University of Regina

Faculty of Engineering and Applied Science

Academic Unit Review Self Study Report

(Research, Graduate Studies and Services)

2012 - 2018

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EXECUTIVE SUMMARY

This self-study focuses on graduate studies, research and service in the Faculty of Engineering and Applied Science (FEAS) at the University of Regina. Undergraduate studies and programs are assessed via a re-accreditation visit (November 18-20, 2018) by the Canadian Engineering Accreditation Board. The report of the accreditation visiting team is available in the Faculty's Office in the Education Building, Room 408.

The first graduate program in Engineering (ENGG -General Engineering) was established in 1993. The Faculty currently offers six graduate programs (Master and PhD) in Electronics, Environmental, Industrial, Petroleum, Process, and Software Systems Engineering. FEAS has made significant strides in the last two decades to become a research-intensive Faculty. It hosts two CRC I Chairs and the SaskPower Industrial Chair in Clean Energy. It has developed unique capabilities in research and is considered a world leader in Climate change modeling, Carbon capture, Wastewater treatment, Heavy oil recovery, Public safety communications and informatics, and in the applications of Artificial Intelligence.

The Faculty attracts a large numbers of applications for graduate studies and has provided research opportunities for graduate students and visiting researchers. Through the dedication of staff, faculty members and graduate students, the Faculty is recognized nationally and internationally as a model for collaborative and interdisciplinary research. The Faculty has increased diversity at the graduate level and has a high participation rate for women in Engineering. FEAS has increased its advising services to graduate students and has made significant efforts to strengthen its relationship with the Engineering Graduate Students Association (EGSA).

FEAS is planning for a new Engineering building, and in the process of establishing a new strategic research plan. FEAS aspires to become a recognized world leader in providing excellence in graduate engineering education. Our mission is to prepare students to be global leaders in academia, research, industry, and government. FEAS will endeavor to continue addressing society's most relevant needs and challenges.

1. BACKGROUND

This self-study serves as a guide for the Faculty's 2019 unit review and will inform the development of our next strategic research plan. The study was created in accordance with the University's Policy No. OPS-130-005 on Academic Unit Reviewers. However, this review focuses on research, graduate studies and services, since the undergraduate programs were reviewed during an accreditation visit in November 2018.

The mission of the Faculty of Engineering and Applied Science (FEAS) is to provide high quality education and perform high quality research that positively respond to the needs of the community and impact all industrial sectors of Saskatchewan, Canada and beyond. The Faculty's mission embodies commitments to student success, research impact and community engagement as articulated in the University of Regina Strategic Plan (2015-2020).

FEAS offers comprehensive graduate programs including Master of Applied Science, Master of Engineering COOP, Master of Engineering Project and PhD degrees in six engineering specialties (Industrial Systems, Electronic Systems, Environmental Systems, Petroleum Systems, Process Systems and Software Systems). The graduate curriculum in FEAS provides graduate students with opportunities to gain engineering knowledge in different core competencies, with an emphasis on multidisciplinary education. Graduate courses are taught by faculty members as well as by adjunct professors and part-time lecturers (when needed), and each program is committed to offering students at least two regular graduate courses per term (including the Spring/Summer semester).

The graduate program in FEAS aims to graduate students with advanced specialized research skills, who are able to contribute to one or more research areas and to work both independently and collaboratively to investigate previously unknown or currently unsolved problems. The Faculty is also engaged in many services with the wider University community, the profession, industry and internationally.

2. FACULTY MISSION

- **Educate** engineers for the future with a systems approach: strong technical knowledge, well-rounded skills and experience, to maximize their impact on our communities and industries. (*Student Success*[1]*, Sustainability*).

[1] Text in pantheists reflect the University's Strategic Plan.

- Engage in **research** that supports learning, industry and entrepreneurship, supported by external funding and high quality graduate students (*Research with Impact, Sustainability*).
- **Entrepreneurship** in research, infrastructure, resources and learning (*Student Success and Research with Impact*)
- Engineering knowledge to **serve our communities** (*Commitment to Our Communities, Sustainability and Indigenization*).

3. UNIVERSITY STRATEGIC PLAN AND STRATEGIC RESEARCH PLAN

The University of Regina Strategic Plan 2015-2020 (UR Plan) identifies three strategic priorities:

- *Student success;*
- *Research impact; and*
- *Commitment to our communities.*

The University's Strategic Research Plan (2016-2021) states that over the next five years, the university will commit to the following strategic research objectives

- *Strengthen support required for students and researchers to deliver high impact outcomes*
- *Advance the profile and awareness of research successes locally, provincially, nationally and internationally*
- *Increase research partnerships and projects with First Nations and Métis people, communities and organizations, including the First Nations University of Canada*
- *Develop and implement processes, procedures and tools to help ensure the University's Strategic research plan is actualized.*
- *Increase research revenues.*
- *Facilitate and support high quality research with dissemination practices including public engagement.*

FEAS plays a major role in meeting the University's vision, mission, goals and priorities. The Faculty supports graduate students by providing them with high-quality graduate courses (2 per program per term for three terms in each academic year) in addition to as many additional courses taught by qualified sessionals and adjunct professors. Reading courses provide opportunities for tailored courses related to their specific research interests. Students are encouraged and financially supported to present their research in national and international conferences.

The array of program offerings is aligned to respond to the needs and interests of current and prospective students but also to local and provincial needs.

We celebrate graduate student success with a special Dean's list for students that have completed their course requirements and obtained a GPA higher than 90%. Student innovative achievements are disseminated using the university website, the university's research magazine *Discourse*, and the *Professional Edge* magazine of the Association of Professional Engineers and Geoscientist of Saskatchewan (APEGS). Graduate students have participated in solving some First Nations' problems dealing with water treatment and energy distribution in the north. Many graduate students received teaching assistantships (TAs) from the Faculty. According to a 2017 survey by Engineers Canada, 5.4 % of the budget is devoted to TAs on par with the national average. Almost half of the applications received by the Faculty of Graduate Studies and Research (FGSR) are for studying Engineering. FEAS' acceptance rate is about 7 %, while the FGSR average acceptance rate is about 31 %. However, there has been a decrease in MASc applications, and increase in the MEng Coop option. Funding available to graduate students has not increased lately and many faculty members at the Associate and full Professor ranks prefer having PhD students. FEAS graduates as many students as the Johnson Shoyama Graduate School of Public Policy (JSGS) and the Levene School of Business, which offer mostly course-based graduate degrees. On average, a FEAS faculty member supervises seven graduate students; few members supervise more than 15 graduate students. Unfortunately, however, the number of self-declared indigenous graduate students is low, only two is 2018/2019.

FEAS contributes to two of the five thematic areas of the University's Strategic Research Clusters (priorities): "**Water, environment and clean energy**" and "**Digital future**". Many faculty members are nationally and internationally recognized as leaders in their field, are board members and editors of scientific journals [2]and serve on national funding panels and learned societies. According to InCites, the University of Regina has the highest number of citations per paper in Canada in the "Clean Energy" component of the cluster, and the third highest number of citations per paper (16.8) in the area of "Environment/Ecology" in western Canada. Examples are long-term studies of climate change, hydrological cycles in prairie ecosystems, source tracking of fecal contamination, and carbon capture technology. The "Water, Environment & Clean Energy" Research Cluster aligns with three of the six Core Growth Activities identified by provincial government to foster economic growth and address challenge.[3]

[2] See https://www.uregina.ca/engineering/research/editors.html.
[3]see https://www.uregina.ca/research/assets/docs/pdf/Brochures/Water-Environment-Clean-Energy-cluster-brochure.pdf
[4]http://publications.gov.sk.ca/documents/112/108586-Saskatchewan%20Plan%20for%20Growth%20-%20Full%20Version.pdf

Digital Future engineering researchers are leading the way through innovation and creativity in computing and digital media. The growth and expansion of the data culture provide constant opportunities members holding NSERC grants.

The research agenda in FEAS is aligned with the provincial government proprieties which include “clean energy, innovative oil and gas initiatives such as enhanced oil recovery, mining, life sciences, crop sciences, value-added food processing and manufacturing.”[4]

4. PROGRAMS OFFERED

Over the last ten years, FEAS expanded and enriched its educational programs and research. Demand for our programs remains very high among international students, yet we are only able to accept a limited number (7 per cent) of these applications (800-1000 per year). We have expanded our efforts to recruit more domestic students into our research-based programs. Our Research and professional programs attract high quality students from all over the world. There are approximately 322 graduate students, the second highest number on campus. Female students represent 37 % and international students 76 % of the total number of graduate students.

The program aims at graduating students with advanced research skills in the discipline, able to contribute to one or more research areas and to work both independently and collaboratively to investigate previously unknown or currently unsolved problems. The Master of Engineering degree program (both Coop and project routes) with a project report component attracts practicing engineers and aims to advance their professional development. All six graduate programs offer MASc and PhD (Thesis based) degrees and course-based Master of Engineering (MEng) with Coop and Project options. BASc to PhD pathways exist in all programs but Software. Applicants must meet the Faculty of Graduate Studies and Research entrance requirements and must be admitted by each individual program.

Graduates have expertise in areas that are in demand across Canada, and they have other characteristics that employers want. All programs in this Faculty have in common the “systems approach” to engineering education. Although each program has some unique implementation of the systems theme, a common underlying objective is to produce graduates with not only a strong base of technical knowledge but also the breadth of non-technical skills that a successfully professional engineer should have in the workplace. The Co-op program is a very popular option and gives the opportunity for students to experience a work-study program of learning has proven to produce very employable and motivated students. This makes it possible for all students, especially visa students, to benefit. This leads to much better courses and enriched interactions with professors and industries. It also leads to research partnerships between professors and industry.

4.1. Electronic Systems Engineering

The Electronic Systems Engineering (ESE) graduate programs were approved by the University's Senate in February 2007. Prior to that the programs were offered under general engineering (ENGG), approved by Senate in May 1993. ESE conducts research and offers graduate courses in selected areas of microelectronics, signal processing, instrumentation and communications. Research activities include Smart grids, Intelligent transportation, Vehicle-to-Grid Systems, Deep Learning, Microwave devices and systems, Multi-Agent Systems, and Robotic sensor systems, field-programmable gate array (FPGA) Embedded System Design, Ultrasound Testing for Pipelines; Boundary-Scan Testing; Design for Testability; Brain Computer Interface, Brain stimulation, Neural Network simulation, Renewable Energy Integration.

4.2. Environmental Systems Engineering

The Environmental Systems Engineering (EVSE) graduate programs were approved by Senate February 2007. Prior to that the programs were offered under general engineering (ENGG), approved by Senate in May 1993. The EVSE program emphasis is on water and wastewater treatment, solid and hazardous waste management, air quality management, industrial air pollution control, groundwater contamination, geotechnical engineering, transportation, sustainability and urban development, risk and impact assessment, environmental modeling/simulation/optimization, and energy & environment.

Research activities include Characterization and improvement of geomaterials, Sustainable mine waste Management, Civil Infrastructure systems , Waste management, Site remediation, and Risk assessment, Simulation and optimization of hydrological and environmental systems, Modeling of energy and environmental management systems, Climate modeling, Impact assessment, and Adaptation planning, Hydraulic engineering, Erosion and sediment transport, Groundwater contamination, Environmental hydraulics, Remote sensing and GIS application in hydrological systems, Non-hazardous waste, Reuse of waste materials in civil and environmental applications, Cold Region River Engineering, Local scour and sediment transport, Flood mapping and prediction, Water drainage engineering, River hydraulics and Fluvial Morphology, Environmental Impact Assessment and Risk Analysis, Reclamation of oily water and reuse, Advanced physical/chemical treatment, including membrane filtration and bioremediation, Water treatment process & facility design and modification, Collection and distribution systems design and analysis, Corrosion and corrosion inhibition, CO_2 capture technologies, Gas separation and purification, Biofuel technologies, Air pollution control and management, Highway traffic monitoring, Intelligent transportation systems, Statistical analysis of highway traffic data, Transportation economics, Highway traffic safety. An EVSE faculty member holds a Canada Research Chair Tier 1 (G. Huang).

4.3. General Engineering Systems Engineering

A general (ENGG) graduate program was approved by the University Senate in May 1993. This program provides an avenue for a PhD to those students in whose area of specialization crosses two or more Engineering areas, or cannot fit the existing areas (Electronics, Environmental, Industrial, and Petroleum). It provides a structured environment for advanced research. General Engineering courses are provided to cater to all programs. In terms of enrolment, the program is not accepting any new students, and will be archived soon. An ISE faculty member holds the SaskPower Industrial Research Chair in Clean Energy (R. Idem).

4.4. Industrial Systems Engineering

Industrial Systems Engineering (ISE) graduate programs were approved by the Senate in February 2007. Prior to that the programs were offered under general engineering (ENGG), approved by Senate in May 1993. The major areas of specialization in ISE are in Manufacturing, Artificial intelligence, Control, Decision analysis, Process engineering and Energy systems. Activities include Computer-aided design (CAE_, Facilities design, Quality control, Performance evaluation of manufacturing systems, Fatigue analysis, Vibration and noise analysis, Design and manufacturing of pressure vessels, Non-linear dynamics fracture mechanics, Modeling/ simulation/ design/ implementation of robotic human powered, Sensor-based motion planning, Optimal control, Artificial Neural networks, Virtual reality, Artificial/Computational sapiens (wisdom), Metabotics, System risk, Uncertainty analysis, Infrastructure management, Wastewater treatment and Water Quality and resource management, Radiology engineering, Sustainable engineering, Nuclear methods for non-destructive testing and Imaging, Inverse problems and Monte Carlo methods. Value-added product and manufacturing from agricultural wastes, Lean and agile manufacturing, Operational management, Human Factors Engineering, Applied mechanical engineering analysis and design including Biomechanics, Vibration control, Structural analysis, Strength of materials, Instrumentation, and Chaos theory.

4.5. Petroleum Systems Engineering

Approved by the Senate in February 2007, the Petroleum Systems Engineering (PSE) program offers graduate programs focused on conducting research in the areas of enhanced oil recovery (EOR), Tight oil/gas reservoir development and Multistage fracturing optimization, CO_2 EOR & geo-sequestration, Reservoir and Fluid characterisation/modeling and simulation, heavy oil recovery through steam-assisted gravity-drainage (SAGD) and vapor-extraction (VAPEX) and Chemical processes, Miscible and immiscible displacement, Phase behavior, Joint Implementation of Vapour Extraction (JIVE), Post-cold Heavy Oil Production (CHOP) and Wormhole evaluation, Fluid-rock interactions, Multiphase fluid flow in heterogeneous porous media, Asphaltene/Wax/ Hydrate precipitation, in-situ combustion, Kinetic models development, Underground storage of carbon dioxide, Sand production, Caprock integrity, Formation Damage, Permeability improvement, Well testing 2D/3D heterogeneous reservoirs, Drilling and Well completion.

4.6. Process Systems Engineering

Approved by Senate in October 2006, the major areas of specialization in Process Systems Engineering (PSEng) are in Chemical Process Engineering, Materials Engineering, Petroleum Process Engineering, Environmental Process Engineering, Process Modeling, Simulation & Control, and Energy & Environment. Research activities deal with Fuels & Biofuels, Biomass, Hydrogen production, Heterogenous catalysis development, Agriculture waste conversion to biofuels, Economic evaluation and feasibility studies, Chemical reaction engineering, Reformer technology, Fuel cell applications, Greenhouse gas technology control including Solubility of gases in liquids, Pressure-volume-temperature (PVT) studies, Mass transfer with chemical reactions, Kinetics, Corrosion and degradation, Calorimetry, Physical and transport properties measurements, Pilot plant design, operations and simulation, Fuel cells, Membranes, Modeling and simulation of industrial systems, Process Optimization, and Application of artificial intelligence, Wind, Solar and Geothermal engineering.

4.7. Software Systems Engineering

Approved by Senate in October 2008, the Software Systems Engineering (SSE)'s objective is to train students to study, analyze, design and develop different software systems including web-based software systems, transaction-based systems, interactive multimedia systems, and management information systems, and to become knowledgeable in the process and life-cycle aspects of software development. The program also aims to teach students to apply computational theories to real-life programming techniques; analyze requirements; design, implement and test software systems; plan and manage software projects; solve technical problems; practice co-design and embedded systems construction. Research activities include Enterprise Software Design and development, Intelligent transportation systems, Grid /Cloud and service-oriented computing, Mobile computing platforms, Mobile Software Tools and Applications Multimedia Ubiquity and Processing, Contextually Aware Software, Logistics and Tracking Software, Distributed and Parallel Computing, Mobile Agent Software, Open Source Software, Machine/deep learning, Human Computer Interaction, Knowledge Management, Decision Support Systems, Software Engineering Methodologies (Agile, Scrum, Lean), Wireless MESH Networks, Location-Aware Applications and Mobile Agent, Distributed and Pervasive Computing, Artificial, Generative Adversarial Networks, Computer Vision and Image Processing, Pattern Recognition, Cognitive Architectures, Common sense Reasoning, Applications of artificial intelligence and knowledge-based systems for energy and environmental system analysis, Methods and tools for ontological engineering, Knowledge acquisition, modeling, and management, Object-oriented methodologies for knowledge-based systems development, Artificial Consciousness, Ethics of Artificial Intelligence, Social and economic impact of information technology. An SSE faculty member holds a Canada Research Chair Tier 1 (C.Chan).

5. STAFFING AND RESSOURCES

5.1. Leadership

Name	Position
Hussein, Esam	Dean
deMontigny, David	Associate Dean, Academic
Henni, Amr	Associate Dean, Graduate & Research
Schmidt, Meigen	Faculty Administrator

5.2. Staff list

a. Academic Staff:

The faculty counts 44 members (Instructors, Lecturers, Assistant, Associate and full Professors) and 11 lab instructors.

Surname	First Name	Program	Position & Rank	Notes
Al Zubaidi	Isam	ISE	Lab Instructor III	
Al-Anbagi	Irfan	ESE	Assistant Professor	
Aroonwilas	Andy	ISE	Associate Professor	
Azadbakht	Saman	PSE	Lecturer	
Azam	Shahid	EVSE	Professor	Program Chair
Bais	Abdul	ESE	Assistant Professor	
Benedicenti	Luigi	SSE	Professor	resigned July 2017
Bi	Yonghong	PSE	Lab Instructor	retired July 2018
Chan	Christine	SSE	Professor	
Conroy	Tom	ESE	Associate Professor	retired October 2014
Dai	Liming	ISE	Professor	
Demontigny	David	ISE	Professor	
Douglas	Trevor	SSE	Lab Instructor III	Associate Program Chair
Downie	Keegan	ESE	Lab Instructor II	
Duguid	David B.	ESE	Lab Instructor III	
El-Darieby	Mohamed	SSE	Professor	
Gelowitz	Craig	SSE	Associate Professor	

Gu	Peter	PSE	Professor	
Gutiw	Pete	EVSE	Lab Instructor III	retired April 2018
Henni	Amr	ISE	Professor	Program Chair
Hong	Sam	PSE	Lab Instructor II	
Huang	Gordon	EVSE	Professor	
Hussein	Esam	ENGG	Professor	
Ibrahim	Hussameldin	ISE	Associate Professor	
Idem	Raphael	ISE	Professor	
Ismail	Mohamed	ISE	Assistant Professor	resigned August 2018
Iwaniw	Marie	ISE	Associate Professor	retired 2013
Jia	Na (Jenna)	PSE	Assistant Professor	
Jin	Yee-Chung	EVSE	Professor	
Jones	Robert	ISE	Lab Instructor III	
Kabir	Golam	ISE	Assistant Professor	
Laforge	Paul	ESE	Associate Professor	Program Chair
Lichtenwald	Ben	EVSE	Lab Instructor III	
Maciag	Timothy	SSE	Lecturer	Associate Program Chair
Mayorga	Rene	ISE	Professor	
Mcmartin	Dena	EVSE	Professor	resigned November 2017
Mehran	Babak	EVSE	Assistant Professor	resigned June 2018
Mehrandezh	Mehran	ISE	Professor	
Milton	Dean	EVSE	Lab Instructor III	
Misskey	Bill	ESE	Professor	retired April 2014
Morgan	Yasser	SSE	Associate Professor	
Naqvi	Karim	ESE/SSE	Lecturer	
Ng	Kelvin	EVSE	Associate Professor	
Paranjape	Raman	ESE	Professor	
Peng	Wei	ENGG	Lecturer	
Sharma	Satish	EVSE	Professor	
Shirif	Ezeddin	PSE	Professor	
Stilling	Denise	ISE	Associate Professor	
Tontiwachwuthikul	Paitoon	ISE	Professor	

Torabi	Farshid	PSE	Professor	
Veawab	Amy	EVSE	Professor	
Wagner	Doug	ESE	Instructor II	
Wang	Yuan	PSE	Lab Instructor II	
Wang	Zhanle	ESE	Lecturer	
Wirth	David	ESE	Lab Instructor	retired August 2016
Wu	Peng	EVSE	Assistant Professor	
Yang	Tony	PSE	Professor	
Young	Stephanie	EVSE	Professor	
Yow	Kin-Choong	SSE	Associate Professor	
Zaidi	Syed	ISE	Lab Instructor II	
Zeng	Fanhua (Bill)	PSE	Professor	Program Chair
Zhang	Lei	ESE	Assistant Professor	
Zhao	Gang	PSE	Professor	
in progress		PSE	Assistant Professor	
in progress		ISE	Assistant Professor	
in progress		PSE	Lab Instructor	
in progress		EVSE	Assistant Professor	

b. Administrative Staff:

Last Name	First Name	Position	Notes
	Meigen	Faculty Administrator	
Barlow	Christine	Dean's office assistant	
Fahlman	Robyn	Dean's office assistant	
Ehr	Milena	Main Office - UG admin assistant	
Benoit	Kayla	Main Office - Grad admin assistant	
Varcoe	Kathy	Purchasing admin assistant	
Stack	Katelyn	Scheduling/events admin assistant	
Savoie	Janice	Program Coordinator	

Berwald	Melissa	Academic Advisor	
MacPherson	Gina	Academic Advisor	
Tathibana	Christina	Coop & Graduate Coordinator	
Walsh	Coleen	Coop & Graduate Coordinator	on leave
Smithson	Heidi	Technical Writer	position eliminated June 2014
Bradshaw	Lauren	Lab Safety Coordinator	
Yung	Chris	Machine shop technician	
Berwald	Harald	Machine Shop	retired Dec 2014
Moore	Megan	EYES coordinator (youth programs)	
Sandiford	Ashlee	EYES Assistant Coordinator (pt)	

5.3. Organization and Graduate Programs

Programs are represented by Graduate Coordinators in a standing Faculty committee called the "Graduate Committee". It advises on different graduate matters, particularly the administration of the graduate programs and allocation of Graduate Teaching Assistants (GTAs) funds provided by the Faculty of Graduate Studies and Research (FGSR) and Teaching Assistantships (TAs) funded by the Faculty. The Graduate Committee meets on a monthly basis. Two Graduate Advisors (one on a contract) and a Graduate Assistant provide advice and services to graduate students. Advising, guidance as well as ongoing compliance audits on program management is also done by FGSR staff. Admission to graduate programs is administrated by the Faculty of Graduate Studies and Research in consultation with the FEAS. Once a student has completed all the requirements of the program, FGSR audits the entire program for approval to graduate.

5.4. List of Graduate Coordinators

The Graduate Committee is a permanent committee that decides on all matters related to graduate studies. It has a representative from each program (6 members) and is chaired by the ADR. The Grad Committee meets on a monthly basis. Motions are then presented to the Faculty Executive Committee (consisting of deans, faculty administrator and program Chairs) and voted on, if necessary, in the Faculty Council. Distributions of GTAs are first discussed in program meetings before reaching the grad committee. Two Graduate Advisors and a Graduate Admin Assistant provide advice and services to graduate students.

Faculty Members	Program	Rank
Amr Henni	-	Professor/ Associate Dean GS&R
Irfan Al-Anbagi	ESE	Assistant Professor
Kelvin Ng	EVSE	Associate Professor
Mehran Mehrandezh	ISE	Professor
Na Jia	PSE	Assistant Professor
Hussameldin Ibrahim	PSEng	Associate Professor
Christine Chan	SSE	Professor

6. RESOURCES

6.1. Teaching Space

The following table lists the rooms available for teaching and used mainly by undergraduate students but also by graduate students.

Teaching Space		
Room	**Function**	**Program**
ED 116.2	Computer Teaching Lab	Engineering
ED 117	Engineering Machine shop	Engineering
ED 118	Teaching Laboratory – wet	EVSE
ED 119	Laboratory – dry	EVSE/ISE
ED 121	Laboratory – dry	EVSE/ISE
ED 122	Teaching Laboratory – wet	EVSE
ED 129	Teaching Laboratory – wet	ISE
ED 134	Teaching Laboratory – dry	ISE
ED 135	Teaching Laboratory – wet	ISE
ED 138	Crescent Point Petroleum Lab	PSE

ED 139	Teaching Laboratory – wet	EVSE
ED 144	Environmental Lab – survey, solid waste	EVSE
ED 434	Microcontroller DSP Lab	ESE
ED 435	Electronics Project Assembly Lab	ESE
ED 435.1	Electronics Teaching Lab	ESE
ED 435.2	Teaching Laboratory – dry	ESE
ED 441	Software Teaching Lab	SSE
ED 486	Electronics II Instrumentation Lab	ESE
ED 487	Electronics Control Systems Real Time Computing Lab	ESE
ED 489	Computer Teaching Lab	Engineering

6.2 Research space (Room, Investigator, some larger equipment)

The following table lists the rooms available for research labs and the names of the faculty members the labs are assigned to.

Research Space		
Room	**Function**	**Primary assigned**
ED 123	Laboratory – wet	Ng
ED 124	Laboratory	Huang
ED 130	Laboratory – wet	Huang
ED 130.1	Laboratory – wet	Huang
ED 130.2	Laboratory – wet	Huang
ED 148	Software App LAb	Douglas

ED 433	Energy Informatics/Process Systems Simulation	Chan, Tontiwachwuthikul
ED 439	Sensing and Localization Lab	Morgan
ED 439.1	Programmable Hardware design and grid computing Access lab	Mayorga
ED 484	Environmental Informatics Lab	Huang
ED 485	MEng Graduate Room	Schmidt
GG 110	Pilot Plant	Idem
GG 110.2	Workshop	Idem
GG 110.7	Solvent Synthesis Lab – Wet	Idem
GG 112	Process Lab – wet	Idem
GG 112.1	NMR Lab - wet	Idem
GG 112.3	SEM & XRD Lab	Idem
GG 112.4	Sample prep – wet	Idem
GG 225	Fundamental Studies Lab – wet	Idem, Henni
GG 310	Environmental Lab - wet	Supap
GG 312.1	Simulation Lab – dry	Idem
GG 313	H2S Lab – wet	Idem
PT 205	Laboratory – wet	Zeng
PT 206	Laboratory – wet	Zeng
PT 207	Laboratory – wet	Zeng
RI 540	Laboratory - dry	Huang
RIC 017	Laboratory – wet	Young
RIC 019	Laboratory – wet	Young
RIC 024	Laboratory – dry	Stilling

RIC 025	Laboratory – dry	Laforge/Al-Anbagi
RIC 027	Laboratory – wet	Azam
RIC 028	Laboratory – wet	Jin
RIC 308.1	Dry lab	Dai
RIC 433	Laboratory - wet	deMontigny, Dai, Henni, Shirif
RIC 436	Laboratory - dry	Dai
RIC 437	Laboratory – wet	Aroonwilas, Veawab
RIC 438	Laboratory – dry	Paranjape
RIC 439	Laboratory – wet	Wu, Peng
RIC 440	Laboratory – wet	Huang
RIC 441	Laboratory – wet	Wu, Peng
RIC 445	Laboratory – wet	Huang

6.3 Specialized Equipment

The following table represents a list of the most important equipment used in the research labs.

Equipment List	
Equipment	**Location**
RCH Series Core Holder	6R
Capture System Development Software	6R201.1
Continuous Flow System	6R201.5
Autosampler, Convection Oven (2), Core Holder, High Pressure Densitometer, High Pressure Pump, High Pressure Viscometer, Laser Care System, Network GC System, Pressure Tapped Core Holder,	6R205

Pump (2), PVT Apparatus with Mixer, Solid Detection System/part of PVT, Syringe Pump (3), Viscoelasticity Analyzer	
500HP Pump & Controller, Core Holder, DMA 4200 M, Dual Component Gas Sorption Analyzer, Evaluation Unit-High Pressure Densitometer, Gasometer, Microscope, Pressure Transducer, Pump, Pump With Controller, Steam Generator, Video Based Level Measurement System	6R206
Convection Oven (2), Syringe Pump	6R206.1
500HP Pump & Controller, Syringe Pump	6R207
Air Valve System, Convection Oven, Hasler Core Holder, Spinning Drop Tensiometer	6R209
Oracle Server (4)	AH106
Lathe, Toolroom Lathe, Vertical Maching Centre	ED117
Material Testing Machine (2), Material Testing Machine (Parts), Rousseau Work Station, Shear Tester	ED119
Lab Oven (2)	ED121
Fabricated Field Sampler, OxiTop System	ED122
Stainless Steel Vessel	ED124
Advanced Resistivity System, Expansion of a Perfect Gas Apparatus, Fluid Bed Dryer, Heat Exchanger Service Unit (2), Laboratory Unit (2), Saturation Pressure & Throttling Calorimeter	ED129
Elemental Determinator, Gas Chromatograph, Headspace Sampler for GC System, Mercury Analyzer, Motherboard (3), Nitrogen Analyzer, Shaker, Spectra AA-50 Single Beam AAS, Storage (2)	ED130
Articulated Robot System, EXperMill 0600 Machining Center, KUKA KR3, Printer, Prolight Lathe	ED134
Open Channel Flow Velocity Meter, Tutor Pump Test Set, Vortex Unit	ED135
Ambient Resistivity System (2), Capillary Pressure System, Coreholder, Gas Permeameter (3), Goniometer (2), Gravimetric Pressure System (2), M6500 Spinning Drop Tensio Meter, Multi-Sample Desaturation	ED138

Cell (2), Permeability System, Permeameter (2), Resistivity Cell with RCL Meter	
Adsorptive Air Drying, Centrifugal Pump Test Set, Gas Cyclone, Hydrostatics Bench, Sieve Shaker	ED139
Oedometer (2), Pressure Extractor, Shear Tester, Total Station Survey Equipment, Universal Oven	ED144
Vision Traffice Suite Software	ED413
Computer (2), Perspecta Spatial 3-D	ED433
TutorTims-Advanced Signals and Systems	ED434
Camera, SGI – SVR	ED439
Telecommunications Trainer (2)	ED487
Ammonia Monitoring System, Greenhouse Gas Equipment, Heater, Hollow Fibre Membrane Fabrication System, Packing (2), Pilot Plant, Roman Filter by Rosemund, Sample Gas Measurement Control Plate, Spectrophotometer	GG110
Continuous Emissions Monitoring System (2)	GG110.1
3D-PDA System with Traverse, Density Meter (2), Potentiostat, Spraytec System, Thermal Conductivity System	GG112
Spectrometer	GG112.1
Computer & Peripherals, Diffractometer System, Energy Dispersive Spectrometer, Linear Precision Saw, Scanning Electron Microscope	GG112.3
Calorimeter, Calorimeter Calvet, Density Meter, Digital Refractometer, Gas Chromatograph/Mass Spectrometer Detector System, Glass Reactor, Hewlett Packard 3D Capillary Electrophoresis System (2), HPLC unit, Joule Effect Calibration Device, Magnetic Circulating Pump, Mass Selective Detector, Motorized Reversing Mechanism, Network GC System, Pump Controller, Pump Module, Refractive Index Detector, Temperature Test Chamber, Tensiometer	GG225
ICPMS	GG225.1
5 High Temperature Reactor Unit #4, 5 High Temperature Reactor Unit #5, Control Box, Flow Control Module, FTIR Spectrometer,	GG310

Reactor, Simultaneous Analyzer, TA-60WS, Thermogravimetric Analyzer, TPR / TPD	
Controller, Gas High Pressure Control Panel, Surface Area & Porosity Analyzer	GG310.1
5 High Temperature Reactor Unit #1, 5 High Temperature Reactor Unit #2, 5 High Temperature Reactor Unit #3, Coal Gasification Unit, GC System w/ micro electron capture detector, GC System w/ thermal conductivity & single flame photometric, Potentiostat, Power Module System, Pressure Reaction Apparatus (2), Pressure Reactor	GG313.2
Zeta Meter System	LB412.1
Greenhouse Equipment	MT
Oxygen Transmitter	MT110
CFI Discount	MT112
Temp Control	MT313.2
Cement Permeameter, Compressive Strength Tester, Core Holder, DAWN Heated EOS Instrument, High Pressure Displacement Pump, IR Spectrometer	PT205
Data Acquisition System, Flow Controller, Pressure Tapped Haassler Core Holder, Rock-Fluid Centrifuge	PT206
500D Pump	PT207
Electrospray Source, Reservoir Model	PT209
External Scan Interface	PT209.1
Gradient Pump, Membrane Filtration System	RIC017
Meso-Scale Oedometer, Pneumatic Linear Valve Actuator	RIC027
Resistivity and IP System	RIC028
Sound Intensity Probe Kit	RIC308.1
Server	RIC408.1
Impedance Tube Kit	RIC410

4 Test Cells all in one lot, bench, Conductivity Device, Density and Sound Velocity Meter, Glass Reactor, High Pressure Syringe Pump, Ion Chromatograph, LabBrain, Particle Analyzer, Particle Analyzer - Zetasizer, Pump, RotoVisco 1 with TCL/Z, Stop Flow Kinetics Cell	RIC433
Air Compressor, Autoclave System, BES Basic Electrochemical system, Differential Reaction Calorimeter, Flow-Loop, Gas Chromatograph, Image Analysis System, Lock-in Amplifier, Mercury Analyzer, Multi-Reactor System, Potentiostat	RIC437
Automated Chemistry Analyzer, Environmental Chamber, Refrigerated Shaker (2), Sampling System	RIC439
Autoclave, floor shaker with refrigeration, Gas Analyzer, HPLC w/ two 210 solvent delivery modules & one UV/VIS detect, Incubator Shaker, Infinity Binary Pump, K100 Force Tensiometer, Mastersizer (Lot), Micrometics Tristar, Spectrophotometer, Tensiometer	RIC440
Assembled Skid, Ceramic Membrane, M-03G Hydracell CC Pump, Microscope, Spectrophotometer, Temperature chamber, Toxicity Analyzer, Combustion Analyzer Lot, Motorized Rotary Microtome	RIC445
X5000 industrial x-ray CT-scanner, co-owned with the Saskatchewan Research Council's (SRC) Energy Division and the Petroleum Technology Research Centre (PTRC).	SRC-Regina

6.4 Enrolments Trends

FEAS had 322 students enrolled in 2018, 320 in 2017 up from 263 in 2012. In 2017, the percentage of international was 76 %. The number of accepted students has grown steadily since 2012. To encourage domestic undergraduate students to consider post-graduate programs, two information sessions are organized by the faculty. The large numbers of international graduate students in Engineering have made the largest contribution to cultural diversity at the University of Regina. Most of our international students come from India, Bangladesh, China, Pakistan, and Iran.

Total Enrollment in All Engineering Graduate Programs							
	2012	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**

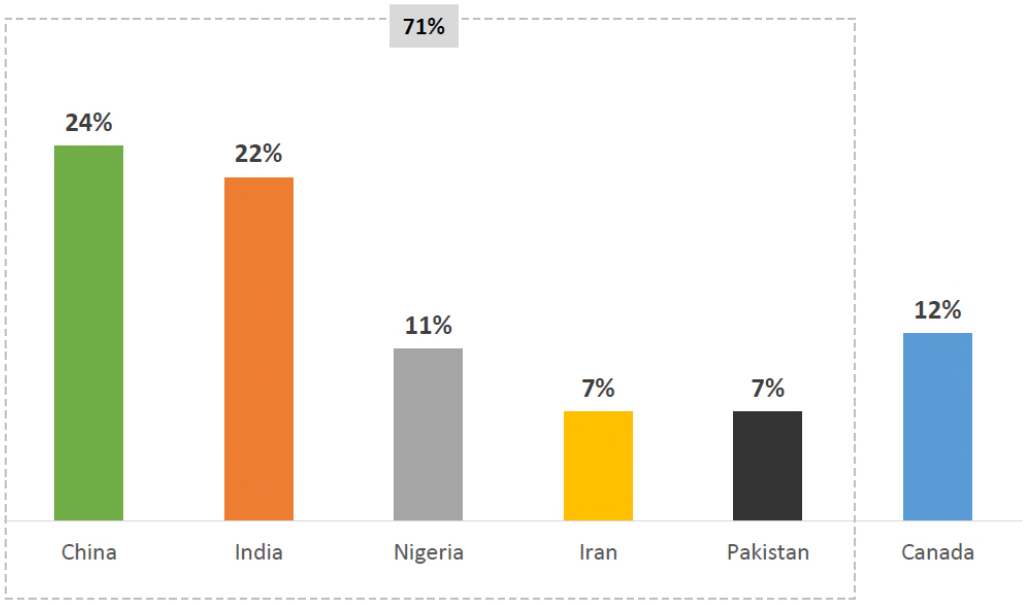
Full Time Students	201	230	227	239	240	278	251
Part Time Students	62	42	48	45	65	42	71
FNMI	0	1	1	1	1	2	4
Female	67	77	78	72	81	88	84
Non-Female	196	195	197	212	224	232	234
International	187	206	212	225	222	242	236
Domestic	76	66	63	59	83	78	86
Total	**263**	**272**	**275**	**284**	**305**	**320**	**322**

Percent Total of Engineering Graduate Students							
	2012	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Full Time Students	76.4%	84.6%	82.5%	84.2%	78.7%	86.9%	77.9%
Part Time Students	23.6%	15.4%	17.5%	15.8%	21.3%	13.1%	22%
FNMI	0.0%	0.4%	0.4%	0.4%	0.3%	0.6%	1.2%
Female	25.5%	28.3%	28.4%	25.4%	26.6%	27.5%	26%
Non-Female	74.5%	71.7%	71.6%	74.6%	73.4%	72.5%	72.6%
International	71.1%	75.7%	77.1%	79.2%	72.8%	75.6%	73.2%
Domestic	28.9%	24.3%	22.9%	20.8%	27.2%	24.4%	26.8%

Percent Change						
	2013	**2014**	**2015**	**2016**	**2017**	**2018**
Full Time Students	14%	-1%	5%	0%	16%	-7%
Part Time Students	-32%	14%	-6%	44%	35%	9%

FNMI	0%	0%	0%	0%	100%	100%
Female	15%	1%	-8%	13%	9%	-10%
Non-Female	-1%	1%	8%	6%	4%	-2%
International	10%	3%	6%	-1%	9%	-2%
Domestic	-13%	-5%	-6%	41%	-6%	10%

Engineering graduate students: Top 5 countries of origin



6.5 Graduate Students' Funding

In 2018, graduate students received a total of $**536,286** in scholarships and awards including **$340,403** provided by the Faculty of Graduate Studies and Research in the form of Graduate Teaching Assistantships (GTAs). The faculty contributes **$236,846** in additional funding for graduate students as TAs for marking and other duties. This funding has almost doubled since 2012.

Funding	2017-18	2016-17	2015-16	2014-15	2013-14	2012-13
Teaching assistants/invigilators	**$236,846**	$181,747	$215,507	$154,738	$153,466	$117,051

6.6 Examples of Student Success

University positions: Just in Petroleum and Environmental Engineering, as examples and in the last ten years, twenty-eight (28) PhD graduates became faculty members in universities in Canada, USA, China. Dr. S. Y. Cheng became the Dean of the College of Environmental and Energy in Beijin Polytechnic University, Dr. Z. Chen is the Associate Chair of Chemistry at the University of Northern BC (Prince George). Details about some of these students are listed below.

- Lin, Q.G., Environmental Systems Engineering, (2008), Professor, Centre for Business and Climate Change**, University of Edinburgh,** Edinburgh, United Kingdom.
- Yu, H., Environmental Systems Engineering (2010), Assistant Professor, Department of Civil and Environmental Engineering, **Temple University**, USA, Philadelphia, Pennsylvania, USA.
- Zhang, H., Environmental Systems Engineering (2011), Assistant Professor, School of Engineering and Computing Sciences, **Texas A&M University,** USA.
- An, C.J., Environmental Systems Engineering (2013), Assistant Professor, Department of Building, Civil and Environmental Engineering, **Concordia University**, Montreal, Quebec, Canada.
- Wang, X.Q., Environmental Systems Engineering (2015), Assistant Professor, School of Climate Change and Adaptation, University of **Prince Edward Island**, Charlottetown, Prince Edward Island, Canada.
- Fan, Y.R., Environmental Systems Engineering (2015), Lecturer, Department of Civil and Environmental Engineering**, Brunel University London**, London, United Kingdom.
- Li, Z., Environmental Systems Engineering (2016), Assistant Professor, Department of Civil Engineering, **McMaster** University, Hamilton, Ontario, Canada.
- S. Chen, Petroleum Systems Engineering (2013 Associate Professor at **U of Calgary**, Calgary, Canada.
- H. Li, Petroleum l Systems Engineering (2013), Assistant Professor at **U of Alberta**, Edmonton, Canada.
- Y. Zhang, Petroleum Systems Engineering (2014), Assistant Professor at **University of Alaska Fairbank**, USA.
- N. Mosavat, Petroleum Systems Engineering (2015), Assistant Professor at **Muscat University**, Oman. **12)**
- X. Li, Petroleum Systems Engineering (2015), Assistant Professor at the **University of Kansas**, USA.

Professional positions:

- K. Hayko (ISE, MASc'97), Vice-President, Transmission and Industrial Services, Saskpower, Regina.
- A. Gupta (ISE, MASc'06), Vice President of Engineering and Innovation, Glen Dimplex Americas, Ontario.

6.7 Number of Graduate Courses Offered and Students Registered

RC: reading course

 # classes offered per semester

	2018						2017						2016					
	201810		201820		201830		201710		201720		201730		201610		201620		201630	
	C	RC[2]	C	RC	C	RC	C	RC	C	RC	C	RC	C	RC	C	RC	C	RC
ENGG[1]	4	-	2	-	3	-	2	-	2	-	2	-	2	-	2	-	2	-
ESE	5	2	2	2	3	0	5	3	1	0	3	0	4	2	2	0	3	1
EVSE	3	3	2	2	3	0	2	4	2	2	4	1	3	1	2	0	2	2
ENIN	1	1	1	1	4	2	3	1	3	3	3	1	2	2	1	0	2	2
ENPC	1	0	2	0	1	1	2	0	2	2	3	0	2	2	2	0	2	0
ENPE	2	1	1	1	3	0	3	0	2	0	3	0	2	0	1	0	2	0
ENSE	3	1	2	1	1	0	4	1	2	2	0	1	1	1	3	0	2	1

Total student enrollment per semester

	2018						2017						2016					
	201810		201820		201830		201710		201720		201730		201610		201620		201630	
ENGG[1]	160		77		78		105		78		91		65		72		128	
ESE	42		18		19		55		11		38		49		23		29	

EVSE	30		19		26		30		16		25		40		28		18	
ENIN	14		25		53		54		37		59		21		6		55	
ENPC	11		32		13		32		33		28		38		39		36	
ENPE	15		14		17		36		18		32		27		15		28	
ENSE	29		19		11		29		25		1		2		23		12	

Average students per class

	2018						**2017**						**2016**					
	201810		**201820**		**201830**		**201710**		**201720**		**201730**		**201610**		**201620**		**201630**	
ENGG[1]	40		39		26		53		39		46		33		36		64	
ESE	6		4.5		6.3		6.9		11		13		8.2		12		7.3	
EVSE	5		4.8		8.7		5		4		5		10		14		4.5	
ENIN	7		13		8.8		14		6.2		15		5.3		6		14	
ENPC	11		16		6.5		16		8.3		9.3		9.5		20		18	
ENPE	5		7		5.7		12		9		11		14		15		14	
ENSE	7.3		6.3		11		5.8		6.3		1		1		7.7		4	

 # students in each program (registered students in the semester - MEng, MASc, PhD)

	2018						**2017**						**2016**					
	201810		**201820**		**201830**		**201710**		**201720**		**201730**		**201610**		**201620**		**201630**	
ESE	44		41		39		47		48		44		40		36		44	
EVSE	54		55		60		54		50		53		54		53		55	
ENIN	70		74		72		66		64		76		41		44		59	
ENPC	39		39		33		44		42		39		32		30		42	

ENPE	60		58		53		58		54		56		51		52		59	
ENSE	29		25		25		24		26		28		18		14		20	

(1) It includes ENGG 701, 702, 703. Does not include ENGG 800 and ENGG 900

(2) All classes that end with 2 letters and had 4 or less students enrolled were considered reading classes

7. RESEARCH OUTPUT

7.1. Significance and Scope of Research

Many FEAS faculty members are engaged in high quality research that has a high impact, from modeling climate change to developing sources of clean energy. FEAS is home to two Tier 1 Canada Research Chairs, one is in Energy and Environment and the other is in Energy and Environmental Informatics. FEAS is also home to the SaskPower Industrial Chair in Clean Energy-Carbon Capture, Utilization and Storage Technologies. Two research institutes (Institute for Energy, Environment and Sustainable Communities/IESS[4], Clean Energy Technology Research institute/CETRi[5]) call the FEAS home. Both institutes are world leaders in environmental-related reseat and in carbon capture technologies. The Institute for Energy, Environment and Sustainable Communities of the University of Regina is an institutional research and demonstration centre that integrates energy, environment and sustainability research expertise and undertakes thematic research to address the impacts and challenges of climate change. The Institute was formed in 2011. IEESC has the expertise to better understand and develop responses to environment and energy issues affecting our communities. Our research provides a solid scientific basis for decision-making, public policy development, risk management strategies, and adjusting to our changing climate.[4] Dr. Huang (CRC I Chair) alone has published 445 journal publications. [6]

The Clean Energy Technologies Research Institute (CETRi) was established to provide a broad umbrella for all of the low-carbon and carbon-free clean energy research and development activities in the University of Regina. It evolved from the International Test Center for CO_2 Capture (ITC), which focused solely on Carbon Capture activities. Some of the research areas of

[5]2017 Resources Survey, Engineers Canada for The National Council of Deans of Engineering and Applied Science.

[6]http://www.jeionline.org/huangg/publications.html;

focus for CETRi are: Greenhouse Gas Mitigation, CO_2 Capture Related Activities, H_2 Energy Technologies, including syngas, GTL and CTL, Bioenergy Technologies, Environmental & AI Applications in Clean Energy, Membrane Technologies, Alternative Energy Systems, including Wind and Solar Power, and Advances in Amine-Based & Other CO_2 Capture technologies. Given the importance of research and demonstration of CO_2 Capture and clean energy activities for both the University of Regina and the Province of Saskatchewan, the creation of CETRi has become timely. CETRi is actively researching and demonstrating the possibilities of drastic improvements in Carbon Capture and Storage Technologies, as well as methods for minimizing the costs associated with these technologies.[5] The Faculty houses a state-of-the-art carbon capture pilot plant and research lab.[7] The research group had a critical mass of 7 faculty members and led pioneering research in the area of carbon capture. The institute worked with a consortium of X international companies (who funded a portion of the research).

The institute was established with an initial CFI grant of 3.4 million dollars. A new $2.4 million hydrogen production pilot plant was built to provide a new feed-flexible and process flexible hydrogen production and demonstrate the commercial viability of the new technology with the production of novel catalysts.

Dr. Morgan and his team have received federal funding of $2.3 million to develop the largest and most advanced public safety broadband and test-bed in Canada. He has established BRIC (Bridging Research and Interoperability Collaboration), a national test-bed used to study and research public safety communications and informatics. The Public Safety Interoperability Platform is operated at the U of R's Collaborative Centre for Justice and Safety. The Centre was created to meet numerous challenges and issues facing first responders and the public safety sector.

A team of 14 researcher, seven of them affiliated with FEAS, are investigating the technical criteria for siting next generation small modular nuclear reactors, supported by the Sylvia Fedoruk Canadian Centre for Nuclear Innovation.

FEAS has longstanding relationships with Crown corporations (SaskPower, SaskEnergy, and SaskTel) and the Petroleum Technology Research Centre. We have developed strong relationships and research cooperation with international universities (in the USA, China, Taiwan, Thailand, Pakistan, Qatar, Iran, Italy, France).

[7] http://co2-research.ca/research-activites/industrial-research/regina-pilot-plant/

7.2 Statistical Summary of Published Material

Below is a partial list of all published material available by area for the six graduate programs from 2012-2017, according to the office of resource planning.

Engineering Fields	Total
Total overall	1,078
Aerospace Technology	1
Chemical Engineering	442
Civil Engineering	64
Computers	279
Electrical Engineering and Electronics	159
General Engineering	2
Industrial Engineering	2
Materials Science	20
Mechanical Engineering	57
Metals and Metallurgy	31
Miscellaneous Engineering and Technology	14
Nuclear Technology	2
Operations Research	5

7.3 Grants and Contracts

Our researchers innovate in manufacturing, automotive, enhanced oil recovery, healthcare, etc. Our external research funding reached $2,310.911 in 2018, and set a record of $4,579,373 in 2014. Funding mainly came from NSERC Discovery, MITACS Engage and Accelerate, PTRC Hornet program and CRD grants, but also from the Provincial government, Crown corporations and private international oil companies. Despite the increase in funding from Tri-council grants. Total funding decreased due to a drop in support from the federal government to PTRC and a decrease in major funding from CFI (see table below).

	Tri-council Grants	Other Research grants	Contracts	Total
2018	**$1,043,712**	$671,449	$595,750	**$2,310,911**
2017	$622,700	$2,437,498	$318,200	$3,378,398
2016	$485,102	$1,326,925	$691,950	$2,503,977

2015	**$1,419,000**	$354,600	$692,224	$2,465,824
2014	$582,850	$212,023	$3,784,500	**$4,579,373**
2013	$636,950	$751,848	$1,696,500	$3,085,298

7.3.1 NSERC Results

Success rate in NSERC applications has increased from 28 % in 2016 to 35 % but is still lower than 40 % rate reached in 2014.

Year	Number of NSERC Discovery applications	Number Successful NSERC Discovery	Success Rate
2017	20	7	35%
2016	18	5	28%
2015	18	6	33%
2014	20	8	40%
2013	12	3	25%
2012	14	4	29%

NSERC Discovery grant average success rate for small size university is shown below to put U of R results in perspective.[8] Our goal in the next five years is to increase our total research funding to the 2014 level and to have at least 70 % of our faculty holding NSERC grants.

Success Rate by Category of Applicants and University Size, 2014-18

	Large					Medium					Small				
	2014*	2015	2016*	2017	2018*	2014*	2015	2016*	2017	2018*	2014*	2015	2016*	2017	2018*
Early Career Researchers	74%	67%	80%	72%	70%	65%	75%	73%	72%	61%	55%	47%	49%	52%	43%
Established Researchers - Returning	84%	85%	85%	86%	85%	76%	75%	77%	79%	79%	64%	72%	66%	68%	77%
Established Researchers - Not Holding a Grant	43%	45%	43%	45%	39%	37%	32%	33%	33%	33%	24%	25%	20%	27%	30%

*Includes additional funding received resulting from Federal Budget 2014, 2016 and 2018

[8] NSERC (http://www.nserc-crsng.gc.ca/NSERC-CRSNG/FundingDecisions-DecisionsFinancement/2019/2018DG-RTI-SP_e.pdf)

8. COMMUNITY SERVICE INITIATIVES

Academic staff members are involved in a variety of activities in learned societies, and the Association of Professional Engineers and Geoscientists of Saskatchewan (APEGS). Many also have participated in organizing research conferences, reviewing papers and proposals and serving on NSERC selection committees and evaluation Groups and editorial boards. These activities are numerous to list here in detail.

Graduate students participate in large numbers as judges in all provincial science fairs held on campus. They also helped with the national science fair held in Regina. Students and faculty members in ESE, help organize competition in Robotics taking place in Campbell collegiate. They also mentored two winning students who will participate on the national level and will compete next year in Russia.

Below is a descriptor of some of the organized activities that reaches out to communities.

8.1 Educating Youth in Engineering and Science (EYES)

The EYES program provides youth in grades 2-9 in Saskatchewan opportunities to experience and engage in STEM activities. The program offers hands on, interactive experiments and activities for youth to explore. The program hires between 21-23 full time summer students, various high school volunteers and part time students through the fall and winter for weekend end camps and school workshops.

In 2018, the program had 40% female campers and 7.8% First Nations, Métis, and Inuit (FNMI) campers from 9 communities including Regina, Moose Jaw, Swift Current, Shaunavon, Estevan, Esterhazy, Foam Lake, Weyburn and Watrous including free camps in Partnership with Albert Community, Augustine Community, Sacred Heat, Thomson Community, Connaught Community Schools and the Open Door Society. EYES received $270,000 in funding from the Federal CanCode Initiative to purchase laptops, 3D printers, Edison bots, Microbits and more to expand digital literacy and computational thinking. The program is partnering with the Regina Police Service to work with vulnerable youth in North Central Regina and is also developing a relationship with the Treaty 4 Education Alliance and the Regina Public Library to share resources with teachers.

Year	Number of Workshops	Number of Summer campers	Number of Youth reached
2018	1,122	1,612	**19,097**
2017	813	1,330	18,600
2016	568	1,463	11,995
2015	785	1,451	16,612
2014	619	1,313	12,249
2013	649	1,363	14,235
2012	633	1,328	12,633

8.2 Regina Engineering Student Society

The Regina Engineering Students' Society (RESS) is the body of undergraduate engineering students elected by students registered in Engineering and Applied Science to represent them in student governance and other matters.

The RESS provides services such as arranging tutorials for difficult classes, hosting extra-curricular activities, and representing the Engineering student body on the University of Regina

Students' Union, on various faculty and university committees, and in discussions with the faculty administration on academic matters.

8.3 Engineering Graduate Students Association

The Engineering Graduate Students Association (EGSA) mission is to represent the interests of the engineering graduate students at the University of Regina. The association looks after the professional, and academic activities of the engineering graduate students, as well as hosting some regular meetings and annual events.

8.4 Cougar Racing

Cougar Racing is the University of Regina's collegiate chapter of the Society of Automotive Engineers International (SAE). The Cougar Racing team competes in Collegiate SAE events road rally racing in the Mini Baja series, and has consistently placed well over the past several years.

8.5 Engineers Without Borders (EWB)

Engineers Without Borders is an international not-for-profit organization with the mission of partnering with disadvantaged communities around the world to "improve their quality of life through education and implementation of sustainable engineering projects, while promoting global experience for engineers, engineering students, and similarly motivated non-engineers" (www.ewb-international.org/who-we-are).

U of R's EWB student chapter is a member of Engineers Without Borders Canada. EWB hosts numerous events on campus and in Regina. Visit http://uregina.ewb.ca/ for more information.

8.6 Great Northern Concrete Toboggan Race

The Great Northern Concrete Toboggan Race (GNCTR) is an annual event that challenges the creativity of engineering students to design and construct a toboggan with a metal frame and concrete.

8.7 Institute of Electrical and Electronics Engineers Student Group (IEEE)

The University of Regina has an IEEE Student group that includes robotic and programming events for students as well as student socializing events. They have a lounge, ED 184.

8.7 Society of Petroleum Engineers (SPE)

The University of Regina has a newly established student chapter of the Society of Petroleum Engineers.

8.9 Canstruction

Canstruction is an annual event held in cities throughout North America to raise donations for local food banks. Regina's Canstruction event benefits the Regina and District Food Bank.

During this event, teams of engineers and architects design and build elaborate artistic structures from cans of food that are displayed in local venues. The cans are then donated to the local food bank.

The Faculty Engineering and Applied Science has entered a small team made up of undergraduate students every year since the competition began in Regina in 2009 until 2016.

The Faculty is also involved with the Campbell Collegiate High School Robotics program provide financial support for the program as well as judges for the school competition. The Regina Regional Science Fair is held on campus and the Faculty offer organizational support, sponsorship and faculty acting as judges. The Faculty has also been a partner in the local Launch a Rocket competition for Grade 6 students.

9. UNIT BUDGET

The total budget of the FEAS in 2018 was $10,764,761 up from $5,755,450 in 2012. In addition to the funding provided by the Faculty of Graduate Studies, the faculty spent $236,846 to support graduate students in the forms of teaching assistantships (TAs). A budget of $124,043 was spent on sessionals. The Faculty generated funding of $578,946 in 2018 as compared to $42,482 in 2012, mainly to the increase of funding from the Center of Continuing Education (CCE) and few temporarily vacant faculty positions. The faculty generated revenue by teaching evening courses and in the spring-summer semester. The faculty also generated $358,298 in 2018 based on the number of MEng students enrolled in Engineering. The Faculty also received $221,216 in equipment funding from contributions payed by undergraduate students. The table below gives more details about the operating budget.

	2017-18	2016-17	2015-16	2014-15	2013-14	2012-13
Operating Budget	$10,764,761	$9,826,690	$9,517,042	$8,431,392	$6,295,226	$5,755,450
Salaries budget*	$8,874,212	$8,597,665	$8,371,498	$7,889,307	$6,212,332	$5,797,731
Salaries actual	$8,275,474	$7,959,802	$7,961,909	$7,295,560	$6,205,312	$5,510,063
Capital Expenditures	$1,383,819	$1,441,474	$426,962	$584,078	$141,590	$243,331
Non-capital	$287,005	$244,126	$183,838	$173,467	$124,386	$210,500

Teaching assistants/invigilators	$236,846	$181,747	$215,507	$154,738	$153,466	$117,051
Sessionals						
Spent	$124,043	$85,981	$143,814	$145,796	$157,071	$116,694
CCE Revenues						
Stipends	$303,696	$230,751	$156,548	$71,531	$0	$0
Revenue	$275,250	$197,268	$192,866	$180,022	$109,873	$42,482
Total	**$578,946**	**$428,019**	**$349,414**	**$251,553**	**$109,873**	**$42,482**
CCE courses	46	34	33	36	13	13
CCE stipend	18	23	17	19	10	8
MEng tuition revenues	**$358,298**	**$360,925**	**$193,163**	**$71,099**	**$16,195**	**$0**
Equipment Fund revenue**	$221,216	$222,765	$241,865	$114,950	$58,906	$72,932

*Benefits funding moved to salaries budget in 2014-15

**RESS Equipment fee increased in 2015

FEAS has received the lowest amount of funding for the last decade based on the number of "full-load-equivalent students" or FLE, according to the numbers provided by the Office of Resource Planning (ORP). The faculty has a budget surplus of $4 MM based on students 'fees.

The following table shows the average resources allocation by school size as reported by Engineers Canada in a 2017 survey prepared for "The National Council of Deans of Engineering and Applied Science".[5] The survey reports a total FEAS budget of $ 9,642,005 and graduate expenditures of $ 1,836,350 with 52.5 % devoted to TAs but only 1.1 % of external support.

The ratio of the total budget over Full Time Equivalent (FTE) graduate student is $ 38,5372, well below the national average of $ 52,381. Office and lab spaces are also below the national average.

	University of Regina	Under 500	500 to 2000	Over 2000	All schools
Number of Schools		15	15	14	44
Total budget	9,642,005	4,792,015	24,764,302	71,234,221	32,741,451
Percentage budget devoted to faculty salaries	75.8	80.6	75.3	51.8	59.3
Percentage budget devoted to staff salaries	9.6	13.7	12.3	25.3	21.4
Percentage budget devoted to teaching assistants' salaries	5.4	1.6	3.3	5.9	5.0
Percentage budget devoted to equipment purchases	6.4	1.9	4.2	5.9	5.3
Percentage budget devoted to supply and service purchases	2.8	2.3	4.8	11.1	9.0
Total graduate expenditures	1,836,350	523,722	4,423,161	16,643,649	6,982,144
Percentage internal scholarships/teaching assistantships	46.4	15.4	30.5	45.5	41.5
Percentage research assistantships	52.5	51.1	60.8	41.7	46.1
Percentage external support	1.1	33.6	8.6	12.7	12.4
Total graduate expenditures/Total FTE graduate research student	11,150.3	14,118.0	16,061.1	16,135.5	16,060.7
Total budget/Total FTE UG student	5,058.4	20,511.4	17,536.1	17,655.8	17,747.9
Equipment budget/Total FTE UG student	322.5	390.8	737.6	1,046.9	937.8
Total budget/Total FTE graduate student	38,537.2	92,424.3	60,093.4	48,545.0	52,381.4

Equipment budget/Total FTE graduate student	2,456.8	1,761.1	2,527.7	2,878.4	2,768.0
Total budget/Total FTE student	4,471.5	16,786.1	13,574.8	12,947.0	13,256.3
Equipment budget/Total FTE student	285.1	319.9	571.0	767.7	700.5
Lab space/FTE student (UG and graduate)	2.2	11.8	4.7	4.7	5.0
Office space/FTE student (UG and graduate)	1.1	2.4	2.2	3.0	2.7
Total space/FTE student (UG and graduate)	3.3	14.2	6.9	7.7	7.7

10. KEY POINT FROM SWOT ANALYSIS

As part of the Faculty's effort to revise its strategic plan, a SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis was performed. Below is summary of the issues related to research, graduate studies and services.

Strengths:

The systems approach is widely regarded within the Faculty and Staff as important and a point of pride as it is unique to the U of R in Western Canada. The co-op program, which is also available to MEng students, was widely regarded as a major strength of the programs as it provides students with real world experience and the opportunity for students and faculty members to make industry contacts.
FEAS possesses many strengths as it houses two world class research institutes (IEES and CETRi). The faculty has also identified several challenges such as research lab space and graduate and research funding. FEAS is currently developing a business plan for a new engineering building.

Weaknesses:

A main weakness found in all feedback was staffing, both of Faculty and Staff. We also noted that like many other faculties at U of R, FEAS has been underperforming in NSERC discovery

grants. Research is further impacted by limited funding for graduate students, limited graduate scholarships. Some of the research equipment in CETRi were purchased 15 years ago with a CFI $3.4 million grant are now obsolete and need replacement.

Opportunities:
Enrolment has provided an opportunity for growth in the graduate program by the addition of new hires. As faculty members are hired and begin their research, they bring more graduate students into the program to assist with their research. There also would be opportunity to expand the MENG program (93% rejection), if proper supports for students are implemented, which has been underutilized.

Threats:
The most commonly mentioned threat in the feedback was space, student and research support (funding and technicians). There is also a threat of excessive workloads for both Faculty and Staff if another large enrollment period occurs. There is a pre-existing need for additional graduate administrative support and program expansion would further tax that.

11. INDIGENIZATION

The number of Indigenous graduate students is quite low compared to their number in BASc programs. Only two students declared themselves as Metis. The faculty has hosted visiting Indigenous students under the Verna J. Kirkness Science and Engineering Program. Students visited research labs and helped with research experiments. The faculty has established a strong relationship with the Star Blanket nation and the Piopot School with a visit to show research performed to improve heating and ventilation in houses using a radiant heating system. Unless the number of FN students increases at the Bachelor level, it is very difficult have more students at the graduate level.

12. CONCLUSION

Since the last unit review in 2012, significant renewal in faculty members has occurred due to retirements, departures and the addition of new positions. We expanded and diversified our faculty, students and staff, which enriched both our research and student experience. We have leveraged funding from the provincial and federal governments and from our industry partners to build a world-leading infrastructure and enhance our programs to educate the next

generation of decision-makers, entrepreneurs and leaders. While we have strengthened the faculty, opportunities remain to increase the number of graduate students and research funding, provide more lab and teaching spaces, and enhance the impact on the community of our research and educational programs. The faculty is at a quite advanced stage in planning for a new Engineering building, we are also in the process of establishing a new strategic research plan. FEAS aspires to become a recognized leader in engineering graduate education in the world. Our mission is to prepare students to be global leaders in academia, research, industry, and government. FEAS will endeavor to continue addressing society's most relevant needs and challenges.

APENDICES:

APPENDIX I SHORT CVS

Irfan Al-Anbagi, Ph.D. P.Eng. SMIEEE
Assistant Professor (Tenure Track), Electronic Systems Engineering
Phone: 306-585-4703 **Email:** Irfan.Al-Anbagi@uregina.ca

Education

Degree	Area of Study	Institution	Date
Ph.D.	Computer and Software Engineering	University of Ottawa	2013
M. Eng.	Micro and Nanoelectronics	University of Technology, Iraq	2003
B. Eng.	Electronics and Telecommunication	University of Baghdad	1997

Select Teaching History and Times Taught

ENEL 371	4	ENEL 492/792	4	ENEL 890AJ	3	ENEL 895AK	2

Publication Summary and Selected Publications

Journal Articles	Conference Proceedings	Technical Reports	Book Chapters	Books
14	42	1	2	0

Al-Anbagi I., Mouftah H. (2014). QoS Schemes for Charging Electric Vehicles in a Smart Grid Environment. Plug In Electric Vehicles in Smart Grid: Charging Strategies. : 112-124.

Dhunna G., Al-Anbagi I. (2018). A Low Power WSNs Attack Detection and Isolation Mechanism for Critical Smart Grid Applications. IEEE Sensors Journal.

Shrestha R., Wagner D., Al-Anbagi I. (2018). Fuzzy AHP-based Siting of Small Modular Reactors for Power Generation in the Smart Grid. IEEE Xplore. IEEE Electrical Power and Energy Conference (EPEC 2018), Toronto, Canada (PP)

Research Keywords: Cross-layer design in Ad Hoc Networks, Cyber-attacks in WSNs, Delay and reliability critical applications, Internet of Things, Network Design and Optimization, Quality of Service in WSNs, Wireless Sensor Networks (WSNs), WSN-cloud integration

External Activities and Service

Grad Student Supervisions - 18
Committee Member - 7 committees
Member, Secretary, Co-chair - IEEE South Sask.

Isam Al Zubaidi, P.Eng.
Lab Instructor
Phone: 306-337-3126 **Email:** Isam.Al.Zubaidi@uregina.ca

Education

Degree	Area of Study	Institution	Date
M.Sc.	Chemical and Processing Engineering	Heriot Watt University, UK	1981
B.Sc.	Chemical Engineering	Baghdad University, Iraq	1976

Select Teaching History and Times Taught

ENIN 253 lab	19	ENIN 350 lab	13	ENIN 355	16	ENPC 880AI	4

Publication Summary and Selected Publications

Journal Articles	Conference Proceedings	Technical Reports	Book Chapters	Books
34	42			8

Isam A.H. Al Zubaidi, Problem solving in physical chemistry, Al Rateb Al Jamea, Beirut-Lebanon, 2002.

Ubaid Hassan, Isam Al-Zubaidi and Hussameldin Ibrahim, 2018, The Effect of Off-Spec Canola Biodiesel Blending on Fuel Properties for Cold Weather Applications, Chemengineering, 2, 30

Isam Al Zubaidi, Mustafa Al Zubaidi, Mehr Tajik, Mohammed Al Zubaidi, Megren Al Mutairi, Mahfuza Sheikh, Ying Chen, Muntadher Al-yasiri, Ahmed Alsudays 2018, Pomegranate peels powder for the remediation of oil polluted water from waste lubricating oil, accepted for presentation at the 5th International Conference of Fluid Flow, Heat and Mass Transfer (FFHMT'18) Niagara Falls, Canada – June 7 – 9, 2018.

Research Keywords: Oil refinery processes, hydrotreating process, desulfurization process with/without hydrogen, ionic liquid, extraction process, adsorption process, oil spill, soil remediation from oil spill, waste management, waste lube oil recycling, oil sludge processing, fuel processing, corrosion and corrosion inhibitors, food contamination with aluminum during food preparation

External Activities and Service

Examiner for M.Eng. and M.A.Sc. Projects and Thesis
Reviewed over 500 papers in chemical engineering, petroleum production and processing, environment and waste oil management..
Editorial board and Journal reviewer - 5 publications

Adisorn Aroonwilas, Ph.D.
Associate Professor, Industrial Systems Engineering
Phone: 306-337-2469 **Email:** aroonwia@uregina.ca

Education

Degree	Area of Study	Institution	Date
Ph.D.	Engineering	University of Regina	2001
M.A. Sc.	Industrial Systems Engineering	University of Regina	1995
B. Eng. (Honours)	Chemical Engineering	King Mongkut's University of Technology, Thailand	1991

Select Teaching History and Times Taught

ENGG 100	6	ENIN 253	16	ENIN 453	6	ENIN 456	3

Publication Summary and Selected Publications

Journal Articles	Conference Proceedings	Technical Reports	Book Chapters	Patents
69	42	6	4	8

Srinivasan, S.; Veawab, A.; Aroonwilas A. “Screening and Evaluating Environmentally Friendly Corrosion Inhibitors for MEA-based CO 2 Absorption Process” in the book titled “Corrosion Inhibitor”,
edited by Mahmood Aliofkhazraei, In Tech (in press 2018).

Sarker, A. I.; Aroonwilas, A.; Veawab, A. “Equilibrium and Kinetic Behaviour of CO_2 Adsorption onto
Zeolites, Carbon Molecular Sieve and Activated Carbons” Energy Procedia, 2017, 114, 2047-2054.

Krishnaiyer, R.; Veawab, A. and Aroonwilas, A. “Corrosion in Biodiesel Production Process Using
High Free Fatty Acid Feedstock: weight loss tests” the Material Science & Technology 2010

Conference & Exhibition, Houston, Texas, October 17-21, 2010
Research Keywords: CO2 capture and Greenhouse gas control technology, Biodiesel Production Technology, Natural Gas Purification, CO2 capture using spray columns, Modeling, simulation and optimization of gas treating processes, Cogeneration and heat integration for power generation with CO2 capture
External Activities and Service

Saman Azadbakht Ph.D. P.Eng.
Lecturer (Tenure Track), Petroleum Systems Engineering
Phone: 306-585-4438 **Email:** saman.azadbakht@uregina.ca

Education

Degree	Area of Study	Institution	Date
Ph.D.	Petroleum Geomechanics	University of Alberta	2015
M.Eng.	Petroleum Well Processing	University of Calgary	2007
B. Sc.	Petroleum Engineering	Petroleum University of Technology	2005

Select Teaching History and Times Taught

ENPE 300	2	ENPE 360	3	ENPE 435	3	ENPE 475	3

Publication Summary and Selected Publications

Journal Articles	Conference Proceedings	Technical Reports	Book Chapters	Books
10				

S. Azadbakht, A. Nouri, and D. Chan, “An Analytical Model for Estimation of Internal Erosion Rate” Geomechanics and Geoengineering, 2018 (Under review)

X. Tian, S. Azadbakht, “Sparse cross-correlation imaging condition for prestack scalar reverse time migration” Geochemistry, Geophysics, Geosystems, 2018 (Under review)

X. Tian, S. Azadbakht and C. Ren, “Decomposition of Laplacian filter operator for reverse time migration” Journal of Seismic Exploration, Vol. 27, No. 4, 2018

Research Keywords: Experimental and numerical modeling of fines migration and sand production, Caprock integrity assessment for CO2 storage and SAGD applications, Long term wellbore integrity analysis in EOR and hydraulic fracturing operations, Optimization of slotted liner completions in SAGD wells, Cutting transport and hole cleaning in horizontal and

extended-reach wells, Environmentally-friendly drilling and completion fluids
External Activities and Service
Committee Member - 5 Committees. Supervised 4 Grad Students. Spends 4-5 hours per semester counseling students on topics such as studying, job searching and applying for grad school.

Shahid Azam, Ph.D. P.Eng.
Program Chair, EVSE; Professor, EVSE
Phone: 306-337-2369 **Email:** shahid.azam@uregina.ca

Education

Degree	Area of Study	Institution	Date
Ph.D.	Geoenvironmental Engineering	University of Alberta	2003
M.Sc.	Geotechnical Engineering	King Fahd University of Petroleum & Minerals, Saudi Arabia	1997
B.Sc.	Civil Engineering	University of Engineering & Technology, Pakistan	1992

Select Teaching History and Times Taught

ENEV 400	6	ENEV 384	7	ENEV 462	13	ENEV 836	5

Publication Summary and Selected Publications

Journal Articles	Conference Proceedings	Technical Reports	Book Chapters	Books
53	43	13	5	

ITO M, AZAM S (2018) Determination of water flow through clayey slurries using computed micro-tomography. Quarterly Journal of Engineering Geology & Hydrogeology. 51(1):49-62.

AZAM S, GUTIW P, R AGHUNANDAN ME (2012). Meso-scale odometer test system for volume change determination in problematic soils. Multiphysical Testing of Soils & Shales: Series in Geomechanics & Geoengineering. Springer, Germany. 1:267-271.

K HAN F, A ZAM S (2014). Engineering properties of badlands in the Canadian Prairies. Proceedings, 12 th Congress of International Association of Engineering Geology & Environment, Torino, Italy. 6:381-385.

Research Keywords: Characterization and Improvement of Geomaterials (Slurries, Soils, and Rocks), Sustainable Mine Waste Management (Tailings Dams and Waste Rock Dumps), Civil Infrastructure Systems (Constructed in, on, or with Marginal Soils)
External Activities and Service

Abdul Bais, Ph.D. P.Eng.
Assistant Professor, Electronic Systems Engineering
Phone: 306-585-4701 **Email:** Abdul.Bais@uregina.ca

Education

Degree	Area of Study	Institution	Date
Ph.D.	Technical Science, Engineering Science	Vienna University of Technology	2007
M.Sc.	Electrical Engineering	University of Engineering and Technology, Peshawar	2003
B.Sc. (Honours)	Electrical Engineering	University of Engineering and Technology, Peshawar	2000

Select Teaching History and Times Taught

ENSE 350	7	ENSE 380	7	ENEL 495/795	5	ENEL 890AK	2

Publication Summary and Selected Publications

Journal Articles	Conference Proceedings	Technical Reports	Book Chapters	Books
14	44			

Saleem S., Bais A., Ahmad A., Naseer N. (2018). A Feature Point Descriptor Based on Least Squares
Method for Visible Spectrum and Infrared Images. Electronics Letters.

Aleshinloye A., Bais A. (2018). Deep Learning Based Two Stage Lossless Compression Algorithm for the
Smart Grid. Sustainable Energy, Grids and Networks.

Shah S., Zhang L., Bais A. (2018). Real Time Fixed Point Adaptive Chaotic System Generator for

Deep
Brain Stimulation Using FPGA. 16th International Conference on Frontiers of Information Technology, ,
Conference Date: 2018/12

Research Keywords: Signal Processing, Image Processing, Computer Vision, Machine Learning, Deep Learning, Information and Communication Theory

External Activities and Service

17 Grad Student Supervisions
Journal Review (27 Works Reviewed)
Committee Member (6 Committees at U of R)

Christine Chan, Ph.D. P.Eng.
Canada Research Chair (Tier I) (Energy and Environmental Informatics), Professor, SSE
Phone: 306-585-5225 **Email:** christine.chan@uregina.ca

Education

Degree	Area of Study	Institution	Date
Ph.D.	Special Arrangements in Applied Sciences	Simon Fraser University	1992
M.Sc.	Management Information Systems	University of British Columbia	
M.Sc.	Computer Science	University of British Columbia	

Select Teaching History and Times Taught

Publication Summary and Selected Publications

Journal Articles	Conference Proceedings	Technical Reports	Book Chapters	Books
114	159		21	1

Z. Du, F. H. Zeng, X.L. Peng, C. Chan (2018), “Experimental and material balance equations analyses of
cyclic solvent injection based on a large 3D physical model”, Fuel 215 (2018), p.915-927.

Enabling sustainability in an interconnected world, The Expert Panel on the Potential for New and
Innovative Uses of Information and Communications Technologies (ICT) for Greening Canada, (ISBN 978-
1-926558-81-3), Council of Canadian Academies, 2014. (C. Chan is a member of the Expert Panel)

Edited by P. Tontiwachwuthikul, F. Zeng, C.W. Chan, Special Issue on “Carbon Capture, Utilization and

Storage (CCUS), Petroleum Journal, Vol. 3 No.1, (ISSN 2405-6561), March 2017.

Research Keywords: Applications of artificial intelligence and knowledge-based systems for energy and environmental system analysis, Methods and tools for ontological engineering Knowledge acquisition, modeling, and management, Knowledge and software engineering for knowledge-based systems, Object-oriented methodologies for knowledge-based systems development, Social and economic impact of information technology

External Activities and Service

Grad Student Supervision - 71 Grad Students and/or Post Doctoral Fellows Supervision / Co-supervision
Editorial Board member - 9 Journals
Membership on program committees of international conferences and boards - 49 Conferences

Liming Dai, Ph.D. P.Eng. ASME Fellow
Professor, Industrial Systems Engineering
Phone: 306-585-4498 **Email:** liming.dai@uregina.ca

Education

Degree	Area of Study	Institution	Date
Ph.D.	Mechanical and Manufacturing Engineering	University of Calgary	1995
M. Sc.	Industrial Systems Engineering	University of Regina	1989
B.S.	Mechanical Engineering	Xian Jiaotong University	1982

Select Teaching History and Times Taught

ENGG 100	5	ENIN 343	16	ENIN 430	7	ENIN 812	8

Publication Summary and Selected Publications

Journal Articles	Conference Proceedings	Technical Reports	Book Chapters	Books
227	16	24	8	9

Dai, L., Xia, D. and Chen, C., "Nonlinear Responses and Stability of an Elastic Suspended Cable Subjected to Parametrical External Excitations," Nonlinear Engineering – Modeling and Application, Vol. 6, No. 1, pp. 1-13, 2017.

Dai, L. and Jazar, R. "Nonlinear Approaches in Engineering Applications – Energy, Vibrations, and Modern Applications", editors, ISBN: 978-3-319-69480-1, Springer, New York, 2018.

Xia, D., Dai, L., Chen, C., and Fang, P., "Nonlinear Behaviour Diagnosis for Horizontal Axis Wind Turbine Blades Subjected to Inconstant Wind Excitations," chapter contribution in the book: Nonlinear Approaches in Engineering Applications – Energy, Vibrations, and Modern Applications, edited by L. Dai and R. Jazar, ISBN: : 978-3-319-69480-1, Springer, New York, 2018.

Research Keywords: Linear and non-linear vibrations/oscillations and the control of vibrations subjected to static and dynamic loadings; Numerical simulation of nonlinear dynamical systems, sound and wave propagation; Enhanced Oil Recovery (EOR) with seismic wave and vibration stimulation; Industrial noise, traffic noise, and noise control with acoustic design for industrial and domestic facilities; Analysis with Finite Element Method, Non-linear Dynamics, and Fracture Mechanics for assessment of crack initiation and propagation in materials under cyclical loading, high pressure, and high temperature; Metallurgy, microstructures, and property aspects of engineering materials and welding of engineering materials; Design (CAD, FEA) and manufacturing (CAM) aspects of pressure vessels, piping, and LPG transportation vehicles used in petroleum industries; Strategies and analysis of engineering and operations management

External Activities and Service

Conference Chair - 4 conferences.
Conference/Symposium Organizer - 20 events
Chairing International Conferences - 21 Conferences (Chair or Co-chair of sessions)

David deMontigny, Ph.D. P.Eng. FEC
Professor, Associate Dean Academic
Phone: 306-337-2277 **Email:** david.demontigny@uregina.ca

Education

Degree	Area of Study	Institution	Date
Ph.D.	Engineering	University of Regina	2004
M.A.Sc.	Industrial Systems Engineering	University of Regina	1998
B.A.Sc.	Industrial Systems Engineering	University of Regina	1996

Select Teaching History and Times Taught

ENGG 123	18	ENGG 900	4	ENPC 857	2	ENIN 880BP	2

Publication Summary and Selected Publications

Journal Articles	Conference Proceedings	Technical Reports	Book Chapters	Books
21	26		1	

Cui, Z., deMontigny, D. (2013). CO 2 capture using hollow fiber membrane contactors. In P. Tontiwachwuthikul & R. Idem (Eds.), Recent progress and new developments in post-combustion

Cui, Z., deMontigny, D. (2017). Experimental study of carbon dioxide absorption into aqueous ammonia with a hollow fiber membrane contactor. J. Membr. Sci., 540, 297-306.

Scholes, C., deMontigny, D., Kentish, S., Stevens, G. “Regenerating membrane contactors for solvent absorption”, the 13 th International Conference on Greenhouse Gas Control Technologies,
Lausanne, Switzerland, November 14-18, 2016. In Energy Procedia, 114, 2017, 642-649.

Research Keywords: Chemical absorption of CO2 in packed columns and membrane

contactors, Solvent regeneration in membrane desorbers, Membrane-solvent wettability and performance evaluation, Manufacturing of hydrophobic, microporous polymer membranes, Evaluation of membrane resistances, Design of membrane contactor modules, Manufacturing and testing of structured packing, Process simulation and optimization

External Activities and Service

Transitioning the faculty to outcome-based assessment required by the CEAB
Past Associate Dean, Special Projects
Promoting development, management and use Course Content Sheets
Leader of U of R Engineering Canstruction Team (2009-2014)
Launch a Rocket – university liaison

Trevor Douglas, P.Eng.
Lab Instructor, Software Systems Engineering
Phone: 306-585-5269 **Email:** trevor.douglas@uregina.ca

Education

Degree	Area of Study	Institution	Date
B.A.Sc.	Electronic Systems Engineering	University of Regina	1996

Select Teaching History and Times Taught

ENSE 350 lab	9	ENSE 352 lab	22	ENSE 374 lab	11	ENSE 470 lab	14
ENSE 471 lab	14	ENSE 475 lab	17				

External Activities and Service

As a service project, developed the “Virtual Field Goal” system with Karim Naqvi to promote Engineering at the University of Regina, as well as the Saskatchewan Roughriders.

Keegan Downie, B.A.Sc. P.Eng. CPMP. LEED AP.
Lab Instructor, Electronic Systems Engineering
Phone: 306-585-4705 **Email:** keegan.downie@uregina.ca

Education

Degree	Area of Study	Institution	Date
B.A.Sc.	Electronics Systems Engineering	University of Regina	2006

Select Teaching History and Times Taught

ENEL 280 lab	21	ENEL 281 lab	5	ENEL 282 lab	5	ENEL 380 lab	12

External Activities and Service

Engineering and Applied Science Planning Committee, participating in data-gathering and benchmarking
APEGS - Mentoring young professionals
IEEE - South Sask. Executive - Student Branch Counselor

D. B. (Dave) Duguid, Engineering Licensee, A.Sc.T
Laboratory Instructor, Electronics Systems Engineering
Phone: 306-585-4636 **Email:** dave.duguid@uregina.ca

Education

Diploma	Area of Study	Institution	Date
A.Sc.T.	Electronic Engineering Technology	Saskatchewan Technical Institute, Moose Jaw	1980

Select Teaching History and Times Taught

ENEL 384 lab	37	ENEL 393 lab	56	ENEL 380 lab	69	ENEL 387 lab	75
ENEL 390 lab	46	ENEL 283 lab	36	ENEL 282 lab	14	ENEL 495 lab	23

Mohamed El-Darieby, Ph.D. P.Eng.
Associate Professor, Software Systems Engineering
Phone: 306-337-2490 **Email:** mohamed.el-darieby@uregina.ca

Education

Degree	Area of Study	Institution	Date
Ph.D.	Systems and Computer Engineering	Carleton University	2004
M.Sc.	Computer Engineering	Zagazig University, Egypt	1997
B.Sc.	Electronics and Telecommunications Engineering	Zagazig University, Egypt	1994

Select Teaching History and Times Taught

ENSE 374	4	ENSE 471	7	ENSE 483	14	ENSE 872	7

Publication Summary and Selected Publications

Journal Articles	Conference Proceedings	Technical Reports	Book Chapters	Books
> 50	15		9	

M. Ata, M. El-Darieby, M. Abd Elnaby, S. Napoleon, “A Fine Tuned Tracking of Vehicles Under Different Video Degradations. International journal of Information Technology” publisher: Springer , DOI 10.1007/s41870-018-0171-7.

M. EL-Shennawy*. M. El-Darieby, B. Abdulhai, (2015). ONE-ITS: The Strategy, Architecture and Software Implementation of a Cyber- physical-social system” Danda B. Rawat, Joel Rodrigues, Ivan Stojmenovic (editors). Cyber Physical Systems: From Theory to Practice. 1(1): 25-50. Accepted, CRC Press

M. Elshenawy, M. El-Darieby, B. Abdulhai, “Automatic Imputation of Missing Highway Traffic Volume Data,” 2018 IEEE International Conference on Pervasive Computing and

Communications (IEEE PerCom 2018).
Research Keywords: Enterprise Software Design and Development, Mobile Computing Platforms, Computational Engineering and Science, Social Software & Networking, Software Performance Engineering, Grid, Cloud, & Service-Oriented Computing, Wireless Mesh and Sensor Networks, Intelligent Transportation Systems, IEEE 802. 11, 802 . 15, 802.16, Large-scale Network Engineering, Biologically-inspired Optimizations
External Activities and Service

Craig M. Gelowitz, Ph.D. P.Eng.
Associate Professor, Software Systems Engineering
Phone: 306-585-4733 **Email:** craig.gelowitz@uregina.ca

Education

Degree	Area of Study	Institution	Date
Ph.D.	Electronic Systems Engineering	University of Regina	2011
M.A.Sc.	Electronic Systems Engineering	University of Regina	2005
B.A.Sc.	Electronic Systems Engineering	University of Regina	2001

Select Teaching History and Times Taught

ENSE 353	8	ENSE 479	5	ENGG 303	9	ENEL 282	7

Journal Articles	Conference Proceedings	Technical Reports	Book Chapters	Books
18			5	

Marvin Chan, Christine Chan, Craig Gelowitz “An Artificial Intelligence-Based Vehicular System Simulator”, International Journal of Cognitive Informatics and Natural Intelligence (IJCINI), 2016.

Co-Editor, “2013 26 th Annual IEEE Canadian Conference on Electrical and Computer Engineering”, May 2013.

Contributor, “Engineering Economic Analysis”, Newnan and Whittaker, Third Canadian Edition, Oxford, 2013, ISBN-13: 9780195447545

Research Keywords: Multimedia Ubiquity and Processing, Contextually Aware Software, Mobile Software Tools and Applications, Logistics and Tracking Software, Software Engineering Methodologies, Distributed and Parallel Computing, Mobile Agent Software,

Cloud Computing, Open Source Software and The Free Software Movement, Machine/deep learning
External Activities and Service
Supervised and Trained over 60 individuals over the last 14 years, in research and development of software and hardware systems Supervised 24 Graduate Students IEEE South Sask Executive in various roles, including Section Chair, Computer Chapter Chair, Conference Chair, Treasurer, 2002 - 2018

Yongan (Peter) Gu, Ph.D. P.Eng.
Professor, Petroleum Systems Engineering
Phone: 306-585-4630 **Email:** peter.gu@uregina.ca

Education

Degree	Area of Study	Institution	Date
Ph.D.	Thermo-fluid Engineering	University of Alberta	1999
M.Sc.	Mechanical Engineering - Applied Fluid Mechanics	Nanjing University of Science and Technology	1985
B. Sc.	Engineering Thermo-Physics	Nanjing University of Science and Technology	1982

Select Teaching History and Times Taught

ENPE 251	9	ENPE 801	15	ENPE 419	13	ENPE 380	14

Publication Summary and Selected Publications

Journal Articles	Conference Proceedings	Technical Reports	Book Chapters	Books
90	53	5		

Ma, H., Yu, G., She, Y., Gu, Y., 2019, An Analytical Production Model for the Primary Production and Cyclic Solvent Injection (CSI) in the CHOPS Reservoirs, SPE Journal, MS ID: SJ-0918-0026, revised and submitted on January 20, 2019.

Kundu, P., Arora, K., Gu, Y., Kumar, V., Mishra, I. M., 2018, Formation and Stability of Water-in-Oil Nano-emulsions with Mixed Surfactant Using In-situ Combined Condensation□Dispersion Method, The Canadian Journal of Chemical Engineering, MS ID: CJCE-18-0395.R1, accepted on November 1, 2018

Gu, Y., Gong, Y., Han, L.; Yu, G., She, Y., CO 2 -Enhanced Oil Recovery (CO 2 -EOR) and Carbon Sequestration in the Bakken Formation, BCS-3024, International Conference on Carbon

Materials And Technology (IC2MT-2018), Stockholm, Sweden, May 14-17, 2018.

Research Keywords: Carbon Dioxide (CO2) Enhanced Oil Recovery (EOR) and Carbon Capture and Storage (CCS), Vapour Extraction (VAPEX) and Joint Implementation of Vapour Extraction (JIVE), Post-cold Heavy Oil Production (CHOP) and Chemical EOR, Reservoir Characterization; Carbon Dioxide (CO2) EOR Monitoring and Modeling, Solvent-based EOR and In-situ Enhanced Heavy Oil Recovery (EHOR), Asphaltene Precipitation, Flocculation, and Deposition during Solvent-based EOR

External Activities and Service

Graduate Students Supervised - 35
Technical Reviewer for 31 national and international journals (1996-present)
Committee member - Faculty Peer-Review, Faculty Co-op studies, Admission and Studies

Amr Henni, Ph.D.
Associate Dean, Research & Graduate Studies; Professor, Program Chair, Industrial & Process Systems Engineering
Phone: 306-585-4960 **Email:** amr.henni@uregina.ca

Education

Degree	Area of Study	Institution	Date
Ph.D.	Industrial Systems Engineering	University of Regina	2003
M.A. Sc.	Chemical Engineering	University of Alberta	1994
M.Eng.	Mechanical Engineering	Stevens Institute of Technology, Hoboken	1984
Dip. Ing. d'État	Gas Engineering	Algerian Institute of Petroleum	1980

Select Teaching History and Times Taught

ENIN 253	6	ENIN 455	7	ENIN 400	8	ENIN 831	10

Publication Summary and Selected Publications

Journal Articles	Conference Proceedings	Technical Reports	Book Chapters	Books
102	73		10	

"Chapter 9: Composites of Metal-Organic Frameworks (MOFs): Synthesis and Applications in Separation and Catalysis. Sergio Navalón and Hermenegildo García in "Metal Organic Frameworks. Applications in Separations and Catalysis", published by Wiley, 2018.
Mohamedali M., Ibrahim H., Amr Henni, A. "Markedly Improved CO2 Uptake Using Imidazolium-based Ionic Liquids Confined into CuBTC Frameworks", 68th CSChE conference, 27-31 October, Toronto, Canada, 2018.
Shaikh S.; A. Henni, Molar Specific Heats for Diamines (1) + water (2) systems at temperatures T = (298.15to 323.15) K, to be published in J. Chem. & Eng. Data, 2019.

Research Keywords: Acid gas removal from natural and flue gases, Calorimetry, Mass transfer

with chemical reactions, Solubility of gases in liquids, Vapor-liquid-equilibria and PVT studies, Functionalized MOF studies, Physical and transport properties measurements, Process plant simulation, CFD and Wind turbine simulation, Water desalination, Produced water treatment with membranes, Polymer engineering (thermodynamics and heat transfer), Enhanced heavy oil recovery, Chemical education
External Activities and Service
Graduated 50 graduate students, including 6 PhDs. Supervised more than 200 undergraduate students in 4th year capstone projects. Editorial Board and Editor, 4 Publications Scholarly Assessment (Journals) – 29 Vice President and Acting President, Saskatchewan Multifaith (2016-2019)

Sam Hong, M.A.Sc.
Lab Instructor, Petroluem Systems Engineering
Phone: 306-337-2981 **Email:** samyeol.hong@uregina.ca

Education

Degree	Area of Study	Institution	Date
M.ASc.	Petroleum Systems Engineering	University of Regina	2016
B.A.Sc.	Petroleum Systems Engineering	University of Regina	2009

Select Teaching History and Times Taught

ENPE 360 labs	2	ENPE 300 labs	6	ENPE 450 labs	1	ENPE 370 labs	1

Publication Summary and Selected Publications

Journal Articles	Conference Proceedings	Technical Reports	Book Chapters	Books
2				

Zhang, M., Du, Z. , Zeng, F. , Hong, S. Y. and Xu, S. (2016), Upscaling study of the cyclic solvent injection process for post-chops reservoirs through numerical simulation. Can. J. Chem. Eng., 94: 1402-1412. doi:10.1002/cjce.22508

Torabi, F., Jamaloei, B., Hong, S., & Bakhsh, N. (2012). Improving Downhole Pump Efficiency and Well Productivity in Heavy Oil Reservoirs Utilizing Back Pressure Regulator. Journal of Petroleum Exploration and Production Technology (2012) 2: 181. https://doi.org/10.1007/s13202-012-0032-z

External Activities and Service

Tutor / Mentor for Engineering Students in Yanbian University of Science and Technology,

Yanji, Jilin, China

Gordon Huang, Ph.D. P.Eng.
Canada Research Chair (Tier I), Professor, Environmental Systems Engineering
Phone: 306-585-4095 **Email:** gordon.huang@uregina.ca

Education

Degree	Area of Study	Institution	Date
Ph.D.	Civil and Environmental	McMaster University	1994
M.Sc.	Water Resources	Simon Fraser University	1991
B.Sc.	Environmental	Peking University	1982

Select Teaching History and Times Taught

ENEV 862	13	ENEV 801	8	ENEV 834	5	ENPE 490	2

Publication Summary and Selected Publications

Journal Articles	Conference Proceedings	Technical Reports	Book Chapters	Books
977				

J. Sun, Y. P. Li, C. Suo, and G. H. Huang, Identifying changes and critical drivers of future temperature and precipitation with a hybrid stepwise-cluster variance analysis method, Theoretical and Applied Climatology (Springer), (January 2019). (SCI IF = 2.321) online: https://doi.org/10.1007/s00704-018-02758-9

X. M. Kong, X. T. Zeng, C. Chen, Y. R. Fan, G. H. Huang, Y. P. Li, Development of a maximum entropy-Archimedean copula-based Bayesian network method for streamflow frequency analysis – a case study of Kaidu River Basin, China, Water (MDPI), 11(1), 42

P. Zhang, G. H. Huang, C. J. An, H. Y. Fu, P. F. Gao, Y. Yao and X. J. Chen, An integrated gravity-driven ecological bed for wastewater treatment in subtropical regions: Process design, performance analysis, and greenhouse gas emissions assessment, Journal of Cleaner Production (Elsevier), 212, 1143-1153 (March 2019).

Research Keywords: Waste management, site remediation, and risk assessment, Simulation and optimization of hydrological and environmental systems, Modeling of energy and environmental management systems, Climate modeling, impact assessment, and adaptation planning
External Activities and Service
Supervised 115 Grad Students

Esam M.A. Hussein, Ph.D.
Dean and Professor
Phone: (306) 585-4160 Email: esam.hussein@gmail.com

Education

Degree	Area of Study	Institution	Date
Ph.D. Nuclear Engineering	Fast Neutron Scattering in Two-Phase Flow	McMaster University	1983
M.Sc. Nuclear Engineering	Liquid Phase Epitaxy	Alexandria University	1976

Select Teaching History and Times Taught

ENIN 880BW	1	ENGG 701	1	ENGG 703	2	ENGG 702	1

Publication Summary and Selected Publications

Peer-Reviewed Journal Articles	Conference Proceedings	Technical Reports	Peer-Reviewed Book Chapters	Books
63	97	49	9	4

Peng, W., Mayorga, R. and Hussein, E.M.A.(2016). An Automated Confirmatory System for Analysis of Mammograms. Computer Methods and Programs in Biomedicine. 125: 34-144. http://dx.doi.org/10.1016/j.cmpb.2015.09.019

Hussein, E.M.A.(2011). Computed Radiation Imaging: Physics and Mathematics of Forward and Inverse Problems:300. , Elsevier, Amsterdam,

Hussein, E.M.A., Al-Anbagi, I., Bend, S., et. al. A Case Study on Introducing Small Modular Reactors into a New Non-nuclear Jurisdiction. 38th Annual Conference of the Canadian Nuclear Society, Saskatoon SK, Canada, Conference Date: 2018/6

Research Keywords: Nuclear Methods for Nondestructive Testing & Imaging, Inverse Problems and Monte Carlo Methods

External Activities and Service
13 Post-Doc, 12 Ph.D., 35 M.ASc, Students Reviewer for 39 Journals, 6 Conferences Past Committee Member for 27 Committees 6 Patents

Hussameldin Ibrahim, Ph.D. PMP. P.Eng.
Associate Professor, Industrial & Process Systems Engineering
Phone: 306-337-3347 **Email:** hussameldin.ibrahim@uregina.ca

Education

Degree	Area of Study	Institution	Date
Ph.D.	Process Engineering	University of Regina	2008
M.ASc.	Industrial Engineering	University of Regina	2002
B.Sc. (Honours)	Chemical Engineering	University of Khartoum, Sudan	1996

Select Teaching History and Times Taught

ENIN 350	11	ENGG 303	8	ENGG 819	5	ENPC 821	7

Publication Summary and Selected Publications

Journal Articles	Conference Proceedings	Technical Reports	Book Chapters	Books
51	81	3	4	

Nath, D.; Mohamedali, M.; Henni, A.; Ibrahim, H. (2018). Composites of Metal-Organic Frameworks (MOFs): Synthesis and Applications in Separation and Catalysis. WILEY, USA. ISBN: 978-3-527-80910-3. DOI: 10.1002/9783527809097ch9.

Fabrik, M.; Salama, A.; Ibrahim, H. (2019). Modeling and Simulation of Fixed Bed Methane Reforming: A Review. Computers & Chemical Engineering (submitted).

Mohamedali, M.; Ibrahim, H.; Henni, A. (2018). Incorporation of Ionic Liquids on Mesoporous Silica SBA-15 as Efficient Sorbents for CO 2 Capture Applications. 14 th International Conference on Greenhouse Gas Control Technologies, GHGT-14, 21-25 October 2018, Melbourne, Australia.

Research Keywords: Heterogeneous catalysis and catalyst development for greener fuels, syngas, hydrogen, biofuels and fine chemicals production from fossil- and biomass-derived

feedstocks. Chemical reaction engineering, kinetics and reactor modeling and design for CO2 capture, biofuel and syngas/hydrogen production. Agricultural residue catalytic hydrothermal liquefaction to HEV biofuels. Catalytic thermal conversion of biomass to syngas, bio-gas and bio-oil. Municipal wastes into energy via pyrolysis and gasification processes. CO2 utilization for producing value added products. Sorption-based functional materials for CO2 capture and utilization. Modeling, simulation and optimization of post- and pre-combustion CO2 capture with H2 production, and CO2 utilization. Catalytic methods for CO2 capture and utilization. The Economics of greenhouse warming. Conceptual design, economic evaluation, feasibility studies, and project planning and management.

External Activities and Service

Editorial Board Member, 4 Publications
Scholarly Assessment (Journals) - 19
Search Committee Member - 6 times (ISE, PSE and EVSE)

Raphael Idem, Ph.D. P.Eng.
Director, Clean Energy Technologies Institute (CETI); Industrial and Process Systems Engineering
Phone: 306-585-4470 **Email:** raphael.idem@uregina.ca

Education

Degree	Area of Study	Institution	Date
Ph.D.	Chemical Engineering	University of Saskatchewan	1995
M.A. Sc.	Chemical Engineering	University of Ife, Nigeria	1987
B. Eng. (Honours)	Chemical Engineering	University of Benin, Nigeria	1982

Select Teaching History and Times Taught

ENPC 833	5	ENIN 455	2	ENIN 350	4	ENPC 880AA	2

Publication Summary and Selected Publications

Journal Articles	Conference Proceedings	Technical Reports	Book Chapters	Books
172	107		3	3

Helei Liu, Raphael Idem, Paitoon Tontiwachwuthikul. (2018). Post-Combustion CO2 Capture Technology by Using the amine based solvents, Springer, Switzerland.

Srisang, W., Pouryousefi, F., Osei, P.A., Decardi-Nelson, B., Akachuku, A., Tontiwachwuthikul, P. and Idem, R., 2018. CO2 capture efficiency and heat duty of solid acid catalyst-aided CO2 desorption using blends of primary-tertiary amines. International Journal of Greenhouse Gas Control, 69, pp.52-59.

Jaafari, L., Ibrahim H., Jaffary, B., Idem, R., 2018. Catalytic Production of Furfural by Pressurized Liquid Water Liquefaction of Flax Straw, Renewable Energy, 130 (2019) 1176-1184.

Research Keywords: Greenhouse Gas Emissions Mitigation; Carbon Dioxide Capture from Flue Gases from Industrial Sources; Reformer Technology/Fuel Processing for Fuel Cell Application/Hydrogen Energy; Reaction Kinetics, Reaction Mechanisms, and Heterogeneous Catalyst Development; Fossil and Bio-fuels Processing

External Activities and Service

Board Member, Catholic Family Services, Regina (2012-2014)
Member, Carbon Management Canada, Representing University of Regina (2012-2014)
Third High Level Consultation on Education Collaboration between the Provinces and Territories of Canada and the People's Republic of China (2014)

Na (Jenna) Jia, Ph.D. P.Eng.
Assistant Professor, Petroleum Systems Engineering
Phone: 306-337-3287 **Email:** Na.Jia@uregina.ca

Education

Degree	Area of Study	Institution	Date
Ph.D.	Petroleum Engineering	University of Calgary	2007
B. Eng.	Chemical Engineering	Tsinghua University, Beijing, China	1999

Select Teaching History and Times Taught

ENPE 251	3	ENPE 410	3	ENPE 486	1	ENPE 880 AL	2

Publication Summary and Selected Publications

Journal Articles	Conference Proceedings	Technical Reports	Book Chapters	Books
36	24	44	1	

S. Pan, N. Jia, H. Schroeder, Y. Cheng, K. A. G. Schmidt1, H.-J. Ng, Vapour-Liquid Equilibrium and Interfacial Tension Modelling of Aqueous Solutions of Ethylene Glycol or Triethylene Glycol in the Presence of Methane, Carbon Dioxide and Hydrogen Sulfide, Chapter 7, Gas Injection for Disposal and Enhanced Recovery, 2014.

K. Zhang, N. Jia, S. Li, L. Liu, CO_2 Storage in Fractured Nanopores Underground: Phase Behavior Study, Applied Energy, accepted (IF = 7.888)

K. Zhang, N. Jia, F. Zeng, P. Luo, A New Diminishing Interface Method for Determining the Minimum Miscibility Pressures of Light Oil - CO_2 Systems in Bulk Phase and Nanopores. Energy & Fuels, 2017, 31(11), 12021–12034 (IF = 3.091).

Research Keywords: Phase Behavior, Reservoir Fluid Characterization, Thermal Recovery, Miscible Displacement, Chemical Flooding, Asphaltene, Wax and Hydrate Precipitation and Deposition, Heavy Oil and Multiphase Equilibrium Testing, Fluid Flow in Porous Media,

Equation of State (EOS), Carbon Dioxide Sequestration, In-situ Combustion, Kinetic Models Development, Reservoir Simulation, Mass and Heat Transfer.
External Activities and Service
Taught several courses in Industry including Equation of State Modeling, Fluid Analysis, XFA and XLA (2008 - 2014) 7 Graduate Students supervised Reviewer of Technical Journals (8)

Yee-Chung Jin, Ph.D. P.Eng.
Professor, Environmental Systems Engineering
Phone: 306-585-4567 **Email:** Yee-Chung.Jin@uregina.ca

Education

Degree	Area of Study	Institution	Date
Ph.D.	Civil Engineering - Water Resource Engineering	University of Alberta	1990
M.S. Civil Eng.	Water Resource Engineering	Auburn University, Alabama	1982
B. Eng.	Hydraulic Engineering	National Cheng Kung University, Taiwan	1976

Select Teaching History and Times Taught

ENEV 360	13	ENEV 383	19	ENEV 463	3	ENEV 851	12

Publication Summary and Selected Publications

Journal Articles	Conference Proceedings	Technical Reports	Book Chapters	Books
78	74			

Xu T. and Jin Y.C. (2018). “Simulation the convective mixing of CO2 in geological formations with a meshless model” Chemical Engineering Science. 192: 187-198. (Elsevier. Impact Factor=2.895, Citation=0)

Fu, L. and Jin Y.C. (2018) “Macroscopic particle method for open channel flow over porous bed” Engineering Applications of Computational Fluid Mechanics, 12: 13-27. DOI:10.1080/19942060.2017.1331866 (Taylor & Francis, Impact Factor=1.03, Citation=2)

Fu, L. and Jin, Y.C. “Improvements on stepped flow simulation using meshless method”, 2nd International Symposium on Hydraulic Modelling and Measuring Technology (ISHMMT2018), May29-June 1, NanJing, China.

Research Keywords: Hydraulic engineering, Erosion and sediment transport in rivers, Groundwater contamination, Numerical modeling, Environmental hydraulics, Remote sensing, GIS application in hydrological systems
External Activities and Service
Supervised 74 Graduate Students Committee member – Numerous, including currently Lab Instructor Search, Planning Committee, and Review Committee Examiner in PhD Comprehensive / Defense Examinations

Robert Jones, M.Sc. P.Eng.
Laboratory Instructor, Industrial Systems Engineering
Phone: 306-585-4961 **Email:** robert.jones@uregina.ca

Education

Degree	Area of Study	Institution	Date
M.ASc.	Industrial Engineering	University of Regina	1991
B.A.Sc.	Industrial Systems Engineering (Co-op)	University of Regina	1984

Select Teaching History and Times Taught

ENIN 241 lab	146	ENGG 100 lab	98	ENIN 444 lab	41	ENIN 440	25

Research Keywords: Human Factors, Occupational Health and Safety, Quality Control, Machine Design, Computer Aided Engineering, Computer Aided Manufacturing, Facilities Layout, Manufacturing Processes and Machinery, Lean Manufacturing Techniques and Mechanical Systems Equipment.

Golam Kabir, Ph.D. E.I.T.
Assistant Professor, Industrial Systems Engineering
Phone: 306-585-5271 **Email:** golam.kabir@uregina.ca

Education

Degree	Area of Study	Institution	Date
Ph.D.	Civil Engineering / Production Management	University of British Columbia	2016
M.Sc.	Industrial and Production Engineering	BUET	2011
B. Sc.	Industrial and Production Engineering	Bangladesh University of Engineering and Technology (BUET)	2009

Select Teaching History and Times Taught

Publication Summary and Selected Publications

Journal Articles	Conference Proceedings	Technical Reports	Book Chapters	Books
33	6	8	2	

Kabir, G., Ngandu, B., Tesfamariam, S. 2018. Consequence-based framework for buried infrastructure systems: a Bayesian belief network model. Reliability Engineering & System Safety,
180, 290-301.

Tesfamariam, S., Kabir, G., Sadiq, R. 2018. Risk and life cycle cost based asset management framework for aging water supply system. Book Chapter in Handbook of Sustainable and Resilient Infrastructure (Edited by: P. Gardoni), Routledge. UK.

Kabir, G.*, Tesfamariam, S., Sadiq, R. 2016. Handling incomplete and missing data in water mains failure database: comparing three imputation methods. 49th International Conference on
Water Management Modeling, Toronto, Canada, February 24-26, 2016. * Presenter

Research Keywords: System risk, reliability, resilience assessment; Interdependent network resilience analytics; Multi-criteria decision analysis under risk and uncertainty; Infrastructure management; Sustainable system analytics; Data driven decision making; Multi-objective optimization

External Activities and Service

Reviewer for Scholarly Publications (48 Accepted Invitations)
Member of Scientific Committee – International Symposium of Applied Business Management and Economics Researches
Member of Organizing Committees – Short courses on Design in AutoCAD and SolidWorks, and Engineering Product Design

Paul Laforge, Ph.D. P.Eng.
Program Chair, Electronic Systems Engineering; Director, Co-operative Education and Work Study Programs; Associate Professor, Electronic Systems Engineering
Phone: 306-585-5305 **Email:** paul.laforge@uregina.ca

Education

Degree	Area of Study	Institution	Date
Ph.D.	Electrical and Computer Engineering	University of Waterloo	2010
M.A. Sc.	Electrical and Computer Engineering	University of Waterloo	2003
B.A.Sc.	Electronic Systems Engineering	University of Regina	2001

Select Teaching History and Times Taught

ENEL 371	2	ENEL 400	6	ENEL 395	5	ENEL 821	5
ENEL 890AG	3	ENEL 895AI	3	ENEL 382	2	ENEL 384	1

Publication Summary and Selected Publications

Journal Articles	Conference Proceedings	Technical Reports	Book Chapters	Books
8	25	2	1	

Paul Laforge, Raafat R. Mansour, Ming Yu, “Reconfigurable MEMS-Based BPF for Manifold-Coupled-Superconducting Triplexers” IEEE Transactions on Applied Superconductivity, vol. 28, no. 6, 2018 DOI: 10.1109/TASC.2018.2815923

Xiaolin Fan, Song Li, Paul Laforge, Qingsha Cheng, “EM-based Design Approach for Multiband Filters by Reflected Group Delay Method and Cascade Space Mapping” IEEE International Microwave Symposium 2019 (accepted February 2019)

Connor Wright, Christine W. Chan, and Paul Laforge, Decision Support Systems, Chapter Four:"Towards Developing a Decision Support System for Electricity Load Forecast", 2012

Research Keywords: Integration of Microelectromechanical Systems (MEMS) and High Temperature Superconductors (HTS) to Realize Low Loss Tunable Microwave Filters; Niobium-based Low Temperature Superconducting (LTS) MEMS Switches and Tunable Capacitors; Dual Band Microwave Filters; Microwave Multiplexers Implementing HTS or LTS Microwave Filters; Tunable Microwave Filter Design and Analysis; Adaptive Microwave Devices and Systems; Robust Antenna Designs for Monitoring Municipal Infrastructure; Broadband Non-Line-of-Sight Communications; Electrical Heating for Enhanced Oil Recovery

External Activities and Service

21 Graduate Students Supervised (M.Eng., M.A.Sc., Ph.D.)
Served on various committees, including Search for Associate V.P. Academic U of R, U of R Executive Council, Dean's Advisory Committee

Ben Lichtenwald, M.Sc.
Lab Instructor, Environmental Systems Engineering
Phone: 306-585-4599 **Email:** ben.lichtenwald@uregina.ca

Education

Degree	Area of Study	Institution	Date
M.Sc.	Environmental Engineering	Georgia Tech	2009
B.A. Sc.	Environmental Systems Engineering	University of Regina	2000

Select Teaching History and Times Taught

ENEV 383 lab	4	ENEV 440 lab	2	ENEV 281 lab	2		

Timothy Maciag, Ph.D.
Associate Program Chair, Lecturer
Phone: (306) 337-2407 Email: timothy.maciag@uregina.ca

Education

Degree	Area of Study	Institution	Date
PhD Computer Science	Knowledge Management	University of Regina	2016
M.Sc. Computer Science	User Interfaces	University of Regina	2006
B. Sc. Computer Science		University of Regina	2004

Select Teaching History and Times Taught

ENSE 374	1	ENSE 496AB	1	ENSE 885AS	1	ENSE 470	1
CS 100	2	CS 110	1	CS 305	2		

Publication Summary and Selected Publications

Peer-Reviewed Journal Articles	Conference Proceedings	Technical Reports	Peer-Reviewed Book Chapters	Books
2	20	0	2	0

D.H Hepting, J. Jaffe, T. Maciag. Operationalizing Ethics in Food Choice Decisions. Journal of Agriculture and Environmental Ethics. 2013

D.H. Hepting, T. Maciag, and H. Hill. Web-Based Support of Crop Selection for Climate Adaptation. In Proc. Hawaii International Conference on System Sciences (HICSS), pg. 1227-1236. 2012

D.H. Hepting and T. Maciag. Design Scenarios for Web-Based Management of Online Information. In Web-Based Support Systems, Chapter 17, Springer London. 2010

Research Keywords: Knowledge Management, Human Computer Interaction, Lean, Internet of Things, eHealth, Agile, Adult Education, Learning Management Systems,

External Activities and Service

Research Conference Chair (2010-2011) - Organization, sponsorship, planning, production. Keynote speakers included Dr. Richard Stallman and Robert J. Sawyer.

Rene Mayorga, Ph.D. P.Eng.
Professor, Industrial Systems Engineering
Phone: 306-585-4726 **Email:** rene.mayorga@uregina.ca

Education

Degree	Area of Study	Institution	Date
Ph.D.	Electrical Engineering	University of Waterloo	1981
M.A. Sc.	Electrical Engineering	University of Toronto	1975
B.A. Sc. (Equivalent)	Electrical Engineering	Monterrey Institute	1970

Select Teaching History and Times Taught

ENIN 233	33	ENIN 880 AJ	11	ENIN 445	10	ENIN 834	8

Publication Summary and Selected Publications

Journal Articles	Conference Proceedings	Technical Reports	Book Chapters	Books
73	95		2	1

S. Jirasatitsin, R. V. Mayorga. Nonlinear Global Optimization Using Modified Hopfield Neural Networks. Soft Computing. Revision submitted, 2018

E. Shirif, S. El-Mabrouk, R. V. Mayorga. Applications of Function Approximations to Reservoir Engineering: Estimation of Bubble Point Pressure, Oil FVF and GOR. (ISBN-13: 978-3659280), LAP LAMBERT Academic Publishing, 2013.

Mayorga R. V., CD: Proceedings of the International Conference on Applied Bionics and Biomechanics, Venice, Italy, October 14 -16, 2010.

Research Keywords: Artificial/Computational Sapience (Wisdom), and MetaBotics, Intelligent & Sapient (Wise) Decision and Control, Intelligent Sapient (Wise) Systems, MetaBots, Intelligent & Sapient (Wise) Human-Computer Interaction/Interface, Virtual Reality, Software Engineering, Intelligent & Sapient (Wise): Operations Research, Manufacturing, Artificial

Neural Networks, Support Vector Machines, Fuzzy and Neuro-Fuzzy Inference Systems, Robotics: Intelligent Motion Planning, Intelligent Concurrent Motion Planning of Multi-Manipulator, Systems, Intelligent Trajectory/Path Planning of Robot Manipulators, Robotics: Design Evaluation & Optimization of Multi-Robot Manipulators Systems, Design Evaluation & Optimization of Robot Manipulators, Optimal Control, Optimization: Mathematical Programming, Differentiable Penalty Functions, Numerical Methods
External Activities and Service
Served on 2 PhD examination committees Served on 14 University committees Served on 12 Faculty of Engineering Committees

Mehran Mehrandezh, Ph.D. P.Eng.
Associate Professor, Industrial Systems Engineering
Phone: 306-585-4658 **Email:** mehran.mehrandezh@uregina.ca

Education

Degree	Area of Study	Institution	Date
Ph.D.	Mechanical Engineering	University of Toronto	1999
M.A. Sc.	Mechanical Engineering	Queen's University	1995
B. Sc.	Mechanical Engineering	University of Technology, Iran	1990

Select Teaching History and Times Taught

ENIN 241	17	ENIN 370	12	ENIN 833	9	ENIN 444	8

Publication Summary and Selected Publications

Journal Articles	Conference Proceedings	Technical Reports	Book Chapters	Books
27	55		6	

M. Hedayatpour, M. Mehrandezh, and F. Janabi-Sharifi, "Path Planning and Trajectory Tracking to a Safe Landing Spot for Quadcopter UAVs in case of Motor Failure", AIAA, 2018.

A. Dehghan, M. Mehrandezh, and R. Paranjape, "Pose Estimation in Dioptric Imaging", Nonlinear Approaches in Engineering Applications – Dynamic Systems and Control, Springer Publishing, 2014.

M. Hedayatpour, M. Mehrandezh, and F. Janabi-Sharifi, "Revised Propeller Dynamics and Energy optimal Hovering in a Monospinner", Proceedings of the 4th International Conference of Control, Dynamic Systems, and Robotics (CDSR'17), Toronto, Canada (1-6), 2017.

Research Keywords: Motion planning of co-operating robotic arms in dynamic environments, Autonomous sensor-based motion planning of robots (mobile and articulated), Computer

integrated manufacturing, inspection, assembly, Remote control/analysis via Internet, Urban search and rescue robotics, Time-optimal rendezvous planning of co-operating robots for pick-and-place task sharing
External Activities and Service
Giving “What is Engineering” presentations to High School Students Presented in four episodes of “Re-inventors” for Discovery and History channels Consulted for the RCMP on a homocide case

Dean Milton, A.Sc.T. B.V/T.Ed.
Lab Instructor, Environmental Systems Engineering
Phone: 306-585-4963 **Email:** 306-585-4855

Education

Degree	Area of Study	Institution	Date
B. Ed.	Vocational / Technical Education	University of Regina	1989
Certificate	Administration	University of Regina	1986
Diploma	Civil Engineering Technology	SIAST	1982

Select Teaching History and Times Taught

ENEV 261	82	ENEV 363	42	ENEV 321	42	ENEV 384	38
ENEV 360	29	ENEV 465	18				

External Activities and Service

Served on various Hiring Committees for the Faculty of Engineering
Chair of the Recruitment and Public Relations Committee (1996-1026)
Committee Member of Engineering Lab Safety (2000-Present)

Yasser Morgan, Ph.D. P.Eng.
Associate Professor, Software Systems Engineering
Phone: 306-337-3207 **Email:** yasser.morgan@uregina.ca

Education

Degree	Area of Study	Institution	Date
Ph.D.		Carleton	
M. Sc.		Cairo	
B. Sc.		Cairo	

Select Teaching History and Times Taught

ENSE 475	9	ENSE 472	7	ENSE 350	6	ENSE 885 AL	4

Publication Summary and Selected Publications

Journal Articles	Conference Proceedings	Technical Reports	Book Chapters	Books
19	25		3	

Liu, Y.; and Morgan, Y.; "Security against Passive Attacks on Network Coding System - A Survey", in the Elsevier Journal on Computer Networks, Mar 2018.

Tabrizi, P; and Morgan, Y. "A Novel Host Intrusion Detection System Using Neural Network," in the IEEE 8th Annual Computing and Communication Workshop and Conference (CCWC).

Morgan, Y.; Hai, B.; and El-Darieby, M.; "Policy-based Management of DSRC Services in Intelligent Transport Systems," in the proceedings of the "Wireless Technologies in Intelligent Transportation Systems", Published by Nova Science Publishers Incorporation USA, June 2009.

Research Keywords: Wireless MESH Networks, Mobile Ad-hoc Networks, MAC layer and Service Discovery algorithms, Mobile Applications and Middleware, Location-Aware Applications and Mobile Agent, Vehicular Communications specially DSRC and VII, Distributed

and Pervasive Computing, Software Engineering Models,
External Activities and Service
Served on numerous U of R committees, including hiring, performance review, admission and studies, appeal Chair and Speaker, Winter Institute, College Station, Texas (2018) NSERC external reviewer for IRC/CRD application.

Karim Naqvi, M.A.Sc. P.Eng.
Lecturer, Software Systems Engineering
Phone: 306-337-2279 **Email:** karim.naqvi@uregina.ca

Education

Degree	Area of Study	Institution	Date
M.A.Sc.	Electronic systems Engineering	University of Regina	1999
B.A.Sc.	Electronic Information Systems Engineering	University of Regina	1986

Select Teaching History and Times Taught

ENEL 487	18	ENSE 470	12	ENSE 352	6	ENSE 481	5
ENEL 282	5	ENEL 890 AM	3	ENEL 281	3		

External Activities and Service

As a service project, developed the “Virtual Field Goal” system with Trevor Douglas to promote Engineering at the University of Regina, as well as the Saskatchewan Roughriders.

Kelvin T. W. Ng, Ph.D. P.Eng.
Associate Professor, Environmental Systems Engineering
Phone: 306-337-8487 **Email:** kelvin.ng@uregina.ca

Education

Degree	Area of Study	Institution	Date
Ph.D.	Civil and Environmental Engineering	The Hong Kong University of Science and Technology	<>
M.Eng.	Civil Engineernig	McMaster University	<>
B. Eng.	Civil Engineering	McMaster University	<>

Select Teaching History and Times Taught

ENEV 422	10	ENEV 469	9	ENEV 408	8	ENEV 834	6

Publication Summary and Selected Publications

Journal Articles	Conference Proceedings	Technical Reports	Book Chapters	Books
23	24	13		

Vu, H. L., Bolingbroke, D., Ng, K. T. W., and Fallah, B. (Under Review) “Assessment of waste characteristics and their impact on GIS vehicle collection route optimization using ANN waste forecasts”. Submitted to Waste Management, Elsevier. Manuscript ID.: WM-18-3167

Vu, H. L., Ng, K. T. W., and Fallah, B. (Under review) “Weekly Yard Waste Prediction Models using ANN and ANFIS” In Proceedings, The 34 th International Conference on Solid Waste Technology and Management, Annapolis, U.S.A., March 31–April 3, 2019.

Richter, A. and Ng, K. T. W. (2018) “Using Remote Sensing & GIS to rank current landfill sites for regionalization”. Poster presentation, Ground Security Workshop, December 4 th , 2018, Travelodge Hotel & Conference Center, Regina.

Research Keywords: Non-hazardous waste generation in Western Canada; Environmental geotechnics and sustainable solid waste treatment; Beneficial reuse of waste materials in civil and environmental applications; Design, operation, and remediation of municipal solid waste landfills and other solid waste containment systems.

External Activities and Service

Judge at the Regional Science Fair, and Canada-Wide Science Fair
Organized Workshop on Sustainable Solid Waste Management (I and II)
Interviews with Media (Global Regina, CBC Radio, Prairie Dog) discussing landfills and recycling topics

Raman Paranjape, Ph.D. P.Eng.
Professor, Electronic Systems Engineering
Phone: 306-585-5290 **Email:** raman.paranjape@uregina.ca

Education

Degree	Area of Study	Institution	Date
Ph.D.	Electrical Engineering	University of Alberta	1989
M.Sc.	Electrical Engineering	University of Alberta	1984
B. Sc.	Electrical Engineering	University of Alberta	1981

Select Teaching History and Times Taught

ENEL 484/784	10	ENEL 857	12	ENEL 282	10	ENEL 389	7

Publication Summary and Selected Publications

Journal Articles	Conference Proceedings	Technical Reports	Book Chapters	Books
51	84		9	

M Hegdus, M Mehrandezh, R Paranjape, Formation Control of Nonholonomic mobile robots using acoustic sensor, Nonlinear approaches to Engineering Applications, Springer, Jazar, Dai (Ed), 2018

R Paranjape, ZG Wang, S Gill, The Diabetic Patient Agent: Modeling Disease in Humans and the Healthcare System Response, Intelligent Systems Reference Library Volume 133, Springer 2018

D Castro-Hernandez, R Paranjape, Dynamic Analysis of Load Balancing Algorithms in LTE/LTE-A HetNets, Wireless Personal Communications 96 (3), 3297-3315, 2017.

Research Keywords: Mobile Agents Systems – E-commerce, Medical Data Retrieval, Graphical Representation of Agent Societies, Sonics and Ultra-Sonics for underground and non-destructive visualization and testing, Fibre Optic sensors for oil and liquid sensing, Robotic

sensor systems – vision, touch, sonar, Biomedical Signal and Image Processing, Fundamentals of Signal and Image Processing
External Activities and Service
IEEE South Saskatchewan Executive - Various Roles (Secretary, Treasurer, Vice Chair, Chair) - 2001-present Program Chair of Electronics Systems Engineering (1998-2004) through two accreditation periods. CEO of CRL Engineering Ltd., which created a public transit tracking system.

Wei Peng, Ph.D. P.Eng.
Lecturer, Engineering General
Phone: 306-585-4397 **Email:** Wei.Peng@uregina.ca

Education

Degree	Area of Study	Institution	Date
Ph.D.	Industrial Systems Engineering	University of Regina	<>
M.Eng.	Industrial Systems Engineering	University of Regina	<>
B. Eng.	Automation	Wuhan Institute of Technology	<>

Select Teaching History and Times Taught

ENGG 100	16	ENGG 240	9	ENGG 140	7	ENGG 815	4

Publication Summary and Selected Publications

Journal Articles	Conference Proceedings	Technical Reports	Book Chapters	Books
14	2			

Pourjavad E. and Peng W.* (2017) “An Integrated MCDM approach for Risk Evaluation of New Product in Fuzzy Environment”. International Journal of Product Development (IJPD). Vol 22, No 3, pp. 165-188. DOI: 10.1504/IJPD.2017.10008341

Peng W., Mayorga R. V., (2017) “A Fuzzy-Stochastic Approach for Binary Linear Programming under Uncertainties”. Journal of Mathematics Research. 9(3): 95-111. DOI: https://doi.org/10.5539/jmr.v9n3p95

Mettu S., Mayorga R. V., Peng W. (2017) "A Fuzzy Inference System as a Risk Analysis Tool to Prioritize Risks in Medication Dispensing Process. " International Journal of Fuzzy Systems and Advanced Applications. Vol 4, pp. 23-31. http://www.naun.org/main/NAUN/fuzzy/2017/a102017-074.pdf

Research Keywords: Development and application of Simulation, Modeling, and Optimization, techniques for dealing with uncertainty in Environmental Engineering, Sustainable Engineering, Industrial Engineering, Process Engineering, and Management. 1. Statistical (Probability) Techniques. 2. Risk Assessment, Decision Analysis, and Control Planning. 3. Fuzzy Logic, Rough Sets, and Artificial Neural-Networks. 4. Drinking Water quality Engineering, Wastewater Treatment, Water Resource Management, and Hydraulic Reliability Assessment. 5. Radiology Engineering. 6. Process Control Techniques in Industrial Applications.
External Activities and Service
Supervised 21 graduate students

Satish Sharma, Ph.D. P.Eng.
Professor, Environmental Systems Engineering
Phone: 306-585-4553 **Email:** satish.sharma@uregina.ca

Education

Degree	Area of Study	Institution	Date
Ph.D.	Civil Engineering	University of Manitoba	1978
M.Sc.	Civil Engineering	University of Manitoba	1973
B.Sc.	Civil Engineering	University of Pantnagar, India	1971

Select Teaching History and Times Taught

ENEV 842	7	ENEV 372	6	ENEV 334	5		

Publication Summary and Selected Publications

Journal Articles	Conference Proceedings	Technical Reports	Book Chapters	Books
76	83			2

Hyuk-Jae Roh. S. Sharma, Prasanta K. Sahu, and Babak Mehran. (2018) “Performance Comparison of Mode Choice Optimization Algorithm with Simulated Discrete Choice Modeling.” Modeling and Simulation in Engineering. Vol. 2018, Article ID 8169036, 38 pages.

Lingras, P.J., Zhong, M., Sharma, S.C. (2008). “Evolutionary Regression and Neural Imputations of Missing Values”. In Soft Computing Applications in Industry, B. Prasad (Ed.) 226, ISBN: 978-540-77464-8, pp. 151–163, Springer-Verlag Berlin Heidelberg, Feb. 14, 2008.

Roh, H-J., and Sharma, S., 2017. “Parametric and Non-Parametric Diagnosis of the Impact of Adverse Weather on Vehicle Type Distribution” Paper presented at the Seoul International Conference on Engineering and Applied Science, Seoul, Korea, February, 2017.

Research Keywords: Highway traffic monitoring, Intelligent transportation systems, Statistical analysis of highway traffic data, Transportation economics, Highway traffic safety

External Activities and Service

Supervised 32 Graduate Students (Theses)
Reviewer for NSERC grant applications
Reviewer for 7 journals

Ezeddin Shirif, Ph.D. P.Eng.
Professor, Petroleum Systems Engineering
Phone: 306-585-4810 **Email:** ezeddin.shirif@uregina.ca

Education

Degree	Area of Study	Institution	Date
Ph.D.	Petroleum Engineering	University of Alberta	1998
M.Sc.	Petroleum Engineering	University of Southern California, Los Angeles	1982
B.A.Sc.	Petroleum Engineering	University of Southern California, Los Angeles	1980

Select Teaching History and Times Taught

ENPE 470	14	ENPE 302	12	ENPE 381	10	ENPE 450	8

Publication Summary and Selected Publications

Journal Articles	Conference Proceedings	Technical Reports	Book Chapters	Books
36	33			1

Alarbah A., Shirif M. and Shirif E. (2019). Investigating the Effect of Different Ionic Liquids in Improving Oil Recovery Factor. Advances in Chemical Engineering and Science, 9, 87-98

“Application of Function Approximations to Reservoir Engineering: Estimation of Bubble Point Pressure,
Oil FVF and GOR”. Authors, E. Shirif, S. El-Mabrouk. Publisher: LAP LAMBERT Academic Publishing
(January 15, 2013) ISBN-10: 3659280291, ISBN-13: 978-3659280290

Al Zubaidi, I., Ibrahim, H. and Shirif, E., Evaluation of Various Synthetic Sorbent Materials for the Remediation of Crude Oil Contaminated Water Bodies, Williston Basin Petroleum

Conference, 28-30 April, 2015, Regina, SK, Canada.

Research Keywords: Methods for the evaluation and prediction of hydrocarbon reservoir performance; Reservoir description and reservoir management; Development and application of methods of analysis and interpretation of well tests and production data; Theoretical/mathematical modeling studies of multiphase flow in porous media; Evaluation and prediction of performance for oil and gas wells; Characterization of conventional/unconventional oil and gas; Petroleum reservoir engineering

External Activities and Service

Member of RACA Regina (2018 - Present)
Board Member, Huda School, Regina (2011-2015)
Active Member of Lansdowne community soccer league (2000-2015)

Denise Stilling, Ph.D. P.Eng.
Associate Professor, Industrial Systems Engineering
Phone: 306-337-2696 **Email:** denise.stilling@uregina.ca

Education

Degree	Area of Study	Institution	Date
Ph.D.	Mechanical Engineering	University of Saskatchewan	2000
M.Sc.	Mechanical Engineering	University of Saskatchewan	1989
B. Eng.	Mechanical Engineering	University of Saskatchewan	1985

Select Teaching History and Times Taught

ENIN 349	10	ENIN 340	8	ENIN 241	7	ENIN 880BT	5

Publication Summary and Selected Publications

Journal Articles	Conference Proceedings	Technical Reports	Book Chapters	Books
1	2	5		

Oguochoa, I., Shen, S., Yannacopoulos, S., Stilling, D.S.D., Fatigue and Tensile Properties of Tandem Submerged Arc Welder ASTM A709 Grade 50 Steel Plates. Materials Science & Engineering. A. : 29.

Guo, J., Stilling., D.S.D., (2014). Review of Bio-composite Derived from Agricultural Waste Streams. Proceedings and program. 26th Canadian Materials Conference, Saskatoon, Canada.

Panigrahy, B. and Stilling, D.S.D. (2011). Bio-Composite Development for Acoustic Barriers. Conference Abstracts for 6th Annual U of R Graduate and U/G Research Conference. 6th Annual University of Regina Graduate and Undergraduate research Conference, Regina, Canada.

Research Keywords: Value-added product and manufacturing research and development from agricultural fiber and reclaimed material, Engineering management including principles of lean manufacturing, JIT, agile manufacturing, operational management, etc., Human Factors Engineering including ergonomics, safety design, procedures, etc., Applied mechanical engineering analysis and design including biomechanics, vibration control, structural analysis, strength of materials, instrumentation, chaos theory and nonlinear dynamics, manufacturing processes, Research experience in artificial intelligence including applications in knowledge based expert systems, artificial neural networks, wavelets, etc.

External Activities and Service

11 Graduate Students Supervised
APEGS 30 by 30 Special Committee member
Lead for Engineering on Indigenization - Strategic plan to enhance Academic Indigenization for Faculty of Engineering and Applied Science

Paitoon (P.T.) Tontiwachwuthikul, Ph.D. P.Eng.
Professor, Industrial & Process Systems Engineering & Fellow, Canadian Academy of Engineering (FCAE)
Phone: 306-585-4688 **Email:** paitoon@uregina.ca

Education

Degree	Area of Study	Institution	Date
Ph.D.	Chemical Engineering	University of British Columbia	1991
M.Eng.	Chemical Engineering	University of British Columbia	1986
B. Eng. (Honours)	Chemical Engineering	King Mongkut's Institute of Technology, Thailand	1983

Select Teaching History and Times Taught

ENIN 456	5	ENIN 355	6	ENPC 880 AG	3	ENPC 870	3

Publication Summary and Selected Publications

Journal Articles	Conference Proceedings	Technical Reports	Book Chapters	Books
228	48	4	1	2

Chief Guest Editor (with C. Chan, F. Zeng, Z. Liang and T. Sema) : SPECIAL ISSUE on "Recent progress and new developments of applications of Artificial Intelligence (AI), Knowledge-based Systems (KBS), and Machine Learning (ML) in the Petroleum Industry", for publication in PETROLEUM (Elsevier), in progress for 2019.

Liu, Idem and Tontiwachwuthikul, "Post-combustion CO2 Capture Technology by Using the Amine Based
Solvents" (ISBN 978-3-030-00922-9) by Springer (October 2018)

"CO_2 capture from water-gas shift process plant: Comparative bench-scale pilot plant investigation of MDEA-PZ blend vs novel MDEA activated by 1, 5-diamino-2-methylpentane";

International Journal of Greenhouse Gas Control; 82; 218-228; 2019 (with Nwaoha, Chikezie; Tontiwachwuthikul, Paitoon; Benamor, Abdelbaki;)

Research Keywords: New technologies for CO2 recovery, production, and utilization (including Greenhouse Gas Control Technologies), High efficiency processes for gas separation and purification, Industrial pollution prevention and control (including energy and environment issues), Heat & mass transfer with chemical reactions, Industrial corrosion prevention and control Intelligent and knowledge-based systems development, Modeling, simulation, control, and optimization of industrial processes

External Activities and Service

64 Graduate Students Supervised
Technical Advisor and Consultant for over 60 organizations worldwide
Editorial Board Member of 4 journals

Farshid Torabi, Ph.D. P.Eng.
Petroleum Systems Engineering; Professor, Petroleum Systems Engineering
Phone: <Blah> **Email:** <Blah>

Education

Degree	Area of Study	Institution	Date
Ph.D.	Petroleum Systems Engineering	University of Regina	2008
M.A. Sc.	Petroleum Engineering	Heriot-Watt University, Edinburgh, Scotland	2001
B.A.Sc.	Petroleum Engineering	University of Technology, Iran	1992

Select Teaching History and Times Taught

ENPE 460	12	ENPE 410	7	ENPE 860	6	ENPE 381	5

Publication Summary and Selected Publications

Journal Articles	Conference Proceedings	Technical Reports	Book Chapters	Books
61	49	26		

A. Ahadi and F. Torabi. Effect of Light Hydrocarbon Solvents on the Performance of CO2-Based Cyclic Solvent Injection (CSI) in Heavy Oil Systems, DOI: 10.1016/j.petrol.2018.12.062

A. Tabatabaei, F. Torabi, P. Tontiwachwuthikul., Simultaneous Scheduling of Machines and Automated Guided. Paper#1570416463, The 8th IEEE Annual Computing and Communication Workshop and Conference, University of Nevada, Las Vegas, USA, 8th - 10th January, 2018. Accepted in December 2017.

F. Torabi, and A. Abedini. Unlocking Bakken Potential through Utilization of CO2 Huff-and-Puff, Final Report for Petroleum Technology Research Centre (PTRC), 2013.

Research Keywords: Miscible and Immiscible Processes in Fractured Reservoirs, Diffusion/Dispersion and Convection Mechanisms, Enhanced Oil Recovery and Geological Sequestration of Greenhouse Gases, Production Optimization, Formation Damage and Permeability Improvement, Improved Oil Recovery from Heavy Oil Reservoirs, Interfacial Phenomena, Capillary Pressure and 3-Phase Relative Permeability, Fluid Flow in Porous Media, Reservoir Simulation, Well Testing, Drilling and Well Completion, Fluids Transportation

External Activities and Service

35 Graduate Students Supervised
VP Academic for Faculty Association at the University of Regina, 2016-2017
Program Chair of Petroleum Systems Engineering (2014-2016)

Amornvadee (Amy) Veawab, Ph.D. P.Eng.
Professor, Environmental Systems Engineering
Phone: 306-585-5665 **Email:** veawab@uregina.ca

Education

Degree	Area of Study	Institution	Date
Ph.D.	Engineering	University of Regina	2000
M.A. Sc.	Industrial Systems Engineering	University of Regina	1995
B. Eng. (Honours)	Chemical Engineering	King Mongkut's University of Technology, Thailand	1991

Select Teaching History and Times Taught

ENEV 440	18	ENEV 863	14	ENEV 261	11	ENPE 490	5

Publication Summary and Selected Publications

Journal Articles	Conference Proceedings	Technical Reports	Book Chapters	Books
32	120	4	5	<1>

Srinivasan, S., Veawab, A. and Aroonwilas A. "Screening and Evaluating Environmentally Friendly Corrosion Inhibitors for MEA-based CO 2 Absorption Process" in the book titled "Corrosion Inhibitor: Principles and Recent Applications", edited by Mahmood Aliofkhazraei, In Tech (2018).

Gunasekaran, P., Veawab, A. and Aroonwilas, A. "Corrosivity of Amine-based Absorbents for CO 2 Capture" Energy Procedia, Vol. 114, p. 2047-2054, 2017.

Rokanuzzaman, M., Veawab, A. and Aroonwilas, A. "Design Method for Layered-bed Adsorption Column for Separation of CO 2 and N 2 from Natural Gas" Energy Procedia, Vol. 114, p. 2441-2449, 2017.

Research Keywords: Corrosion and corrosion inhibition, CO2 capture technologies, Gas separation and purification, Biofuel technologies, Air pollution control and management
External Activities and Service
Member of search committee's for professors in Environmental systems and Petroleum Systems Engineering Member of numerous other committees at the university 29 Graduate Students Supervised

Doug Wagner, P.Eng.
Instructor (Tenured), Senior Engineer in Residence
Phone: 306-337-2633 **Email:** douglas.wagner@uregina.ca

Education

Degree	Area of Study	Institution	Date
M.Sc.	Engineering	University of Saskatchewan	In Progress - Fall 2019 (estimated)
B.A. Sc.	Electronic Information Systems Engineering	University of Regina	1990

Select Teaching History and Times Taught

ENSE 417	14	ENEL 280	10	ENEL 482	10	ENEL 472	10
ENEL 283	9	ENEL 395	7	ENEL 383	5		

Research Keywords: Teaching Focus: Analog Electronics, Analog Design; Energy and Power Topics, geared to Electronic Systems Students; Power Quality; Industrial Electrical Protection and Coordination; Economics of Electrical Power in Industrial Applications; Student Capstone Project Support and Management. Research Support and Interests: Arc Flash Mitigation Strategies; Small Scale Generation applied to Demand Side Management; Enhanced Engineering Teaching Engagement Strategies; Engineering Recruitment Strategies in Saskatchewan; Industry Liaison

External Activities and Service

Participant in “Strategies to Minimize academic misconduct” survey and subsequent focus group Nov 2018.
Coordinator, Undergraduate Engineering Student Project Day
U of R co-representative to Regina Engineering Society

Yuan Wang
Lab Instructor, Petroleum Systems Engineering
Phone: 306-337-2957 **Email:** Yuan.Wang@uregina.ca

Education

Degree	Area of Study	Institution	Date
M. Sc.	Chemical Engineering	University of Calgary	2010
M. Sc.	Production Engineering	University of Petroleum (East China)	2001
B. Sc.	Reservoir Engineering	University of Petroleum (East China)	1994

Select Teaching History and Times Taught

ENPE 410 lab	13	ENPE 440	9	ENPE 251	9	ENPE 486	3

External Activities and Service

Canada Wide Science Fair (CWSF), University of Regina, May 15 ~ May 20, 2017
What is Engineering (WIE), Faculty of Applied Science and Engineering, University of Regina, October 11, 2017
What is Engineering (WIE), Faculty of Applied Science and Engineering, University of Regina, October 4, 2018

Zhanle (Gerald) Wang, Ph.D. E.I.T.
Lecturer, Electronic Systems Engineering
Phone: 306-337-2957 **Email:** zhanle.wang@uregina.ca

Education

Degree	Area of Study	Institution	Date
Ph.D.	Electronic Systems Engineering	University of Regina	2015
M.A. Sc.	Electronic System Engineering	University of Regina	2012
B. Eng.	Industrial Automation	Hebei Polytechnic University, Tangshan, China	2001

Select Teaching History and Times Taught

ENEL 280	7	ENEL 281	4	ENEL 280 lab	20	ENEL 380 lab	6

Publication Summary and Selected Publications

Journal Articles	Conference Proceedings	Technical Reports	Book Chapters	Books
3	10			1

Z. Wang and R. Paranjape, "Optimal Residential Demand Response for Multiple Heterogeneous Homes with Real-Time Price Prediction in a Multi-Agent Framework," IEEE Transactions on Smart Grid, vol. 8, issue. 3, pp. 1173-1184, May 2017.

R. Paranjape, Z. Wang, and S. Gill, The Diabetic Patient Agent: Modeling Disease in Humans and the Healthcare System Response vol. 133: Springer, 2017.

Z. Wang and R. Paranjape, “Evaluation of Electric Vehicle Penetration in a Residential Sector Under Demand Response Considering Both Cost and Convenience”, in Proc. IEEE Electrical Power Energy Conference, Saskatoon, SK, Canada, Oct. 2017.

Research Keywords: Computational Methods for Smart Grids; Demand Response; Simulation and Modeling Optimal Control of Electricity Usage; Vehicle-to-Grid Systems (V2G); Renewable Energy Integration; Solar/Wind power; Optimization Theory and Applications; and Multi-Agent Systems

External Activities and Service

Reviewed several papers for IEEE Transactions Journal
Division Head for Student and Academic Services at Hebei Polytechnic, 2003-2010

Peng Wu, Ph.D. P. Eng.
Assistant Professor, Environmental Systems Engineering
Phone: 306-585-4309 **Email:** Peng.Wu@uregina.ca

Education

Degree	Area of Study	Institution	Date
Ph.D.	Hydraulic Engineering		2015
M.A. Sc.	Hydraulic and Hydro-power Engineering		2010
B. Eng.	Civil Engineering		2007

Select Teaching History and Times Taught

ENEV 223	5	ENEV 421	4	ENEV 281	3	ENEV 886CT	3

Publication Summary and Selected Publications

Journal Articles	Conference Proceedings	Technical Reports	Book Chapters	Books
16	10			

Wu P., Balachandar R, Ramamurthy A. 2018. “Effects of splitter plate on reducing local scour around bridge piers.” Accepted, RRA-18-0098.R1, River Research and Applications.

Wu P., Balachandar, R, Sui, J. 2015. "Local Scour around Bridge Piers under Ice-Covered Conditions." Journal of Hydraulic Engineering, 10.1061/(ASCE)HY.1943-7900.0001063 04015038.

Yu B, Wu P, Ben P, Ni J, Sui J, 2016. “The combined operation of flood plain and flood diversion Channel in the Middle Reach of Huai River”. 8 th Internal Conference on Fluvial Hydraulics.

Research Keywords: Cold Region River Engineering, Local scour and sediment transport, Hydraulic structures, Flood mapping and prediction, Water drainage engineering, River hydraulics and Fluvial Morphology, Environmental Impact Assessment and Risk Analysis

External Activities and Service
Supervised 6 Graduate Students Journal Reviewer for CJCE, CWRJ, IJSR, JH and EFM

Daoyong (Tony) Yang, Ph.D. P.Eng.
Professor, Petroleum Systems Engineering
Phone: 306-337-2660 **Email:** tony.yang@uregina.ca

Education

Degree	Area of Study	Institution	Date
Ph.D.	Petroleum Systems Engineering	University of Regina	2005
Ph.D.	Petroleum Engineering	University of Petroleum, China	2000
B. Sc.	Petroleum Engineering	University of Petroleum, China	1992

Select Teaching History and Times Taught

ENPE 241	11	ENPE 370	8	ENPE 440	6	ENPE 870	5

Publication Summary and Selected Publications

Journal Articles	Conference Proceedings	Technical Reports	Book Chapters	Books
108	91	29	2	2

D. Yang, P. Tontiwachwuthikul, and, and Y. Gu. Interfacial Tensions of the Crude Oil + Reservoir Brine + CO2 Systems at Pressures up to 31 MPa and Temperatures of 27 °C and 58 °C. Journal of Chemical & Engineering Data 2005 50 (4), 1242-1249. DOI: 10.1021/je0500227

Li, H., Zheng, S., & Yang, D. (Tony). (2013, April 17). Enhanced Swelling Effect and Viscosity Reduction of Solvent(s)/CO2/Heavy-Oil Systems. Society of Petroleum Engineers. doi:10.2118/150168-PA

Wettability Determination of the Reservoir Brine−Reservoir Rock System with Dissolution of CO2 at High Pressures and Elevated Temperatures. D. Yang, Y. Gu, and P. Tontiwachwuthikul. Energy & Fuels 2008 22 (1), 504-509. DOI: 10.1021/ef700383x

Research Keywords: Reservoir description and dynamics, assisted history matching, formation evaluation, phase behaviour, heat and mass transfer, production optimization, CO2 EOR and storage, pressure transient analysis, reservoir nanoagents, jet dynamics, artificial lift methods, interfacial interactions in EOR processes, heavy oil recovery, unconventional resources exploitation, and oilfield wastewater treatment.

External Activities and Service

Associate Editor, 2 journals. Technical Editor, 3 Journals.
Paper reviewer for 13 journals.
25 invited presentations and 7 keynote speaker presentations

Stephanie Young, Ph.D. P.Eng.
Professor, Environmental Systems Engineering
Phone: 306-585-4722 **Email:** stephanie.young@uregina.ca

Education

Degree	Area of Study	Institution	Date
Ph.D.	Environmental Engineering	University of Alberta	2001
M. Sc.	Environmental Engineering	University of Alberta	1996
B. Sc.	Chemical Engineering	Tianjin University, China	1984

Select Teaching History and Times Taught

ENEV 363	15	ENEV 465	14	ENEV 321	11	ENEV 832	6

Publication Summary and Selected Publications

Journal Articles	Conference Proceedings	Technical Reports	Book Chapters	Books
26	14	1		

Palmarin, M. J., Young, S. (2019). The effects of biocarriers on the mixed liquor characteristics, extracellular polymeric substances, and fouling rates of a hybrid membrane bioreactor. Biochemical Engineering Journal. 141: 278-284.

Palmarin, M. J., Young, S. (2019). Comparison of the treatment performance of a hybrid and conventional membrane bioreactor for greywater reclamation. Journal of Water Process Engineering. Journal of Water Process Engineering. 28: 54-59

Palmarin, M. J., Young, S., Wilson, M. (2017). Application of treated greywater for green space irrigation in southern Saskatchewan. Western Canada Water Annual Conference Proceedings. Western Canada Water Annual Conference and Exhibition, Saskatoon, Canada (1-6) Conference Date: 2017/9

Research Keywords: Municipal Engineering, specializing in water and wastewater treatment, Treatment and disposal of municipal and industrial wastewater particularly pulp mill effluent, wastewater from oil field: oil/water separation and reclamation of oily water and reuse, Advanced physical/chemical treatment, including membrane filtration and bioremediation, Water treatment process & facility design and modification, Collection and distribution systems design and analysis, Solid waste management including composting, sludge treatment and recycle, Hazardous waste management, Use of polymer materials for environmental engineering applications

External Activities and Service

Member of several professional organizations, including APEGS, Water Environment Federation, American Water Works, Canadian Society for Civil Engineering, Western Canada Water
Supervised 25 Graduate Students
Served on the Faculty and Campus Review Committee

Kin-Choong Yow, Ph.D.
Associate Professor, Software Systems Engineering
Phone: 306-337-3219 **Email:** kin-choong.yow@uregina.ca

Education

Degree	Area of Study	Institution	Date
Ph.D.		University of Cambridge	1998
B. Eng.		University of Singapore	1993

Select Teaching History and Times Taught

ENSE 470	1						

Publication Summary and Selected Publications

Journal Articles	Conference Proceedings	Technical Reports	Book Chapters	Books
26	60	1	7	

K.C.Yow, B.C.Seet, “Mobile Interactive Learning in Large Classes: Towards an Integrated Instructor-Centric and Peer-to-Peer Approach”, Multiplatform E-Learning Systems and Technologies - Mobile Devices for Ubiquitous ICT-Based Education, 2008.

J.Yu, K.C.Yow and M.Jeon, “Joint representation learning of appearance and motion for abnormal event detection”, Machine Vision and Applications, July 2018, DOI: 10.1007/s00138-018-0961-8.

I.Kim and K.C.Yow, “Object Location Estimation from a Single Flying Camera”, In Proceedings Ninth International Conference on Mobile Ubiquitous Computing, Systems, Services and Technologies (UBICOMM 2015), July 19 - 24, 2015, Nice, France.

Research Keywords: Artificial Intelligence and Machine Learning, Deep Learning, Generative Adversarial Networks, Deep Reinforcement Learning, Computer Vision and Image Processing, Pattern Recognition, Smart Environments, Intelligent Systems, Artificial General Intelligence,

Cognitive Architectures, Commonsense Reasoning, Artificial Consciousness, and Ethics of Artificial Intelligence.
External Activities and Service
Associate Editor-in-Chief of “Journal of Advances in Information Technology”, Managing Editor for “International Journal of Information Technology” Served as a reviewer for 19 journals and 17 conferences. Served as a Session Chairman / Organizer for 12 conferences.

Syed Adeel Haneef Zaidi
Lab Instructor, Industrial Systems Engineering
Phone: 306-585-4094 **Email:** syed.zaidi@uregina.ca

Education

Degree	Area of Study	Institution	Date
M.ASc.	Advanced Manufacturing Technology and Systems Management	University of Manchester, UK	2008
B. Eng.	Industrial and Manufacturing Engineering	NED University of Engineering and Technology, Karachi	2003

Select Teaching History and Times Taught

Publication Summary and Selected Publications

Journal Articles	Conference Proceedings	Technical Reports	Book Chapters	Books
4				

Sharfuddin Ahmed Khan, Syed A. H. Zaidi, Warehouse Location Decision in Pakistan: A Real Case Study, International Journal of Supply Chain Management, 2 (2013) 70-83.

Syed A. H. Zaidi, Sharfuddin Ahmed Khan, Fikri Dweiri, Implementation of Inventory Management System in a Furniture Company: A Real Case study, International Journal of Engineering and technology 2 (2012) 1457-1474.

Injection Moulding of Acrylic Torus, Syed A. H. Zaidi, LAP LAMBERT Academic publishing, ISBN: 978-3-659-16241-1.

Research Keywords: Advanced manufacturing processes, Continuous Improvement of

manufacturing processes, warehouse management.

Fanhua (Bill) Zeng, Ph.D. P. Eng.
Associate Dean Graduate Studies, Program Chair, Professor, Petroleum Systems Engineering
Phone: 306-337-2526 **Email:** fanhua.zeng@uregina.ca

Education

Degree	Area of Study	Institution	Date
Ph.D.	Petroleum Systems Engineering	University of Regina	2008
M.ASc.	Oil and Gas Development Engineering	Southwest Petroleum University, Sichuan	2002
B. A. Sc.	Petroleum Engineering	Southwest Petroleum University, Sichuan	1999

Select Teaching History and Times Taught

ENPE 821	10	ENPE 470	4	ENPE 300	8	ENPE 486	6

Publication Summary and Selected Publications

Journal Articles	Conference Proceedings	Technical Reports	Book Chapters	Books
89	57			

Jamshidi, T., Zeng, F, Tontiwachwuthikul,P. and Torabi, F, Micro-fluidic Investigation of the effect of injection rate, temperature, crude oil viscosity, and dual permeability porous media on the performance of waterflooding (WF), Journal of Petroleum Science and Engineering, In revision.

Zhang, Y. and Zeng, F., Study of the Effect of Capillary Confinement and adsorption on the Phase Behaviour of Tight Retrograde Condensate Reservoirs by Oil-gas-adsorption Three-phase Model, Fuel, in revision.

Yuan, Q., Zhan, J., Wang, J., Zeng, F., Knorr, K., and Imran, M., An Optimal Injection Scheme for Maximizing Oil Recovery in CO_2 Miscible Flooding", CMTC-486447, Carbon Management Technology Conference, Houston, Texas, USA, July 2017

Research Keywords: Heavy oil EOR, Tight oil/gas reservoir development, High performance reservoir simulation, Transient pressure analysis and reservoir characterization, Non-Darcy flow in porous media, Unconventional gas reservoir development, CO2 EOR & geo-sequestration

External Activities and Service

48 Graduate Students Supervised
Program Chair from (2016 - Present)
NSERC Reviewer: CRD, DG and I2I (Various years 2012 - 2017)

Lei Zhang, Ph.D. C.Eng. MIEEE, MWeldI
Assistant Professor, Electronic Systems Engineering
Phone: 306-337-2588 **Email:** lei.zhang@uregina.ca

Education

Degree	Area of Study	Institution	Date
Ph.D.	Electronic Engineering	Brunel University	2012
M. Eng.	Electronic Engineering	University of Durham	2006
B. Eng. Honours	Electronic Engineering	Qingdao University	2003

Select Teaching History and Times Taught

ENEL 387	6	ENEL 489/789	5	ENEL 384	5	ENEL 890AL	2

Publication Summary and Selected Publications

Journal Articles	Conference Proceedings	Technical Reports	Book Chapters	Books
	21	1		

Lei Zhang. (2017). Multilayer Artificial Neural Network Design and Architecture Optimization for the Pattern Recognition and Prediction of EEG Signals based on Henon Map Chaotic System. The 2017 International Conference on Computational Science and Computational Intelligence (CSCI), Las Vegas, United States.

Lei Zhang. (2017). Artificial Neural Networks Model Design of Lorenz Chaotic System for EEG Pattern Recognition and Prediction. The first IEEE Life Sciences Conference (LSC), Sydney, Australia

Lei Zhang. (2017). Henon Map Chaotic System Critical Points Analysis and Classification for the Dynamic Control of Brain Stimulation. Conference Proceedings - IEEE Xplore. 2017 IEEE XXIV International Conference on Electronics, Electrical Engineering and Computing (INTERCON), Cusco, Peru

Research Keywords: FPGA Embedded System Design; FPGA Implementation for Hardware Acceleration; Ultrasound Testing for Long Distance Pipelines; Boundary-Scan Testing; Design for Testability; Brain Computer Interface, Brain stimulation, Neural Network simulation

External Activities and Service

6 Graduate Students Supervised
Served on 4 Committees
18 national and international presentations since 2012.

Gary G. Zhao, Ph.D. P.Eng.
Professor, Petroleum Systems Engineering
Phone: 306-585-4736 **Email:** gang.zhao@uregina.ca

Education

Degree	Area of Study	Institution	Date
Ph.D.	Petroleum Engineering	University of Tulsa, Oklahoma	1999
M.Sc.	Petroleum Engineering	Research Institute of Petroleum Exp. & Dev., Beijing	1988
B. Sc.	Petroleum Engineering	Petroleum University of Southwestern China, Sichuan	1985

Select Teaching History and Times Taught

ENPE 300	13	ENPE 440	11	ENPE 450	11	ENPE 841	9

Publication Summary and Selected Publications

Journal Articles	Conference Proceedings	Technical Reports	Book Chapters	Books
34	45			

Su, C., Yuan, W. and Zhao, G.*: “Analytical Modeling of Multi-Stage Hydraulically Fractured Horizontal Well Producing in Multilayered Reservoir with Inter-layer Crossflow”, submitted to SPEREE, under review.

Su, Chang, Zhao, G.* and Jin, Y.C.: “Semi-analytical Modeling of 2-Dimensonal Heterogeneous Reservoir by Using Boundary Element Method”, under revision, to be submitted to SPEJ.

Zhao, G.: Reservoir Modeling Method, US Patent Application No. 12/837,683, 07/16/2010. Provisional file on July 16, 2009. Published on Jan. 20, 2011. US Patent No. 8, 275, 593 issued on Sept. 25, 2012.

Research Keywords: Well Testing for 2D/3D Heterogeneous Reservoirs, Naturally Fractured Reservoir Characterization, Parallel Computing for Reservoir Simulation, Tight Oil and Gas Reservoir Multistage Fracturing Optimization, CHOP Technology Studies and Wormhole Evaluation, Well (Horizontal and Lateral) Performance Analysis, Multiphase Fluid Flow in Heterogeneous Porous Media, EOR and CO2 Geo-Storage and Leakage Monitoring
External Activities and Service
24 Graduate students supervised / co-supervised. External Examiner for 6 graduate students.

APPENDIX II. ENROLMENT OF UNDERGRADUATE STUDENTS SINCE 2012

Total Enrollment						
	2012	**2013**	**2014**	**2015**	**2016**	**2017**
Full Time Students	666	814	990	1166	1222	1215
Part Time Students	132	122	134	127	148	150
FNMI	19	21	23	25	21	23
Female	164	183	232	227	230	245
Non-Female	634	753	892	1066	1140	1120
International	229	334	424	436	462	457
Domestic	569	602	700	857	908	908
Total	**798**	**936**	**1124**	**1293**	**1370**	**1365**

Percent Total						
	2012	2013	2014	2015	2016	2017
Full Time Students	83.5%	87.0%	88.1%	90.2%	89.2%	89.0%

Part Time Students	16.5%	13.0%	11.9%	9.8%	10.8%	11.0%
FNMI	2.4%	2.2%	2.0%	1.9%	1.5%	1.7%
Female	20.6%	19.6%	20.6%	17.6%	16.8%	17.9%
Non-Female	79.4%	80.4%	79.4%	82.4%	83.2%	82.1%
International	28.7%	35.7%	37.7%	33.7%	33.7%	33.5%
Domestic	71.3%	64.3%	62.3%	66.3%	66.3%	66.5%

Percent Change					
	2013	2014	2015	2016	2017
Full Time Students	22%	22%	18%	5%	-1%
Part Time Students	-8%	10%	-5%	17%	1%
FNMI	11%	10%	9%	-26%	-10%
Female	12%	27%	-2%	1%	7%
Non-Female	19%	18%	20%	7%	-2%
International	46%	27%	3%	6%	-1%
Domestic	6%	16%	22%	6%	0%

APPENDIX III. PROGRAM CREDIT REQUIREMENT INFO

ENEL Program (as an Example)

Master of Applied Science - Thesis (30 credit hours)

The Master of Applied Science is a research-oriented program with a thesis requirement.

ENEL 800 - ENEL 884	3 cr hrs
ENEL 800 - ENEL 884	3 cr hrs
ENEL 7xx or 8XX	3 cr hrs
ENxx or related discipline 7xx or 8xx	3 cr hrs
ENxx or related discipline 3xx-8xx	3 cr hrs
ENGG 401	3 cr hrs
ENGG 900	0 cr hrs
ENEL 901	12 cr hrs
TOTAL	**30 cr hrs**

***** Students may only take one Selected Topics, Special Topics or Directed Reading

Master of Engineering - Project (30 credit hours)

ENEL 800 - ENEL 884	3 cr hrs
ENEL 800 - ENEL 884	3 cr hrs
ENEL 7xx or 8xx	3 cr hrs
ENEL 7XX or 8xx	3 cr hrs
ENEL 800 - ENEL 884	3 cr hrs
ENxx or related discipline 3xx - 8xx*	3 cr hrs

ENxx or related discipline 3xx - 8xx*	3 cr hrs
ENxx or related discipline 3xx - 8xx*	3 cr hrs
ENGG 701	1 cr hr
ENGG 702	1 cr hr
ENGG 703	1 cr hr
ENEL 917 (may be taken over two semesters)	3 cr hrs
TOTAL	**30 cr hrs**

Master of Engineering - Co-op (42 credit hours)

ENEL 800 - ENEL 884	3 cr hrs
ENEL 800 - ENEL 884	3 cr hrs
ENEL 7xx or 8xx	3 cr hrs
ENEL 7xx or 8xx	3 cr hrs
ENEL 800 - ENEL 884	3 cr hrs
ENxx or related discipline 3xx -8xx*	3 cr hrs
ENxx or related discipline 3xx -8xx*	3 cr hrs
ENxx or related discipline 3xx -8xx*	3 cr hrs
ENGG 601	6 cr hrs
ENGG 602	6 cr hrs
ENGG 701	1 cr hr
ENGG 702	1 cr hr

ENGG 703	1 cr hr
ENEL 917 (may be taken over two semesters)	3 cr hrs
TOTAL	**42 cr hrs**

Doctor of Philosophy

Normally a student will only be admitted to the PhD program following the completion of a Master's program from a recognized university.

ENGG 800	3 cr hrs
ENEL 8xx*	3 cr hrs
ENEL 8xx*	3 cr hrs
ENEL 8xx*	3 cr hrs
ENxx 8xx*	3 cr hrs
ENGG 900	0 cr hrs
ENEL 901	45 cr hrs
TOTAL	**60 cr hrs**
ENGG 401**	3 cr hrs

The program requirements for a student with a Master of Engineering degree from the University of Regina who is admitted to the PhD program in Engineering are:

ENGG 800	3 cr hrs
ENEL 8xx*	3 cr hrs
ENEL 8xx*	3 cr hrs

ENEL 8xx*	3 cr hrs
ENxx or related discipline 8xx	3 cr hrs
ENGG 900	0 cr hrs
ENGG 903*	3 cr hrs
ENEL 901	45 cr hrs
TOTAL	**63 cr hrs**

ENGG 401** 3 cr hrs

APPENDIX IV. COURSE DESCRIPTION FOR ALL GRADUATE PROGRAMSES

Courses in General Systems Engineering

ENGG 600 Graduate Co-op Report (3)
The student makes a formal presentation of the report.

ENGG 601 Graduate Co-op Work Term (6)
First work placement.

ENGG 602 Graduate Co-op Work Term (6)
Second work placement.

ENGG 701 Engineering Practice and Experience in Canada (1)
This course will introduce students to the fundamentals of practicing engineering in Canada.

ENGG 702 Engineering Practice and Continuing Learning in the Workplace (1)
This course will introduce students to the concept of engineering practice and continuing learning in the workplace in Canada.

ENGG 703 Engineering Practice, Professional Development, Communication and Ethical Challenges (1)
This course will introduce students to the principle of engineering practice, professional development, communication and ethical challenges in Canada.

ENGG 789 Technical Writing Laboratory (1)
Introduction of technical writing concepts for graduate students with a specific focus on thesis and report writing. The course is intended to help students improve their general writing skills (grammar and organization), while at the same time learning principles and approaches for producing good quality thesis, report and article manuscripts. Specific topics to be covered include thesis and report writing, improving grammar and organization, literature reviews, and referencing and documentation, including plagiarism and how to avoid plagiarizing.
Prerequisite: Completion of 9 credit hours of any ENXX 901 (Thesis Research)

ENGG 800 Comprehensive Review of a Selected Topic in Engineering (3)
In consultation with thesis supervisor, the student will prepare and submit a written report on a

topic in Engineering related to his/her field of research. A final oral examination will be conducted by the supervisory committee.

ENGG 811 Advanced Process Control (3)
This course is an introduction to Advanced Process Control. The course deals with continuous systems. Discrete-time systems, Frequency domain analysis, Stability and robustness, Advanced multivariable model predictive control, and Process applications.

ENGG 812 Advanced Probability and Statistics (3)
Initially, the axioms of probability theory are presented. Random variables and random processes are then treated in detail. From this probability formalism, we develop a number of statistical methods for data analysis. Statistical modeling is also introduced. Applications of these concepts will be considered.

ENGG 813 Advanced Fluid Mechanics (3)
This course is an introduction to Advanced Fluid Mechanics. It deals with the concept of continuum, Microscopic equation of motion (continuity and momentum equations), NSE (unsteady laminar, flow in rectilinear ducts), Creeping flow, Inviscid flow, Boundary layer theory, Non-Newtonian flows, Introduction to porous media.

ENGG 814 Advanced Thermodynamics (3)
Basic concepts and definitions; Laws of TD; TD energies and general TD equations and relations; TD equations of state; TD properties; Applications of TD to various systems; Gibbs-Duhem equation; Gibbs phase rule; stability theories and general equations of equilibrium; Multiphase and multi-component systems; Chemical reactive systems.

ENGG 815 Modeling, Simulation and Computer-Aided Processes (3)
Simulation, Optimization modeling, integrated simulation/optimization and computer-aided tools for engineering systems, their application to a variety of engineering problems. Reinforces the practical issues of developing and using simulation systems. Explores the new and innovative technologies being developed to extend the applicability of simulation in different domains.

ENGG 816 Engineering Systems Analysis and Design (3)
This course explores advanced concepts and techniques employed in operations research and civil engineering system analysis. It focuses on system abstraction and models, modeling for system analysis, and optimization for system design.

ENGG 817 (480) Applied Artificial Intelligence (3)
Concepts treated include object recognition, computer vision, and robotics. Applications of these concepts to engineering problems will be presented. A project, applying artificial intelligence concepts, will be performed by the student.

ENGG 818 Advanced Numerical Methods (3)
Mathematical models, Solution of non algebraic equation, Direct methods for solving linear systems, Linear algebra iterative methods, Eigen-value problems, System of non-algebraic equations, Differences, Interpolation, approximation, Differentiation and integration, Initial value problem, Boundary value problem, PDE, Finite element and finite volume.

ENGG 819 A Systems Engineering Approach to Project Management (3)
The course covers the fundamentals of project management, nine knowledge areas, five process groups and forty-four processes. It takes a systems approach to managing engineering projects. Students will be exposed to concepts relevant to current industrial practices that adhere to global standard and the PMI project management body of knowledge.

ENGG 820 Economics for Practicing Engineers (3)
This course explores the cost analysis that accompanies large engineering projects. Analysis of the engineering system and value planning is covered. Additional topics include capital and operating cost estimation, discounting, comparative costing, and capital recovery.

ENGG 821 Business Law for Practicing Engineers (3)
Canadian law in the engineering profession is discussed with a focus on legal procurement, contracts, and intellectual property. Case studies explore permitting, licensing, regulatory systems, environmental impact assessment, and liability. The professional Code of Ethics are reviewed and emphasized.

ENGG 822 Risk Assessment and Management (3)
Strategies for minimizing exposure to technical, financial, and geopolitial risk are presented. Recent case studies from industry are discussed. Topics include event tree and fault tree analysis, risk-based decision-making, and decision consideration.

ENGG 900 Graduate Seminar in Engineering (0)
A seminar course devoted to basics of preparing and presenting of research projects. This course will mainly include research seminar presentations by graduate students. Registered students will be required to attend all ENGG 900 seminars and present one seminar.

ENGG 903 Research Methodology in Engineering (3)
This course will develop the research abilities of PhD students in Engineering. It includes various research methods in the fields of the students' PhD research.

Courses in Electronic Systems Engineering

ENEL 782 (ENEL 482) Powers Systems Design (3)
Application of concepts to power delivery and industrial use. Topics include power system

stability/power quality, power system specification, and analysis/design. Course involves at least one design project.

ENEL 784 (ENEL 484) Digital Control System Design (3)
Sampled data control theory and quantization effect modeling, analysis and design of digital control systems. Design using transform and state space methods. Application to industrial systems, interfacing to transducers and creation of feedback systems. Students learn the use of specialized techniques and design tools in laboratory culminating in a design and implementation of a digital control system.

ENEL 789 (ENEL 489) Application Specific Integrated Circuit Design (3)
Introduction to ASIC chips: circuit design, fabrication, testing, and cost analysis. Advanced synchronous digital design techniques such as pipelining, parallelism, and caching. Application to sorting, encoding, decryption, and digital filters. Students do a design using a high-level design language (VHDL) and test it on a RAM based FPGA.

ENEL 792 (ENEL 492) Telecommunications and Computer Networks (3)
Layered network models. Classification of Networks. Design Issues. Transmission Media. Wireless Transmission. Public Switched Telephone Network. Data Link Layer. Network Layer. Transport Layer. Overview of Local Area Networks.

ENEL 794 (ENEL 494) Telecommunication Systems Engineering Design (3)
Approaches to the design of telecommunication systems, based on specifications and constraints. Terrestrial and satelitte communications. Audio, video, and telephone systems. Noise and receiver fundamentals.

ENEL 795 (ENEL 495) Digital Signal Processing Design (3)
Applications of digital signal analysis. The use of Z transforms and discrete Fourier transforms in the design, analysis, and testing of systems. IIR and FIR filter design and analysis, DSP hardware and applications. Students learn the use of specialized equipment and design tools in laboratory, culminating in a design and implementation.

ENEL 821 RF and Microwave Engineering (3)
Fundamentals of radio frequency and microwave circuit analysis, design and measurements. Topics include review of transmission line analysis and Maxwell's equations, waveguide theory, microwave network analysis and scattering parameters; coupler and power divider design; resonator and filter design and computer aided design of RF circuits.

ENEL 822 RF Amplifier and Systems Design (3)
Single and multi-stage amplifier design, noise and non-linear distortion, matching network design, oscillator design, system level consideration of microwave transmission lines, resonators, distributed elements, lumped elements and filters.

ENEL 834 Smart Grid: Architecture, Design and Analysis (3)
The following topics are covered: Smart grid characteristics, components, distributed intelligence and automated control. Smart grid challenges. Smart meters technologies, architecture and design. Integration of renewable energy, distributed generation and energy storage. Smart grid reliability analysis. Two-way communication, privacy and security. Smart grid data management architecture and data analytics.

ENEL 835 Power Systems Advanced Protection and Control (3)
This course addresses advanced topics in power systems protection and control, including topics in digital relaying algorithms, protection and control integration, Intelligent Electronic Devices (IED) communications capabilities, transmission systems protection, substation protection and control, and station automation.

ENEL 857 Digital Signal Processing (3)
Theory and principles of digital signal processing. Topics covered include: digital signals, classification and mathematical modeling, linearity, shift-invariance, causality, stability, pulse response, frequency response, Z-transform, continuous-time system analysis, Fourier analysis and sampled-data signals, discrete-time system analysis, spectral analysis, IIR and FIR filters. **Prerequisite:** undergraduate introductory material in digital signal processing.

ENEL 862 Advanced Topics in Image Processing (3)
Introduction to Image Processing and Image Analysis. Image Enhancement is the Spatial Domain including Histogram Modification and Spatial Filtering. Image Enhancement is the Frequency Domain including Two-dimensional Frequency Representation of Images and frequency domain Filtering of Images. Finally material will be presented about: Image Restoration, Noise, Adaptive Filters and Inverse Filtering. This course is normally taught in the winter semester in even years.

ENEL 863 System Design and Testing using JTAG Boundary Scan (3)
Introduction to JTAG boundary scan: IEEE 1149.x Standard; design for boundary-scan testability(DFT); connection and functional testing using on-board JTAG devices such as CPU, CPLD, FPGA; testing of non-JTAG devices such as passive devices, logic devices and memory; debugging using boundary-scan. Other test methods are also covered.

ENEL 864 Field Programmable Gates Arrays (FPGA) Design Applicances (3)
This class provides the students with an understanding of FPGA-based digital design, embedded system design, and high-level synthesis design methodologies using ZedBoard and Xilinx Vivado design tool.

ENEL 865 Applied Machines Learning (3) effective 201810
Topics in this course include regression (linear regression with multiple features, nearest

neighbors & kernel regression, ridge regression), classification (linear classifiers, logistic regression, decision trees, boosting), clustering, and dimensionality reduction. The concepts of overfitting & regularization, feature selection, and performance evaluation are also included. Students will apply these concepts in implementation of practical machine learning applications.

ENEL 885AA-ZZ Selected Topics in Electrical Engineering (Variable credit 1-6)
Advanced topics in electrical engineering, including surveys of current literature. May be repeated for credit if area of study is different.

ENEL 890AA-ZZ Special Topics in Electrical Engineering (3)
Experimental or one-time only courses in advanced topics in electrical engineering.

ENEL 895AA-ZZ Directed Readings in Electrical Engineering (3)
Reading courses in advanced topics in electrical engineering.

ENEL 901 Research (Variable credit 1-15)
Thesis research.

ENEL 902 Engineering Project (3)
A supervisor-approved project requiring an in-depth study and investigation of an electronic systems engineering problem. An examining committee consisting of the supervisor, and one or more internal member(s) will provide a written evaluation of the project report. If the project is deemed satisfactory, an oral presentation open to the entire University community will be made.

ENEL 917 ESE M.Eng Project (3)
A two-semester, supervisor-approved project, restricted to the MEng program in ESE. The project may be the development and testing of a functional device or system incorporating both hardware and software, or it may be a major study of a technological issue. A formal written report and oral presentation are required.
Prerequisite: Completion of 15 units of MEng program and consent of instructor.

Courses in Environmental Systems Engineering

ENEV 801 Environmental Systems Engineering (3)
Systems engineering and mathematical modelling concepts. Application of systems approach to ecological systems (aquatic), natural transport systems (aquatic), water resources systems, terrestrial systems and engineering planning including environmental impact assessment. Surface water pollution by toxic substances.

ENEV 803 Water Resources Management (3)
Simulation and optimization of water resources management. Management of water projects and floodplains, Markov chain and Monte Carlo applications to water resources.

ENEV 804 – Prairie Water Quality, Treatment Design and Quantity (3)
This course investigates the uniqueness of Prairie water quality challenges in treatment design and allocation, as well as threats to water quantity and application. Includes discussion of dissolved nutrients, pesticides, PPCPs, and other water quality and treatment challenges. Discussion of impacts of economic growth, climate change, water allocation law are included around water quantity threats and opportunities. Planning and management through source water protection, agricultural evaluations, and others from the Prairie perspective.

ENEV 821 Geotechnical Properties of Soil (3)
Principles of effective stress, pore pressure parameters, strength of geotechnical materials, theories of consolidation and compressibility, swelling soils, anisotropy in soils, seepage and flow nets. Related laboratory measurements.

ENEV 831 (363) Physical-Chemical Processes for Water and Waste Treatment (3)
The various physical and chemical processes used in water and wastewater treatment, including, coagulation, flocculation, sedimentation, ActifloÒ ballasted clarification, depth/surface/membrane filtrations, disinfection, ozone, UV, advanced oxidation, adsorption, , softening, , ion exchange, chemical precipitation, flotation and DAF system, gas transfer and striping and sludge treatment and disposal.

ENEV 832 Biological Processes for Wastewater Treatment (3)
Wastewater microbiology, principles and design of biological wastewater treatment processes: suspended growth/attached growth, aerobic/anaerobic processes, pond treatment processes, activated sludge treatment processes, kinetic modeling for the activated sludge treatment process, basic design of activated sludge wastewater treatment system, basic design of nutrient removal processes, and sludge treatment and disposal.

ENEV 833 Design of Water and Wastewater Treatment Systems (3)
An application of the concepts of ENEV 831 and ENEV 832 in the design of water and wastewater treatment plants. . Basic design considerations, choice of proper treatment processes and development of the process train to achieve a desired level of water or wastewater treatment. Detailed design of unit treatment processes, detailed design of activated sludge biological wastewater treatment plant, and detailed design of biological nutrient removal plants. Prerequisite: ENEV 831 and ENEV 832 or permission of the instructor.

ENEV 834 Solid Waste Disposal and Management (3)
Magnitude of the problem. Quantity and composition of municipal solid waste. Collection Systems. Selection of disposal methods. Sanitary landfills. Incineration including on-site

incineration. Composting. Miscellaneous methods of disposal. Management considerations. Hazardous wastes - problems, impacts and disposal options.

ENEV 836 Mine Waste Management (3)
Geoenvironmental aspects of mine waste generation and disposal including: critical evaluation of engineering properties of processed earthen materials; segregation, sedimentation, and consolidation in tailings ponds; acid drainage and metal leaching in waste rock dumps; and geotechnical design of disposal facilities using emerging waste management technologies such as thickening and co-mixing.

ENEV 841 Urban and Regional Transportation Planning (3)
Context and definition of transportation planning, transportation in an urban setting, planning and decision making, data management and diagnosis, demand analysis, supply analysis, study of a selected software package for transportation planning, review of regional transportation studies.

ENEV 842 Economics and Evaluations of Transportation Systems (3)
Transportation cost models; technical concepts underlying economic evaluation methods; comparative assessment methods, cost-effectiveness and effectiveness index methods; example applications to highway and transit system.

ENEV 843 - Urban Traffic Management (3)
Traffic components and characteristics, traffic stream characteristics, traffic flow theory, data collection and traffic monitoring, fundamental concepts of uninterrupted flow facilities, freeway capacity and level of service, traffic control devices, fundamental concepts for interrupted flow facilities, principles of intersection signalization, analysis of signalized intersections, pedestrian and bicycle facilities.

ENEV 851 Groundwater & Contaminant Transport Modelling (3)
Finite difference and finite element simulation of groundwater flow and solute transport. Alternative methods; method of characteristics and random-walk method.

ENEV 852 Environmental Fluid Mechanics (3)
Turbulent flow, Reynolds equations; pollutant conservation equations; jet and plums; mixing, dilution and dispersion of pollutants discharge into rivers, lakes and oceans; hydraulics of effluent discharges into water bodies; and design of outfalls.

ENEV 862 Environmental Modelling and Decision-Making (3)
Optimization modelling for environmental management systems. Linear programming, separable and integer programming, transportation models, dynamic programming, and their application to a variety of environmental engineering problems.

ENEV 863 Air Quality Management (3)
Advanced topics in air pollution impact assessment, mechanisms related to air pollution problems, mitigation and adaptation of air pollution effects through a number of engineering measures, design of air pollution control facilities, air quality management and pollution control planning, and air quality prediction techniques.

ENEV 864 Petroleum Waste Management (3)
Generation of petroleum wastes and their impacts, treatment and disposal of petroleum wastes in exploration, production, and processing processes, remediation of petroleum contaminated sites, regulations related to petroleum wastes, and modeling for petroleum waste management systems.
Cross-listed with ENPC 864

ENEV 865 Hazardous Waste Management and Site Remediation (3)
Principles of hazardous waste management. Subsurface contamination and contaminant migration. Risk-based site investigation and assessment. Discussion on different types of in-situ and ex-situ remediation technologies, including pump and treat, soil vapor extraction, air sparging, bioremediation, permeable reactive barriers, and other innovative technologies.

ENEV 886AA-ZZ Selected Topics in Civil Engineering (Variable credit 1-6)
Advanced topics in civil engineering. May be repeated for credit if the topic is different.
Prerequisite: Permission of the instructor

ENEV 901 Research (Variable Credit 1-15)
Thesis research.
Prerequisite: Permission of the instructor

ENEV 902 Engineering Project (3)
A supervisor-approved project requiring an in-depth study and investigation of an environmental systems engineering problem. An examining committee consisting of the supervisor and one or more internal member(s) will provide a written evaluation of the project report. If the project report is deemed satisfactory, an oral presentation open to the entire University community will be made. This course is to be taken over 2 semesters at 3 credit hours each semester.

Courses in Industrial Systems Engineering

ENIN 800 Mechanical Behaviour of Materials (3)
Elastic, inelastic and plastic properties of single crystals and polycrystalline aggregates. Relationship between deformation in single crystals and polycrystals. Theories of work hardening, strengthening mechanisms, dislocation theory. Microscopic aspects of ductile and brittle fracture.

ENIN 801 Material Deformation Processes (3)
Identification of important material and process parameters in different types of mechanical working operations. Factors influencing working loads, limits of deformation, choice of type of operation. Analysis of stress and strain state in forging, rolling, drawing, extrusion and sheet-metal working.

ENIN 803 Introductory Engineering Fracture Mechanics and Design (3)
Fracture mechanics design approach, linear elastic fracture mechanics, crack-opening displacement, energy considerations, and the J-integral method. Environmental effects temperature radiation, hydrogen embrittlement. Design with defects. Prevention of catastrophic failures in components, vessels, and piping.

ENIN 804 Foundations of Solid Mechanics (3)
Three dimensional stresses and strains; stress and strain tensors; equilibrium and compatibility relations; constitutive equations; applications to elastic, plastic, and viscoelastic materials; finite strains; plane stress applications; stress concentration and implications to fracture.

ENIN 805 Introduction to Materials Science and Engineering (3)
Basic principles of materials science; control of strength and ductility in metals; atomic and crystal structure and microstructural control; crystal defects and mechanical behaviour; diffusion, phase diagrams and heat treatment; ceramics-structure, properties and applications; composites; other phenomena of interest.

ENIN 806 Metallurgy of Welding (3)
Features of various welding processes; welding arc characteristics; temperature distribution around welds; gas-metal interactions. Metallurgy of the weld zone in various alloys including carbon and stainless steels and aluminum alloys. Weld design, defects, distortion and fracture. **Prerequisite:** ENIN 805 or permission of instructor.

ENIN 810 (444) Introduction to Computer Aided Engineering (3)
Overview of computer aided engineering (CAE) as a tool to facilitate computer integrated manufacturing process. Topics include computer graphics techniques, engineering data base design, advanced analyses techniques and economic evaluation of CAE systems. Extension design/implementation projects will be completed.

ENIN 811 System Analysis and Synthesis (3)
Methods of analysing interrelated system components and synthesizing the components into a functional composite system. Defining and diagramming the system. Logical and mathematical modelling. Obtaining solutions of component and overall system requirements, system behaviour and system optimization.

ENIN 812 Finite Element Method of Engineering Systems (3)
The finite element method - direct, variational and weighted residual methods; generalized approach; sub-, iso-, and superparametric elements; equilibrium, propagation, eigenvalue, transient and steady-state analysis as applied to solid mechanics, fluid mechanics, heat transfer, ground water and electromechanical systems.

ENIN 820 Manufacturing Systems (3)
Identify fundamental and universal logic required to control manufacturing enterprises. Establish data-bases and sub-systems required to design closed loop computer integrated manufacturing systems. Provide a feasibility study, implementation plan, and impact study on existing staff for a manufacturing business.

ENIN 821 Robotics (3)
A comprehensive coverage of the field emphasizing design philosophy and development methodology. Designing, planning, and applying robotic technology with regard to mechanics, dynamics and control, load capacity and repeatability. Basic concepts associated with sensors, actuators, sensory feedback, programming and vision.

ENIN 822 Stochastic Systems Simulation (3)
Classification of systems; techniques for modelling systems; fundamentals of simulation; selection of probability distributions; generating system behaviour; performance analysis of systems; model validation; experimental design and optimization; elements of waiting line models; simulation languages, especially SIMAN.

ENIN 830 Fluid Dynamics (3)
Analysis of momentum transfer for Newtonian fluids in rectangular, cylindrical and spherical coordinates in laminar flow; shell balances, macroscopic balances; introduction to non-Newtonian fluids; boundary layer theory.

ENIN 831 Industrial Gas Processing (3)
Design and operation criteria encountered in industrial gas processing industry. Topics include physical and chemical properties and overall phase equilibrium of light hydro-carbons, field treatment of natural gas, gas transportation, gas hydrates, sour gas treating, dewpoint control, fractionation, gas separation processes, NGL production, sulphur recovery, environmental control and economic considerations.

ENIN 832 Industrial Air Pollution Control (3)
Chemical and physical characteristics of major industrial air pollutants, their behaviour in the atmosphere, technologies of particle collection and control of pollutant gases. Current environmental problems of regional and international interests are discussed.

ENIN 833 Computer-Aided Process Engineering (3)
Modelling of industrial processes including chemical processing, petrochemical manufacturing, and environmental processing. Computer simulation using ASPEN and other computer-aided process engineering software. Optimization techniques for process engineering problems. Industrial process case studies are discussed.

ENIN 834 - Introduction to Intelligent Systems (3)
Fuzzy Sets, Fuzzy Rules and Fuzzy Reasoning, Fuzzy Inference Systems, Adaptive Artificial Neural Networks, Supervised Learning Neural Networks, Adaptive Neuro-Fuzzy Inference Systems, Coactive Neuro-Fuzzy Modeling.

ENIN 835 Principles and Prevention of Corrosion (3)
Modern theories relating to corrosion protection. Thermodynamic and kinetic phenomena, corrosion measurements, inhibition of and design for corrosive environments. Case studies on corrosion of current interest are discussed.

ENIN 836 Energy Resources (3)
Technical, economic and human dimensional analysis of energy systems. Case study analysis of coal, oil and gas, nuclear, renewable or energy conservation. Safety, loss and prevention in energy systems.

ENIN 877 World Class Manufacturing Practices (3)
World Class Manufacturing (WCM) is a continuous-improvement system that drives success. The operating methodology focuses on trimming waste, boosting productivity and improving quality and safety. Work place pillars are defined. Monitoring and assessment tools are applied to production and processing, implementation, management and administration.

ENIN 880AA-ZZ Selected Topics in Industrial Systems Engineering (Variable credit 1-6)
Advanced topics in Industrial Systems Engineering. May be repeated for credit if the topic is different.

ENIN 901 Research (Variable credit 3-15)
Thesis research.

ENIN 902 Engineering Project (3)
A supervisor-approved project requiring an in-depth study and investigation of an industrial systems engineering problem. An examining committee consisting of the supervisor, and one or more internal member(s) will provide a written evaluation of the project report. If the project is deemed satisfactory, an oral presentation open to the entire University community will be made. This course is to be taken over 2 semesters at 3 credit hours each semester.

Courses in Petroleum Systems Engineering

ENPE 801 Surface Thermodynamics (3)
Basic postulations in thermodynamics, Euler equation and Gibbs-Duhem relation, Legendre transformation, thermodynamic potentials, systems in potential, systems in electric and magnetic fields will be studied. Also, Bulk, interfacial and linear phases, surface thermodynamics and mechanics of interfaces, excess energy at interfaces, and Gibbs adsorption will be covered.

ENPE 802 - Advanced Reservoir Fluid Analysis (3)
This course covers laboratory PVT and fluid property measurement for black oil, heavy oil and gas condensate; multi-phase equilibrium analysis and modeling; flow assurance studies of asphaltene, wax and hydrate; live reservoir fluid sampling; downhole fluid analysis; enhanced oil recovery related experiments.

ENPE 811 Advanced Reservoir Engineering (3)
Rock and fluid interfacial properties and capillary curve, advanced material balance for oil reserves, Buckley-Leverett equation for two phase immiscible displacement and fractional flow will be covered in detail. Also, reservoir performance by use of decline curves, pressure maintenance, oil trapping, and capillary number correlation are studied.

ENPE 821 Advanced Reservoir Simulation (3)
Development of reservoir simulation theory to the level required for the construction of a 3-phase, 3-dimensional reservoir simulator. Development of equations for multicomponent, multiphase flow between grid blocks comprising a petroleum reservoir. Various techniques for developing black-oil, compositional, thermal and dual-porosity models will be covered in this course.

ENPE 831 Advanced Enhanced Oil Recovery (3)
Microscopic and macroscopic displacement of fluids in a reservoir, mobility control processes, miscible displacement processes, chemical flooding, and thermal recovery processes will be covered in this course. Mathematical representations and physical descriptions will be developed. Carbon dioxide flooding and steam assisted gravity drainage will be covered in more depth.

ENPE 841 Advanced Well Testing (3)
Fundamentals of steady state and transient pressure analysis, multi-rate and well interface test, analytical and numerical Laplace and Stehfest Inverse Laplas transform, analysis of well test data by Green's function method, commingled layered reservoirs, dual porosity reservoirs, multi phase flow reservoirs, and horizontal well pressure behavior analysis will be studied.

ENPE 842 Geostatistics (3)
Understanding of Geological model, seismic data, sparse well data, productions, well test and tracer data. Establish spatial relationships for reservoir parameters and generate reservoir properties at interwell locations. Spatial modeling, conventional estimation, sequential conditional simulation. Also Grid Based modeling techniques, and Object Based modeling techniques will be reviewed.

ENPE 851 Mathematical Analysis of Multi Phase Flow in Reservoirs (3)
The principal objective of this course is to develop techniques for the solution of wide variety of multi phase flow problems in porous media for compressible and incompressible flow. Selected mathematical techniques will be developed for specific problems, and analytical and numerical solutions will be compared.

ENPE 860 Advanced Secondary Oil Recovery (3)
This course provides students with a thorough understanding of immiscible fluid displacement phenomenon in porous media. Immiscible displacement processes widely employed in the industry will be discussed. These will be mainly waterflooding and, to a less extent, gas flooding. Coverage of the processes will include design and evaluation.

ENPE 861 Fluid Flow in Porous Media (3)
Microscopic aspects of fluid flow in porous media: pore structure, capillarity, wettability, single phase flow, immiscible displacement, miscible displacement and dispersion. Critical examination of interactions among three main factors: transport phenomena, interfacial effects, and pore structures. Discussions of relative permeability, heterogeneity and viscous fingering, and film flow in three-phase systems.

ENPE 870 Advanced Production Engineering (3)
This course provides a detailed study of advanced topics in well completion design and techniques. Other topics include inflow performance, well stimulation, sand control and surface facilities. Issues related to horizontal wells will also be discussed.

ENPE 880AA-ZZ Selected Topics in Petroleum Engineering (3)
Advanced topics in Petroleum Systems Engineering. May be repeated for credit if the topic is different.

ENPE 881 Advanced Gas Reservoir Engineering (3)
Review of natural gas properties; reserve estimation techniques and advanced treatment of water influx in gas reservoirs; steady and transient single-phase gas flow in porous media; non-Darcy flow; deliverability tests; transient gas well testing and single and multiphase flow in circular conduits.

ENPE 901 Research (Variable Credit 1-15)
Thesis Research

ENPE 902 Engineering Project (3)
A supervisor-approved project requiring an in-depth study and investigation of a petroleum engineering problem. An examining committee consisting of the supervisor, and one or more internal member(s) will provide a written evaluation of the project report. If the project is deemed satisfactory, an oral presentation open to the entire University community will be made.

Courses in Process Systems Engineering

ENPC 821 Advanced Reaction Engineering (3)
Evaluation of types, mechanisms, rates and reactors required for various chemical and biochemical reactions; interpretation of reactor data for batch and flow reactors; selection of appropriate reactor for various reactions; flow patterns in industrial flow reactors; heterogeneous reaction systems; reactor design and modeling; heterogeneous catalysis; introduction to biochemical reaction systems.

ENPC 833 Advanced Mass Transfer (3)
Advanced topics in physical mass-transfer and mass-transfer with chemical reaction and their applications; the principles of mass-transfer with chemical reaction, diffusion and mass-transfer coefficients, multi-component mass-transfer processes, steady and unsteady state mass-transfer, mass transfer models and simulation, simultaneous heat and mass-transfer, and design of staged/continuous process equipment for mass-transfer.

ENPC 845 Advanced Transport Phenomena (3)
General concepts of momentum, heat and mass transfer. General balances: continuity, species continuity, energy and linear momentum equations. Rate expressions; Newton's law of viscosity, Fourier's law of conduction, and Fick's law of diffusion. Applications to multi-dimensional problems, convective transport, transport in turbulent flow, interphase transport and boundary layer theory.

ENPC 857 Membrane Separation Technologies (3)
This course covers the use of membrane technologies for separation processes and engineering applications. Topics include membrane process theory, traditional gas separation membranes, micro- and ultra-filtration, reverse osmosis, facilitated transport and absorption membranes. The manufacture of polymeric membranes, membrane fouling, wettability, and scale-up are also discussed**.**

ENPCE 863 Air Quality Managment (3)
Advanced topics in air pollution impact assessment mechanisms related to air pollution

problems, mitigation and adaptation of air pollution effects through a number of engineering measures, design of air pollution control facilities, air quality management and pollution control planning, and air quality prediction techniques.
*Cross-listed with ENEV 863 – Air Quality Management

ENPC 864 Petroleum Waste Management (3)
Generation of petroleum wastes and their impacts, treatment and disposal of petroleum wastes in exploration, production, and processing processes, remediation of petroleum contaminated sites, regulations related to petroleum wastes, and modeling for petroleum waste management systems.
Cross-listed with ENEV 864

ENPC 869 Advanced Heat Transfer (3)
Conservation of energy concepts and modes of heat transfer; advanced concepts of conduction heat transfer including steady and unsteady, multi-dimensional, different coordinate systems and applications; solution methods for conduction heat transfer governing equations including analytical and numerical approaches; advanced concepts of convection heat transfer; advanced concepts of radiation heat transfer.

ENPC 870 - Advance Topics in CO2 Caputure & Separation Using Reactive Solvents (3)
The class will cover the fundamental issues as well as the advanced topics in carbon capture and separation using reactive solvents. Recent progress and new developments of the subject will be described and its industrial applications will be discussed.

ENPC 880AA-ZZ Selected Topics in Process Systems Engineering (3)
Advanced topics in Process Systems Engineering

ENPC 901 Research (Variable Credit 3-15)
Thesis Research

ENPC 902 Process Systems Engineering Project (3)
A supervisor-approved project requiring an in-depth study and investigation of a Process Systems Engineering problem. An examining committee consisting of the supervisor and one or more internal member(s) will provide a written evaluation of the project report. If the project report is deemed satisfactory, an oral presentation open to the entire University community will be made.

Courses in Software Systems Engineering

ENSE 817 - Applied Artificial Intelligence (3)
Concepts treated include object recognition, computer vision, and robotics. Applications of these concepts to engineering problems will be presented. A project, applying artificial

concepts, will be performed by the student.

ENSE 818 - Ontology and Software Engineering (3)
The course focuses on development and use of ontologies in software engineering. It explores the development of ontologies in different application domains and how they can support and enhance the software engineering and data analysis processes.

ENSE 819 - Mobile Application Development (3)
The course objective is to study how to create mobile applications utilizing various methodologies, techniques and technologies. The course will introduce students to topics such as user-interface design, multi-modal development, integration of mobile device sensor data within applications, integration with back-end online services and APIs.

ENSE 828 - Developing Creative Software (3)
This course focuses on the software engineering process for building applications in creative technology arts and performances. Tools that support this development process will be studies and applied.

ENSE 834 - Smart Grid, Architecture, Design and Analysis (3)
This course covers the following topics: Characteristics of the smart grid, two-way communication, issues of privacy and security, smart grid elements and components, distributed intelligence and automated control systems. Smart grid environmental, economic and infrastructure challenges. Smart meters technologies, architecture and design. Architectural and design issues related to the integration of renewable energy, distributed generation and energy storage. Analysis of smart grid reliability. Smart grid asset monitoring and control technologies. Smart grid data management architecture and data analytics.
*Cross-listed with ENEL 834 – Smart Grid: Architecture, Design and Analysis

ENSE 865 - Applied Machine Learning (3)
Topics in this course include regression (linear regression with multiple features, nearest neighbors & kernel regression, ridge regression), classification (linear classifiers, logistic regression, decision trees, boosting), clustering, and dimensionality reduction. The concepts of overfitting & regularization, feature selection, and performance evaluation are also included. Students will apply these concepts in implementation of practical machine learning applications.
*Cross-listed with ENEL 865 – Applied Machine Learning

ENSE 870 – Advanced Software Design (3)
This course explores the software design methods currently in use in industry, comparing them with the techniques found in the literature. The course includes a design experiment that measures the effectiveness of the most advanced design techniques and provides a basis for a detailed exploration of the software design process.

ENSE 872 – Network Computing (3)
This course is designed for a detailed analysis of the concept of network computing, a survey of the advanced technologies of distributed systems and a review of some current and future directions of the state of the art of network computing. It includes a substantial term project.

ENSE 873 - Software Systems Data Analytics (3)
In this course, we will study state-of-the-art methods for software system data analytics including surveys of current literature. This includes exploratory data analysis, confirmatory data analysis, qualitative data analysis, machine learning and data visualization.

ENSE 874 – Advanced Software Process (3)
This course teaches the skills necessary to model and improve the software process in a company. Although the focus lies principally on software production, many of the concepts taught in the course are applicable to other fields.

ENSE 880 - Advanced Topics in Digital Networks (3)
Lectures are focused on advanced digital networks that illustrate characteristics of modern networks. Topics like ubiquitous and ad-hoc networks, vehicular communications, and safety applications may be covered. Students are expected to extend their knowledge through comprehensive survey on defined topics. This course prepares students for research on areas relevant to networking and mobile computing.

ENSE 882 – Advanced Multimedia Communication (3)
This course teaches many advanced concepts in multimedia communication. It covers multimedia compression in theory, techniques and standards as well as multimedia communication principles in wired and wireless networks.

ENSE 883 - Software Systems Architecture (3)
This courses focuses on back-end software systems architecture including design concepts, database concepts, and back-end software systems. Distributed software services of system architectures ranging from enterprise to industrial applications.

ENSE 885AA-ZZ – Selected Topics in Software Systems Engineering (1-6)
Advanced topics in Software Systems engineering, including surveys of current literature. May be repeated for credit if area of study is different.

ENSE 890AA-ZZ – Special Topics in Software Systems Engineering (3)
Advanced Topics in Software Systems Engineering.

ENSE 901 – Research (3-15)
Thesis Research.

ENSE 902 – Engineering Project (3)
A supervisor approved project requiring an in-depth study and investigation of a software systems engineering problem. An examining committee consisting of the supervisor, and one or more internal member(s) will provide a written evaluation of the project report. If the report is deemed satisfactory, an oral presentation open to the entire University community will be made.