vancouver, BC.

Davila-Cervantes A., **Hillier, T.**, Gye, J., Lai, H. (Apr 2015). Development, Implementation, and Outcomes from a Comprehensive Electronic Evaluation Process for an Undergraduate Program. Poster presented at the Annual meeting of the Canadian Conference on Medical Education. Vancouver, BC.

Tan A., **Hillier, T.**, & Lai, H. (Apr 2015). Challenges and Solutions in Developing an Assessment Process for a Longitudinal and Integrated Physicianship Course. Oral presentation presented at the Annual meeting of the Canadian Conference on Medical Education. Vancouver, BC.

Lai H., Forbes, K., Tan, A., Pinsk, M., **Hillier, T.**, Davila-Cervantes, A., Gierl, M., Daniels, VJ. (Apr 2015). Converting from Single to Parallel Forms Examination: Applications of Modern Psychometric Techniques. Poster presented at the Annual meeting of the Canadian Conference on Medical Education. Vancouver, BC.

Lai H., **Hillier, T.** (May 2014). Curriculum Mapping Through Student Crowdsourcing. MedBiquitous Annual Conference. Baltimore, MD.

Lai H., **Hillier, T.**, Gierl M., Tanygin V. (May 2014). Deploying TAO in Medical Education using a rapid development framework. National Council of Measurement in Education. Philadelphia, PA.

Lai H., **Hillier, T.**, Gierl M. (May 2014). Processing evaluation comments using natural language processing in medical education. National Council of Measurement in Education. Philadelphia, PA.

Huie M., Ma L., **Hillier, T.**, Lai H. (Apr 2014). Student's perspective on patient advocacy training in an undergraduate medical curriculum. Ottawa Conference 2014 and Canadian Conference on Medical Education. *Medical Education* 2014;48(Suppl 1):2-130.  
<https://doi.org/10.1111/medu.12485>

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Heydarimanesh H., Longowal N., **Hillier, T.** (Apr 2014). Health of Special Populations in a First Year Medical Curriculum. Ottawa Conference and Canadian Conference on Medical Education. Ottawa, ON.

Davila-Cervantes A., Lai H., **Hillier, T.** (Apr 2014). A modified Delphi approach to develop program level objectives for an Undergraduate Medical Education Program. Ottawa Conference and Canadian Conference on Medical Education. Ottawa, ON.

Tan A., **Hillier, T.**, Koppula S., Seto A., Lee J., Daniels V.J., Humphries P., Hnatko G., Khera A.S. (Apr 2014). Development, Implementation, and Outcomes of a new Resident-as-Teacher collaboration initiative between the Family Medicine Residency Program and the Undergraduate Medical Education Program at the University of Alberta. Ottawa Conference and Canadian Conference on Medical Education. Ottawa, ON.

Hackett C., **Hillier, T.** (Apr 2014). Fostering Medical Leadership: A Student-Led Health Systems and Policy Curriculum. Ottawa Conference and Canadian Conference on Medical Education. Ottawa, ON.

**Hillier, T.**, Tan A., Lai H., Daniels VJ, Brett-MacLean P., Davila-Cervantes A., Lee J., Ali S. (Apr 2014). Incorporating Professional Identity Formation into a Medical School Curriculum. Ottawa Conference and Canadian Conference on Medical Education. Ottawa, ON.

Wang, S., **Hillier, T.**, Lai, H. (Apr 2014). CanMEDS Professional Competencies: Coverage in a First Year Medical Curriculum. Ottawa Conference and Canadian Conference on Medical Education. Ottawa, ON.

Ostrowerka,B., Lai H., **Hillier, T.** (Apr 2014). Assessment item mapping to inform curricular evaluation of a neurosciences course. Ottawa Conference and Canadian Conference on Medical Education. *Medical Education* 2014;48(Suppl 1):2-130.  
<https://doi.org/10.1111/medu.12485>

**Hillier, T.**, Lai H., Tan A., Davila A., Daniels VJ. (Apr 2014). Identity formation and competency: A longitudinal conjunctive approach to assessment. Ottawa Conference and Canadian Conference on Medical Education. *Apr 2014 Medical Education* 2014;48(Suppl 1):2-130. <https://doi.org/10.1111/medu.12485>

Sundaram A., **Hillier, T.**, Campbell S. Student-led Development of Patient Safety and Quality Improvement Medical Curriculum. *Medical Education* 2014 48(Suppl 1)2-130.  
<https://doi.org/10.1111/medu.12485>

Sundaram A., Dennett E., Campbell S., **Hillier, T.** (Oct 2013). Student-led Development of Patient Safety and Quality Improvement Medical Curriculum. *Celebration of Teaching and Learning*, University of Alberta. Edmonton, AB.

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Lee R., San Agustin P., Bhutani M., **Hillier, T.** (Aug 2013). Can 3rd year medical students write a 4th year OSCE? Making a summative exam formative. AMEE International Association for Medical Education Annual Meeting. Prague, Czech Republic.

Lai H., **Hillier, T.**, Vestemean R. (Aug 2013). Electronic crowdsourcing as a method for curriculum mapping. Short Communication. AMEE International Association for Medical Education Annual Meeting. Prague, Czech Republic.

Brett-MacLean P., Lai H., **Hillier, T.** (May 2013). The Medical Education Book Club at the University of Alberta; Promoting faculty development and community through a blended learning approach. Association of American Medical Colleges West WGEA, Irvine, CA.

**Hillier, T.**, Brett-MacLean P. (Apr 2013). Introducing DocCom as an Online Communication Skills Curriculum Resource: Feedback from Students and Small Group Facilitators. Canadian Conference on Medical Education. Quebec City, QC.

**Hillier, T.**, Oswald. A. & Hayward, R. (Aug 2012). A Novel and Extended Use of an Online Learning Community in Team Based Learning. Teaching Big: The Joy of Large Classes Event University of Alberta. Edmonton, AB.

Fatmi, M., **Hillier, T.**, Hartling, L., Campbell, S., & Oswald, A. (Aug 2012). Best Evidence in Medical Education (BEME) Systematic Review: The effectiveness of team-based learning (TBL) on learning outcomes in health professions education. AMEE International Lyon, France.

Fatmi, M., **Hillier, T.**, Hartling, L., Campbell, S., & Oswald, A. (Apr 2012). A Best Evidence in Medical Education (BEME) Systematic Review: The effectiveness of team-based learning on learning outcomes in health professions education. Canadian Association of Medical Education Annual Meeting. Banff, AB.

**Hillier, T.**, Oswald A. (Apr 2012). Developing and assessing professionalism in undergraduate medical education: A novel approach using a Peer Evaluation process. Canadian Association of Medical Education Annual Meeting. Abstract and Poster Presentation. Banff, AB.

**Hillier, T.**, Oswald, A., & Hayward, R. (Mar 2012). Homer: A Novel and Extended Use Of An Online Learning Community In Team Based Learning. Abstract and Poster Presentation. Team Based Learning Collaborative Annual Meeting. St Petersburg, FL.

Lee, K., Roy, E., Inacio, J.R., **Hillier, T.**, Nicolaou, S. (Nov 2009). An Evaluation of Conventional Imaging Modalities in the Triaging of Acute Chest Pain in the Emergency Department with Emphasis on the Impact of Low-Dose MDCT Protocol. Radiological Society of North America 2009 Scientific Assembly and Annual Meeting, Chicago, IL

Lee, K., Lee, A., Roy, E., **Hillier, T.**, Nicolaou, S. (Nov 2009). Pictorial Review of the Spectrum of Pericardial Disease: Utility of MDCT, MRI, Echocardiography, and Radiography in the Management and Diagnosis of Pericardial Effusion/Tamponade, Pericardial Masses, and

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Trauma to the Pericardium. Radiological Society of North America 2009 Scientific Assembly and Annual Meeting, Chicago, IL

**Hillier, T.**, Wiebe E, Raymond G. (June 2004). Crisis management training in radiology: the use of a computerized patient simulator. Poster and Podium Presentation at the 23rd International Congress of Radiology (ISR), Montreal, QC.

Jadad AR, **Hillier, T.**, Fowler-Graham D, Enkin M. (October 1997). Manipulating the type, timing and amount of input from reviewers with different expertise to reduce bias in systematic reviews: a case report. 5th Annual Cochrane Colloquium, Amsterdam, The Netherlands.

Jadad AR, **Hillier, T.** (1996). Measuring Clinical Pain: do we need more tools? Abstracts of the 8th World Congress on Pain. 1996:289. IASP, Seattle, WA,

**Hillier T.**, Jadad AR. (1996). The measurement of Clinical Pain: an appraisal of published reviews. Abstracts of the 8th World Congress on Pain. 1996:290. IASP, Seattle, WA,

**Hillier T.**, Jadad AR. (June 1996). The development of a database on the measurement of pain. Supportive Care in Cancer 1996; 3:246. 8th International Symposium on Supportive Care in Cancer. Toronto, ON.

## ACADEMIC AND PROFESSIONAL PRESENTATIONS

### Invited International Presentations

Date	Presentations
Nov 2020	Invited Keynote Speaker, Wenzhou Medical University 2020 International Cultural Festival. Embracing the world, facilitating people-to-people exchanges and communications.
Sep 2020	Alberta Institute Wenzhou Medical University.
Dec 2019	A collaborative curriculum for undergraduate medical education between Wenzhou Medical University and University of Alberta, Beijing China
Oct 2019	International Faculty Development Program Academic Exchange, Active Learning: Team Based Learning, Problem Based and Discovery Learning.
Oct 2019	International Faculty Development Program Academic Exchange, Research in Medical Education.
Sept 2019	International Faculty Development Program Academic Exchange with Jilin University, MD Program Curriculum
Mar 2019	Undergraduate Medical Education in Canada. Symposium for Medical Education, China Medical University, Shenyang, China
Mar 2019	Undergraduate Medical Education in Canada. Sino-Canadian Forum on Medical Collaboration, Wenzhou, China



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Mar 2019	Undergraduate Medical Education in Canada Shanghai Mental Health Center, Shanghai, China
Mar 2018	International Faculty Development Program Academic Exchange with Jilin University, MD Program Curriculum
Apr 2014	Redrawing the Line on Professionalism: Views on Professional & Ethical Behavior within Radiology. Association of University Radiologists, Baltimore MD
Oct 2013	Radiology in a Disaster Zone. Association of Emergency Radiologists Boston MA
Aug 1996	France USA Pain Association, Speaker and Co-Author of paper presented at invitation-only scientific consortium. Meynadier, J., Lee, M.Y., Thurel, C., Poulian, P., Johnson Jr, B.W., Parris, W.C.V., Altman, M., and Hillier, T., "Pain Education in the 21st Century: How to Establish a Pain Curriculum." Paris, France.

### **Invited National Presentations**

<b>Date</b>	<b>Presentations</b>
Oct 2021	Equity, Diversity and Inclusion: Checking Your Privilege. University of British Columbia, Post-Graduate Radiology Speaker Panel on EDI, Vancouver BC
Aug 2020	Virtualizing the Medical School Interview in Response to the COVID-19 Pandemic - McGill University, Post Graduate Medical Education Meeting, Virtual with McGill University
Dec 2017	Comprehensive Review of Medical School Admissions – Perspectives from Another University. University of Calgary MD Admissions Review Committee Retreat, Calgary AB
Sept 2011	Overview of Current Undergraduate Medical Education Programs in Afghanistan. International Medical Mentorship Training Program, Petawawa, ON
Apr 2011	Radiology Not Just Nine to Five. Canadian Association of Radiologists Annual Meeting, Montreal QC
Mar 2011	Advanced Military Trauma Resuscitation Course, McGill Simulation Center, Montreal, QC
Oct 2010	Place of Birth. Presentation and Panel Discussion. Canadian Association of Midwives Conference, Edmonton AB

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### **Invited Regional and Continuing Medical Education Presentations**

<b>Date</b>	<b>Presentations</b>
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Mar 2021	Mental Health Awareness for Medical Students, Edmonton AB
Feb 2021	Indigenous Women in Health Care, University of Alberta Women in Science and Engineering (UA-WiSE), Edmonton AB
Jul 2020	Connecting with Indigenous Engaged Research and Scholarship in Health. Colloquium on Indigenous Engaged Research, Situated Knowledges: Indigenous Peoples and Place (SKIPP), Edmonton AB
May 2019	MD AIDE, Undergraduate Medical Education, Edmonton AB
Sep 2018	Breast Imaging – The Other Side. Alberta College of Medical Diagnostic and Therapeutic Technologists Annual Meeting, Edmonton AB
Oct 2014	Alberta College of Medical Diagnostic and Therapeutic Technologists Annual Meeting, Edmonton AB
Jun 2012	Insight Medical Imaging Clinical Rounds, Radiology and Medicine in Developing Countries, Edmonton, AB
Jan 2012	Grey Nun’s Hospital Psychiatry Grand Rounds Medical Care in a Disaster Zone: The Haiti Experience, Edmonton, AB
Nov 2011	Medical Care in a Disaster Zone: The Haiti Experience. Keynote speaker, Gordon Reid MacDonald Memorial Lecture. Misericordia Medical Staff Association, Edmonton, AB
Oct 2011	Department of Diagnostic Imaging Misericordia Hospital Grand Rounds, Trauma Radiology, Edmonton, AB
Mar 2010	Haiti Disaster Relief: A Radiologists Perspective. Departmental Grand Rounds, Diagnostic Imaging Misericordia Hospital, Edmonton, AB
Apr 1999	Epidural Analgesia – benefits, risks and issues. Day in Primary Care Obstetrics. Rebirthing Low Risk Obstetrics in a High-Risk World. Royal Botanical Gardens, Burlington, ON
May 1996	Identification of methods to measure pain. Supportive Care in Cancer Research Unit Working Group Meeting. Hamilton Regional Cancer Center, Hamilton, ON
Mar 1996	Searching for tools to measure pain: panning for gold or for gravel? Continuing Education Sessions Department of Clinical Epidemiology and Biostatistics. McMaster University, Hamilton, ON

### **Faculty Development**

<b>Date</b>	<b>Presentation</b>
2021	Lecturer, Teaching Scholar’s Program- AI “Introduction to the Alberta Institute Faculty Development Program” Target Group: Faculty Development, Multidisciplinary Learner Group
2021	Lecturer, Teaching Scholar’s Program “From Novice to Expert”

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	Target Group: Faculty Development, Multidisciplinary Learner Group
2020	Lecturer, Teaching Scholar's Program "From Novice to Expert" Target Group: Faculty Development, Multidisciplinary Learner Group
2020	Lecturer, Teaching Scholar's Program "Including Diversity, Inclusion, and Equity in your Teaching" Target Group: Faculty Development, Multidisciplinary Learner Group
2019	Retreat Coordinator and Presenter, Western Undergraduate Medical Education Deans Retreat, Faculty of Medicine and Dentistry, University of Alberta
	Target Group: Faculty Development, Multidisciplinary Learner Group
2019	Retreat Coordinator and Presenter, Undergraduate Medical Education Curriculum Spring Retreat, Faculty of Medicine and Dentistry, University of Alberta
	Target Group: Faculty Development, Multidisciplinary Learner Group
2019	Peer and Self-Assessment using Multi-Source Feedback. Session for Teaching Scholars Program 003, Introduction to Assessment Course, Edmonton AB
	Target Group: Faculty Development, Multidisciplinary Learner Group
2018	Presenter: Faculty of Medicine and Dentistry International Faculty Development Program Academic Exchange with Jilin University, Undergraduate Medical Education Curriculum University of Alberta MD Program
	Target Group: Faculty Development, Multidisciplinary Learner Group
2018	Panelist: Discussion "Do No Harm" What's killing our Doctors? Screening, Edmonton Alberta.
	Target Group: Faculty Development, Multidisciplinary Learner Group
2018	Workshop Coordinator and Presenter, Undergraduate Medical Education Semi-Annual MD Program Curriculum Retreat, Faculty of Medicine and Dentistry, University of Alberta
	Target Group: Faculty Development, Multidisciplinary Learner Group
2017	Workshop Coordinator and Presenter, Undergraduate Medical Education Semi-Annual MD Program Curriculum Retreat, Faculty of Medicine and Dentistry, University of Alberta
	Target Group: Faculty Development, Multidisciplinary Learner Group
2016	Workshop Coordinator and Presenter, Undergraduate Medical Education Semi-Annual MD Program Curriculum Retreat, Faculty of Medicine and Dentistry, University of Alberta

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	Target Group: Faculty Development, Multidisciplinary Learner Group
2015	Workshop Coordinator and Presenter, Undergraduate Medical Education Semi-Annual MD Program Curriculum Retreat, Faculty of Medicine and Dentistry, University of Alberta
	Target Group: Faculty Development, Multidisciplinary Learner Group
2014	Workshop Coordinator and Presenter, Undergraduate Medical Education Semi-Annual MD Program Curriculum Retreat, Faculty of Medicine and Dentistry, University of Alberta
	Target Group: Faculty Development, Multidisciplinary Learner Group
2013	Lecturer: Gold Humanism Program, Conflict Resolution Lecture, Faculty of Medicine and Dentistry, University of Alberta
	Target Group: Faculty Development
2013	Workshop Coordinator and Presenter, Undergraduate Medical Education Semi-Annual MD Program Curriculum Retreat, Faculty of Medicine and Dentistry, University of Alberta
	Target Group: Faculty Development, Multidisciplinary Learner Group
2013	Lecturer: Gold Humanism Program, Conflict Resolution Lecture, Faculty of Medicine and Dentistry, University of Alberta
	Target Group: Faculty Development
2013	Workshop Coordinator and Presenter, Undergraduate Medical Education Curriculum Retreat, Faculty of Medicine and Dentistry, University of Alberta
	Target Group: Faculty Development, Multidisciplinary Learner Group
2013	Co-Chair, Medical Education Book Club

### **Clinical Teaching**

<b>Date</b>	<b>Activity</b>
2009- Present	Clinical Preceptor, Radiology and Diagnostic Imaging, Community Clinic Sites Edmonton, Alberta Target Group: Radiology Residents, Medical Students, Medical Sonography Students
2009-2018	Clinical Preceptor, Radiology and Diagnostic Imaging, Misericordia Hospital Edmonton, Alberta, Canada Target Group: Radiology Residents, Medical Students, Medical Radiation Technology Students, Medical Sonography Students

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2011-2014	Clinical Preceptor, Radiology and Diagnostic Imaging, Vancouver General Hospital Vancouver, British Columbia Target Group: Radiology Residents, Medical Students
2008-2009	Radiology Resident Rounds: 14 sessions, Faculty of Medicine and Dentistry, University of Alberta Target Group: Radiology Residents
2001	Preceptor: Clinical Clerkship, Faculty of Medicine and Dentistry, UAlberta Target Group: Medical Students
2000-2002	Preceptor: Nurse Practitioner Program Target Group: Nurse Practitioner Students
1990-2002	Preceptor: Canadian Forces Physician Assistant Program Target Group: Physician Assistant Students
2013	Workshop Coordinator and Presenter, Undergraduate Medical Education Curriculum Retreat, Faculty of Medicine and Dentistry, University of Alberta Target Group: Faculty Development, Multidisciplinary Learner Group
2013	Co-Chair, Medical Education Book Club

## **PROFESSIONAL MEMBERSHIPS, QUALIFICATIONS and EXPERIENCE**

### **Professional Memberships**

Canadian Emergency Trauma and Acute Radiology Society

Canadian Association Radiologists

American Society of Emergency Radiologists

Indigenous Physicians Association of Canada

Leaders in Indigenous Medical Education

Association of University Radiologists

Canadian Society of Breast Imaging

Military Sexual Trauma, Community of Practice

Assessment Continuum for Canada

National Undergraduate Medical Education Committee

Medical Council of Canada, Legislative Committee

Alliance of Medical Student Educators in Radiology Assessment Subcommittee

Alliance of Medical Student Educators in Radiology Subcommittee  
Association of Medical Education in Europe  
Canadian Association of Medical Education  
Royal College of Physicians of Canada  
Radiology Society of North America  
Association of Women Radiologists

**Professional Qualifications**

Fellow, Royal College of Physicians of Canada (Diagnostic Imaging)  
Certificant Board for Cardiovascular Computed Tomography  
Certificant College of Family Physicians of Canada  
Licentiate of the Medical Council of Canada  
University of Alberta, Gold Academic Leadership Program  
Teaching Scholars Program (TSP), Faculty Development 15-month Certificate Program

**Professional Experience**

**Grant Review, Advisory Committees, Scientific Societies**

2021-Present Vice Chair, Equity, Diversity and Inclusion Working Group for the Canadian Association of Radiologists  
2021-Present Chair Review Committee, Department of Radiology and Diagnostic Imaging, University of Alberta  
2020-Present Indigenous Engaged Research Grant Adjudication Committee, University of Alberta  
2020- Present Alberta Institute, Wenzhou Medical University, Joint Management Committee  
2020- Present Board of Directors, Canadian Emergency, Trauma and Acute Care Radiology Society  
2020 Committee on Accreditation of Canadian Medical Schools, McMaster University DeGroot School of Medicine, Interim Accreditation Review Co-lead.  
2020 Medical Council of Canada, Accommodations Committee  
2019-2020 Transition Advisory Committee, AFMC, Canadian Medical Schools Respond to the Opiate Crisis  
2020 Search & Selection Committee, Endowed Chair in Health Ethics and Director of John Dossetor Health Ethics Centre, FOMD  
2019- Present Indigenous Advisory Council, Office of the Vice Provost Indigenous Programming and Research, University of Alberta  
2019 Search and Selection Committee, Zone Clinical Director Diagnostic Imaging  
2019 Search and Selection Committee, Department Chair Internal Medicine, FOMD

- 2019 Search and Selection Committee, Director Indigenous Health Initiatives
- 2016 - 2019 Medical Education Assessment Continuum for Canada Group
- 2016 Search and Selection Committee, Department Chair Diagnostic Imaging
- 2016 Chair Review Committee, Department Chair Pediatrics
- 2015 - 2020 Medical Council of Canada, Council Member
- 2015 - 2020 Medical Council of Canada, Legislation Committee Member
- 2013 - 2017 Canadian Association of Radiologists Directors of Undergraduate Education Committee
- 2013 - 2016 Alliance of Medical Student Educators in Radiology Education Assessment Committee
- 2013 - 2016 American Society of Emergency Radiologists Scientific Committee
- 2013 - 2016 Association of University Radiologists Education Committee
- 2013 Search and Selection Committee, Director Indigenous Health Initiatives, FOMD
- 2013 American Society of Emergency Radiologists Education Committee

**Institutional Administrative and Leadership Contributions:**

- 2021 - Present Indigenous Research Strategy Task Force, University of Alberta
- 2020 - Present Director and Executive Vice-Dean, Alberta Institute, UAlberta
- 2020 - Present Learning Environment Subcommittee, Department of Psychiatry
- 2020 - Present Indigenous Research Strategy Task Force, University of Alberta
- 2020 - Present Black Applicant Admissions Working Group, Faculty of Medicine and Dentistry, University of Alberta
- 2020 - Present University of Alberta, Vice-Provost Indigenous Programming and Research Advisory Council
- 2020 Indigenous Applicant MD Admissions Selection Committee, UAlberta
- 2019- Present Situated Knowledges: Indigenous Peoples & Place (SKIPP) Indigenous Scholars' Circle
- 2019- Present Member Innovation Discover Education and Scholarship Office Advisory Board
- 2017-2020 Chair, MD Curriculum and Program Committee
- 2015-2020 Chair, MD Program Operations Committee
- 2015-2020 Member, Faculty of Medicine and Dentistry Executive Chairs Committee
- 2015-2020 Member, Faculty of Medicine and Dentistry MD PhD Committee

2015-2020	Member, Faculty of Medicine and Dentistry Professionalism Committee
2015-2019	Member, Deans Strategic Planning Committee
2015-2016	Chair MD Program Committee
2013-2020	Member, Education Quality Improvement Team
2013-2020	Member, Faculty Learning Committee
2013-2016	Co-Chair, Interfaculty Inter-Professional Health Team Development Refresh
2012- Present	Affiliate Faculty, Arts and Humanities in Health and Medicine
2012-2020	Collaborative Health Education and Practice Group Meeting
2012-2017	Chair, MD Program Curriculum Committee
2012- 2015	Chair, Clerkship Committee
2012-2015	Chair, Pre-clerkship Committee
2012-2015	Chair, Assessment and Evaluation Committees
2012-2014	Member, Faculty of Medicine and Dentistry Accreditation Advisory Committee
2012-2014	Clinical Advisor, Teaching Scholars Program
2012-2014	Member, Faculty of Medicine and Dentistry Accreditation Education Standards Committee A and Committee B
2011-2014	Member, Dentistry Program Curriculum Committee
2009-2013	Member, Block Planning Committee, MED523/DDS523 Musculoskeletal, Rheumatology, Rehabilitation and Dermatology course

### **Clinical Experience**

2009-Present	Physician Staff Member, Department of Diagnostic Imaging, Misericordia Hospital, Edmonton, Alberta
2009-2015	Physician Staff Member, Department of Diagnostic Imaging, Base Health Services Clinic, CFB Edmonton, Alberta
2012-2014	Associate Medical Staff, Combined Sub-Specialty Imaging, Vancouver General Hospital, Vancouver, British Columbia
1999-2003	Family Physician Staff Admitting Privileges Surgeon Community Hospital, St Alberta, AB
2002	Acting Base Surgeon, Canadian Forces Health Services Clinic, CFB Edmonton
1999-2002	Deputy Base Surgeon, Canadian Forces Health Services Clinic, CFB Edmonton
1992-94	Nurse, 2 Field Ambulance, Canadian Forces Medical Center, CFB Petawawa
1990-1992	Nurse/Nursing Supervisor, Canadian Forces Hospital, CFB Halifax

### **Review and Editorial Activities:**



Journal of Medical Education and Curricular Development  
Emergency Radiology  
Advances in Health Sciences Education  
Canadian Pharmacists Journal  
Canadian Conference on Medical Education

## Appendix D

### *Statement of Institutional Integrity*

*In the institutional integrity section of the Campus Alberta Quality Council's Academic Freedom and Scholarship Policy, the following statements are made:*

*The institution must present itself accurately and truthfully in all of its written documents. This includes the manner in which it describes its qualities and programs and compares them with other institutions.*

*Full compliance with legal matters such as copyright law is expected.*

*On behalf of (name of applicant institution) I/we attest that, to the best of my/our knowledge, the information presented in this application is complete and accurate and reflects the highest standards of institutional integrity.*

*Signed by:*

\_\_\_\_\_ *President of institution*

\_\_\_\_\_ *Board Chair of institution*  
*(for applications from institutions not authorized to offer a government-approved degree program)*

*OR*

\_\_\_\_\_ *Senior academic officer*

*(for subsequent program proposals from institutions authorized to offer at least one government-approved degree program)*

## Library Impact Statement

As per [GFC Policy 37.3.7](#), Faculties seeking changes to existing programs must consider and seek the agreement to any impact of the proposed program changes on the library system and on course enrolments in other academic units. In addition, any new program proposal going forward for approval will require a service impact statement. Where the affected Faculties and/or Library are in agreement this statement will note that fact and details of the arrangement.

Please contact your [subject librarian](#) to solicit feedback on your program proposal and request a Library Impact Statement.

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### Library Contact:

Name: Sandy Campbell	Date: 4 February 2022
Library Unit: Health Sciences	Email: <a href="mailto:sandy.campbell@ualberta.ca">sandy.campbell@ualberta.ca</a>

### Program Proposal Contact:

Name: Tracey Hillier	Dept./School: Alberta Institute Faculty of Medicine & Dentistry
Faculty: FOMD	E-mail: <a href="mailto:thillier@ualberta.ca">thillier@ualberta.ca</a>

### Proposed Program Changes:

Proposed new program Bachelor of Biomedicine Dual Degree Program

This dual degree program is a collaboration between Wenzhou Medical University (WMU) and the Alberta Institute within the Faculty of Medicine & Dentistry at the University of Alberta. The collaboration is part of the Alberta Institute Wenzhou Medical University (AIWMU).


Students who complete all of the required credits and meet the academic standards of both universities will be granted the degrees from each institution. Students will be eligible for a Bachelor of Biomedicine from the University of Alberta after they complete the first four years of the program. They will be eligible for the Bachelor of Clinical Medicine degree from Wenzhou Medical University after all 5 years of the program have been completed. All 5 years of the program need to be successfully completed as a requirement for either degree to be issued.

All students in the program are located in China. The program will be based on a Fee-Paying model. Students in years 1-2 of the program will maintain minimal registration at the University of Alberta. Students in years 3 and 4 will be assessed University of Alberta Full-Time Student tuition. Students in year 5 will maintain minimal registration at the University of Alberta. There will be 60 students in each year of the program, with a total of 240 students during the first 4 years of the program (the 5th year is taught entirely at Wenzhou Medical University).

Library Service or Resource	Description of Library Impact
Instruction (e.g., classes with a librarian, tours, online resource guides, online tutorials, etc.)	Instruction related to finding evidence based medicine sources will be useful for students in the Bachelor of Biomedicine program.

	The Library offers a range of <a href="#">workshops</a> throughout the academic year to assist students with their research needs. In addition, <a href="#">online instructional guides</a> and <a href="#">tutorials</a> are accessible via the Library's web site to support the research process. Course/assignment specific instruction is also available via subject librarians. Sandy Campbell is the subject librarian for the Faculty of Medicine & Dentistry and has the capacity to support this Program.
Reference assistance (e.g., ongoing one-on-one help)	The <a href="#">subject librarian</a> or other librarians in complementary subject areas will be able to accommodate requests for assistance via email, phone, or online.  General reference assistance is available at all University of Alberta Library <a href="#">service desks</a> and online via <a href="#">Ask us services</a> .
Collections – course materials, print, electronic [note any impacts on simultaneous users, licensing considerations etc.]	The Library's current subscriptions to print and electronic journals and books should adequately support this program. We have a full suite of resources to support an MD program, including primary databases (Medline, EMBASE, CINAHL, SCOPUS, TRIP Pro) journal packages from the major medical journal publishers (eg: Elsevier, Thieme, Springer, Oxford), e-book products including Access Medicine and Clinical Key, point of care tools (eg: Dynamed and Lexicomp) Any items that are not available and/or accessible through the Library can be requested through <a href="#">Interlibrary Loan</a> .  Other subject specific <a href="#">databases</a> and resources may be required.  The Library also supports <a href="#">course reading list and reserve requests</a> online using the <a href="#">Talis platform</a> .  The Library's <a href="#">Medicine Subject Guide</a> will be relevant to students taking specific courses in the Bachelor of Biomedicine course.
Physical facilities (e.g., sufficient room for group work; in-library work, etc.)	Physical facilities are in place to support student research needs during their summer school on site at the University of Alberta. There are bookable group <a href="#">study spaces</a> , as well as collaborative and individual study spaces in all library locations.

- X Proposal has an impact on the Library and can be supported.  
 Proposal can be supported with additional resources; see attached details.  
 Proposal has no impact on the Library.

Unit Head Name	Unit Head Signature	Date
Connie Winther		9 February 2022

Associate University Name	Associate University Signature	Date
Sharon Murphy		9 February, 2022



Jiming Kong, PhD  
Professor

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and Cell Science  
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Rady Faculty of Health Sciences

January 3, 2021

Dr. Janice Causgrove-Dunn  
Vice-Provost (Programs)  
University of Alberta

Dear Dr. Causgrove-Dunn:

**Re: Dual Degree Program in Biomedicine**

Thanks for the opportunity to review the Dual Degree Program of the Alberta Institute at Wenzhou Medical University (AIWMU). I am a professor at the College of Medicine, University of Manitoba. Over the past 14 years I have initiated and served as coordinator for 4 academic exchange programs between the University of Manitoba and Chinese Universities. I have no conflict of interest in providing this letter of assessment.

The proposed program is to be jointly sponsored by the Wenzhou Medical University (WMU) and the Faculty of Medicine & Dentistry at the University of Alberta. It will be developed in the Alberta Institute at WMU that has an ongoing collaborative medical program in the past two years. Students in the program will spend their first two years in Wenzhou Medical University, and the third and fourth years in University of Alberta. Clinical internship of the program will be arranged in the fifth year at Wenzhou Medical University. Students will receive a Bachelor of Biomedicine from the University of Alberta and a Bachelor of Clinical Medicine degree from Wenzhou Medical University after successful completion of the program. The program plans to enroll 60 students each year. Students targeted for admission in this dual degree will be exclusively from China.

In recent years we have seen a number of collaborative medical education programs established between Canadian and Chinese universities. Many of these programs focus on some aspect of medical education such as elective courses, resident exposure, family medicine, and training of clinicians. The collaborative medical program the University of Alberta and Wenzhou Medical University have established a few years ago appears to be one of the most comprehensive programs in this category. It has been taking students for the past two years. The proposed Dual Degree Program in Biomedicine is obviously an expansion of the collaborative program that has already demonstrated a high learner demand in the past few years. I agree that including a degree from the University of Alberta to officially recognize the training experience in Alberta is necessary and appropriate, and will make the program even more attractive to applicants.

Both Wenzhou Medical University and the University of Alberta have a strong undergraduate medical education program. The proposed program comes with a comprehensive curriculum that entails strengths of both universities. I am reasonably convinced that the program is feasible and has the potential to meet international quality standards for degree programs.

Personally I consider the proposed program is new and very interesting. It will provide the students with an exceptional learning experience and will establish the University of Alberta as a leader in international medical education.

Assessment of demands that will be created by the proposed program is realistic. I would therefore endorse the proposal without conditions.

Sincerely,



Jiming Kong, PhD



[Patrick.choy@umanitoba.ca](mailto:Patrick.choy@umanitoba.ca)

UNIVERSITY  
OF MANITOBA

Faculty of Medicine

January 2, 2022

Ms Carley Roth  
Portfolio Initiative Manager  
Office of the Provost and Vice –President Academic  
University of Alberta

Dear Ms Roth:

Thank you for the opportunity to review the new bachelor's degree program in Biomedicine proposed jointly by the University of Alberta and the Wenzhou Medical University. It is a dual degree program through the collaboration between the Wenzhou Medical University and the Alberta Institute within the Faculty of Medicine and Dentistry at the University of Alberta. Upon the completion of required credits in the four years of the joint program, students will become eligible for a Bachelor of Biomedicine from the University of Alberta. They must continue to complete the fifth year of the clinical (clerkship) program at their home institution to become eligible for a Bachelor of Clinical Medicine from the Wenzhou Medical University. As an additional condition, all five years of the program must be successfully completed in sequence as a requirement for either degree to be issued.

The Joint Program will have an intake of 60 students every year. The student will be based throughout the five years at Wenzhou Medical University, and the University of Alberta will send professors to Wenzhou to teach the third and fourth year courses. Students may spend some time at the Alberta campus to take short courses and/or gain some "Canadian" exposure during the summer. The Proposal states that there is a labor market demand for physicians in China who have an international perspective on health care, leadership and medical education.

In general, the academic content of the joint program bears similarities with many ongoing five year medicine program in countries outside North America. One outstanding feature to include the Bachelor in Biomedicine program into this medical program is that the student will receive a strong background in basic and clinical sciences through the first four years of study. This background will not only help medical students to develop better clinical skills and thinking during their clerkship training, but the strong science background also provide them with a clearer path (if they wish) to go into clinical research and related studies in the future.

The first two years of the Bachelor in Biomedicine will be given by professors at the Wenzhou Medical University. Since the incoming students are usually high school graduate, this training will give students adequate basic knowledge in biomedical sciences and the opportunity to learn English as prerequisites to take the more advanced subjects in the third and fourth year. The clinical (preclerkship) sciences in third

and fourth year are taught by professors from the University of Alberta, who will travel to Wenzhou to do the teaching. These courses include Endocrinology & Metabolism, Cardiovascular Medicine, Pulmonary Medicine and Renal Medicine. The course contents provided in the Proposal appear to be at par with selected physiology or biochemistry courses at the BSc Honours level in Canada. Hence, I have no doubt that they will meet the requirements and/or national and international quality standards for a bachelor degree program.

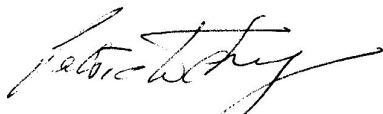
The inclusion of Health System Science courses into the program is an excellent choice. It is clear that health care delivery in China is very different from Canada. The knowledge on how health systems work together to deliver care, both in Canada and the rest of the world, would provide students with a wider perspective to evaluate the pros and cons of their current system. The inclusion of health care policy, economics and management; clinical informatics and health information technology and value-based care are subjects which are very important and timely. Chinese medical students, however, have only limited exposure to these important subjects.

One area which can be strengthened in the Health System Science course is to include the role of family physician in course. There has been a hiatus in the training of family physician in China, and the government has recently encouraged universities to expedite the process.

It is gratifying to see that institutional administrators and faculty have made a realistic assessment of the need for the program. Since graduates of this program will not proceed to work in Canada, there is no impact on the job market in Alberta. In general, the financing of the program will be the onus of the students who want to enroll in this program. A tuition guarantee will be established for each student at the start of the program. Given the preparation work outlined in the proposal, it appears that University of Alberta has adequately assessed the demand for this program, both in financial aspects and human resources.

As a former Associate Dean of Medicine at the University of Manitoba who had initiated a Joint Degree Program in the Bachelor of Science (med) with the Shantou University in China, I certainly support this Proposal. There are many obvious benefits to both partnering institutions in developing a Joint Degree program, but one unexpected benefit in our Joint Degree program with the Shantou University was the attraction of a substantial donation from a third party due to the success of the program.

Sincerely,



Patrick Choy, OM, PhD, MD, FAHA, FIACS  
Professor Emeritus  
Max Rady College of Medicine  
University of Manitoba



5-309 Edmonton Clinic Health Academy  
11405 87 Ave, University of Alberta  
Edmonton, Alberta, Canada T6G 1C9  
Tel: 780.492.9320  
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January 10, 2022

### **Response to Desk Reviews of the Proposal for a Bachelor of Biomedicine Dual Degree Program**

Feedback on the Proposal for a Bachelor of Biomedicine Dual Degree Program has been received from Professors Jiming Kong and Patrick Choy, as required by the Campus Alberta Quality Council. Both reviewers are overwhelmingly supportive of the proposal.

Dr Kong has recognized that while other joint programs exist, many focus on some aspect of medical education such as elective courses, resident exposure, family medicine, and training of clinicians. The collaborative medical program between the University of Alberta and Wenzhou Medical University is indeed one of the most comprehensive programs in this category and combines the strengths of both universities. The proposed Dual Degree Program in Biomedicine is recognized by Dr Kong as obvious an expansion of the collaborative program that has already demonstrated a high learner demand in the past few years and that including a degree from the University of Alberta to officially recognize the training experience in Alberta is necessary and appropriate and will make the program even more attractive to applicants.

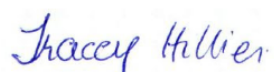
Dr Patrick Choy recognizes that an outstanding feature of the program is that students will receive a strong background in basic and clinical sciences through the first four years of study. We agree that this background will not only help medical students to develop better clinical skills and thinking during their clerkship training, but the strong science background also provides them with a strong foundation for clinical research and related studies in the future. Dr Choy recognized that the course contents provided in the proposed dual degree program are on par with selected physiology or biochemistry courses at the BSc Honours level in Canada and has no doubt that they will meet the requirements and/or national and international quality standards for a Bachelor degree program.

It is gratifying to read Dr Choy's comments that the inclusion of Health System Science courses into the program is an "excellent choice", recognizing that health care delivery in China is very different from Canada. We wholeheartedly agree that the inclusion of health care policy, economics, and management; clinical informatics and health information technology and value-based care are subjects is very important and timely and that knowledge on how health systems work together to deliver care, both in Canada and the rest of the world, will provide students with a wider perspective to evaluate their current system.

Dr Choy notes “One area which can be strengthened in the Health System Science course is to include the role of family physician in course”. Again, we wholeheartedly agree. We have woven content about the role and importance of Family Physicians and “Generalists” through the dual Degree curriculum.

Finally, we are delighted to read the comment that “the program will provide the students with an exceptional learning experience and will establish the University of Alberta as a leader in international medical education”. The University of Alberta is appreciative and encouraged by the overwhelming and enthusiastically supportive reviews provided by two internationally renowned scholars.

Warm regards,



Tracey Hillier, MD, BScN, CCFP, FRCPC, MEd

**Director and Executive Dean, Alberta Institute**

College of Health Sciences

Faulty of Medicine and Dentistry