ANNUAL REPORT

July 1, 2011 to June 30, 2012

Department of Mechanical and Materials Engineering

Faculty of Engineering

Western University

TABLE OF CONTENTS

MESSAGE FROM THE DEPARTMENT CHAIR

Welcome to Western's Department of Mechanical and Materials Engineering! As you browse this report, you'll discover that we have strong academic, research, and professional engineering programs. Our undergraduate and graduate students are provided with an education that is solidly based in the fundamentals, infused with creativity and innovation, and geared to instill a strong ethical responsibility commensurate with the engineering profession. They are well prepared to take on leadership roles in industry and government when they leave our programs.

The department had 231 undergraduate (years 2, 3 and 4) and 113 graduate students (2011). We awarded 58 BESc degrees and 35 graduate degrees this year. We think that we are the right size, where we are small enough to offer personal attention to our students and large enough to have broad, state-of-the-art technical expertise. While we are pleased with the state of the department, we are continually working to improve our undergraduate and graduate programs. Our numerous, high quality graduates are sought after by industrial employers from across the country, whilst many others continue on to graduate, medical, dental, business and law school, all taking with them core skills in engineering design. Indeed, every year, our senior undergraduates work on “real world” design projects sponsored by a variety of companies. In 2011/2012, these projects included the design of an elbow motion simulator, HVAC systems, personal mobility systems, jet flaps, an electric race car, a toilet flush valve and a linear winch. Most of these designs have been further developed and implemented by the sponsoring companies. Such projects provide an excellent opportunity to experience real engineering work and to make contacts in industry. We encourage all the students to participate in collegiate design competitions including the Formula SAE race car, the SAE Baja car, the solar car, the concrete toboggan, the SAE Aero remote-controlled aircraft and others.

In the past year, we have reviewed several aspects of our undergraduate curriculum and have continued to strengthen the experiential part of the program. We have introduced a new 2nd year course that introduces students to the principles of experimentation. We have restructured those courses dealing with the fundamentals of electrical engineering in order to expose students to the use of sensors, actuators and controls, which are becoming essential elements of modern intelligent mechanical systems. Our laboratories are among the best in the country. We have expanded in the scope of our the graduate professional programs in order to address society's needs. Our program in Heating, Ventilation and Air Conditioning (HVAC) addresses the current preoccupation with energy and its efficient use. The program in Engineering and Medicine addresses the needs of our aging society and the opportunities associated with maintaining healthy life styles, while the program in Composite Materials focuses on the automotive as well as biomedical industries both of which require improved and lighter materials.

Our students have the opportunity to participate in a variety of international experiences. We have an ongoing exchange program with the National University of Singapore and the University of Hong Kong. We have an exchange program with the University of British Columbia for students who want to experience other parts of Canada. We are finalizing an exchange program with the Tokyo Metropolitan University that includes students enrolled in graduate professional programs. This year we hosted 22 students from other countries, while we have also conducted an international project where our students worked together with those from the National University of Singapore on the design of a small hydroelectric power station.

Our department has several active student societies including the American Society of Mechanical Engineers (ASME), the Society of Automotive Engineering (SAE), the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) and the Canadian Society for Mechanical Engineering (CSME). These student societies have regular meetings, field trips to companies who hire our students and they participate in regional competitions and meetings.

Almost all of our faculty members are registered Professional Engineers and they come from all over the world. Many are highly recognized in their field and have earned numerous honors and awards from different engineering societies. They are very active in research and in generating new engineering knowledge. With annual externally funded research expenditures exceeding $10 million, research support is derived from major Federal research funding agencies, such as the Natural Sciences and Engineering Research Council, the Province of Ontario and industry. The department has several large research laboratories in the areas of thermofluids, materials, biomechanics, dynamics, computational mechanics and mechatronics, among others. The major research areas include: (i) Heat transfer, (ii) Fluid mechanics, (iii) Composite materials, (iv) Biomechanics, (v) Micro-electro-mechanical systems (MEMS), (vi) Mechatronics, (vii) Computational mechanics and (viii) Design. As you look through our web site, you'll find information on our research programs and the faculty who work in these areas.

We look forward to our continued success in the years to come.

J.M.Floryan
Professor and Chair

ADMINISTRATION

Chair

J.M. Floryan, Ph.D., P.Eng.
Professor

519-661-2111, Ext: 88330
Office: SEB 2051
Email: mfloryan@eng.uwo.ca

Associate Chair, Graduate Research Programs

K. Siddiqui, Ph.D., P.Eng
Associate Professor

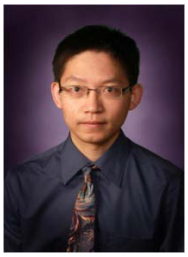
519-661-2111, Ext: 88234
Office: SEB 3078
ksiddiqui@eng.uwo.ca

Graduate Research Programs Committee 2011-2012

C. Dunning
A.G. Straatman
R. Klassen
J. Yang, Associate Chair, Professional Programs
K. Siddiqui, Associate Chair, Research Programs

Associate Chair, Graduate Professional Programs

J. Yang, Ph.D., P.Eng.



Associate Professor

519-661-2111, Ext: 80158
Office: SEB 3089
jyang@eng.uwo.ca

Graduate Professional Programs Committee 2011-2012

E. Savory
L. Jiang
K. Siddiqui, Associate Chair, Research Programs
J. Yang, Associate Chair, Professional Programs

Associate Chair, Undergraduate Affairs

J.T. Wood, Ph.D., P.Eng.
Associate Professor

519-661-3482
Office: SEB 3061
Email: jwood@eng.uwo.ca

Undergraduate Curriculum Committee 2011-2012

R.O. Buchal
L. Jiang
R. Khayat
S. Salisbury
J. Wood, Associate Chair, Undergraduate

AWARDS AND RECOGNITION

C.E. Dunning

Terry E. Base Award for Outstanding Teaching in Mechanical and Materials Engineering 2011-2012

J.M.Floryan

President, Canadian Congress of Applied Mechanics (CANAM) to be held in London in 2015
President, International Congress of Theoretical and Applied Mechanics to be held in Montreal in 2016

J. Johnson

Graham King Musculoskeletal Research Chair (2012-2016).

R. Klassen

Chair of the 24th Canadian Materials Science Conference (CMSC), London, Ontario, June 5-8, 2012

A.Straatman

President, CFD Society of Canada, 2012-2014

J.T.Wood

Leads the International Composites Research Centre (ICRC) established in 2012.

FACULTY MEMBERS AND ADMINISTRATIVE STAFF

1. FULL-TIME FACULTY MEMBERS

Asokanthan, S.F., Professor, Ph.D. Office: SEB 2057A
519-661-2111, x 88907 sasokanthan@eng.uwo.ca

Research Interests: Dynamics and Control; Inertial Sensing and Applications; Nonlinear and Stochastic Mechanics; Rotating Flexible Multi-body Systems

Buchal, R.O., Associate Prof, Ph.D., P.Eng. Office: SEB 2069C
519-661-2111, x 88454 rbuchal@eng.uwo.ca

Research Interests: Design Methods and Tools; Design Education; Instructional Technology; Manufacturing Inspection Planning

Dryden, J.R., Professor, Ph.D., P.Eng., Office: SEB 3057
519-661-2111, x 88307 jdryden@eng.uwo.ca

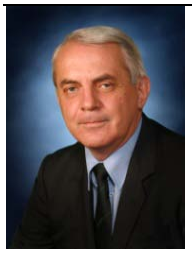
Research Interests: Solid Mechanics; Elasticity; Heat Conduction

Dunning, C.E., Associate Prof, Ph.D., P.Eng. Office: SEB 2077
519-661-2111, x 88306 cdunning@eng.uwo.ca

Research Interests: Human Orthopaedic Biomechanics; Joint Replacement (Implant) Design; Joint Kinematics; Impact Loading and Analysis

Ferreira, L., Assistant Prof, Ph.D., P.Eng. Office: SEB 3024
519-661-2111, x 86124 lferreira@uwo.ca

Research Interests: Medical Mechatronics; Implantable Transducer Design; Biomechanics of Major Joints Computer-Aided Systems for Orthopaedic Surgery



Floryan, J.M., Professor, Ph.D., P.Eng. Office: SEB 2051
519-661-2111, x 88330 mfloryan@eng.uwo.ca

Research Interests: Fluid Mechanics; Hydrodynamic Stability; Flow Control; Numerical Algorithms; Moving Boundary Problems; Immersed Boundary Conditions Method

Jenkyn, T.R., Associate Prof, Ph.D., P.Eng. Office: SEB 2075
519-661-2111, x 88339 tjenkyn@eng.uwo.ca

Research Interests: Orthopaedic Biomechanics; Advanced Medical Imaging; Musculoskeletal Computational Modeling; Injury Causation Biomechanics; Sport Science

Jiang, L.Y., Assistant Prof., Ph.D., P.Eng. Office: SEB 3076
519-661-2111, x 80422 lyjiang@eng.uwo.ca

Research Interests: Nanostructured Materials; Nanomechanics; Piezoelectric Materials; Thin Film Materials; Fracture and Failure Analysis

Johnson, J., Professor, Ph.D., P.Eng. Office: SEB 2076
519-661-2111, x 88255 jajohnso@eng.uwo.ca

Research Interests - Orthopaedic Biomechanics; Implant Design and Analysis; Joint Motion and Load Transfer

Khayat, R.E., Professor, Ph.D., P.Eng. Office: SEB 3086
519-661-2111, x 88253 rkhayat@eng.uwo.ca

Research Interests: Theoretical Fluid Dynamics; Free Surface and Interfacial Flows; Hydrodynamic Stability; Micro-Convective Heat Transfer; Newtonian and Complex Fluids

Klassen, R., Associate Prof, Ph.D., P.Eng. Office: SEB 3075
519-661-2111, x 88323 rklassen@eng.uwo.ca

Research Interests - Micro-Mechanical Properties of Materials; Time-Dependent Deformation of Materials; Microstructure /Mechanical Property Relationships

Knopf, G. K., Professor, Ph.D., P.Eng. Office: SEB 3087
519- 661-2111, x 88452 gknopf@eng.uwo.ca

Research Interests: Engineering Design; Geometric Modeling; Laser Micro-Fabrication; Optical Devices and Systems; Bioelectronics Biosensors

Kurowski, P., Assistant Prof, Ph.D., P.Eng. Office: SEB 3077
519- 661-2111, x 80125 pkurowski@eng.uwo.ca

Teaching: Product Design, Finite Element Analysis, Mechanical Vibrations, Kinematics and Dynamics

Research Interests: Teaching Methods in Design and Design Analysis, Engineering Curriculum Development

Naish, M.D., Associate Prof, Ph.D. Office: SEB 2055
519-661-2111, x 88294 naish@eng.uwo.ca

Research Interests: Mechatronic Systems; Computer-Assisted Surgery and Therapy; Surgical Robotics; Sensing Systems; Surgical Training; Medical Devices; Robotics

Salisbury, S.P., Assistant Prof., Ph.D., P.Eng. Office: SEB 3035A
519-661-2111, x 8074 ssalisbury@eng.uwo.ca

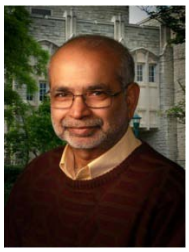
Research Interests: Piezoelectric Actuators; Real-Time Control; Dynamic Modelling and Analysis; Mechatronic System Integration

Savory, E., Associate Prof, Ph.D., P.Eng, C.Eng Office: 3085
519-661-2111, x 88256 esavory@eng.uwo.ca

Research Interests: Experimental Fluid Dynamics; Wind Engineering; Environmental Flows; Biological Fluid Mechanics

Siddiqui, K., Associate Prof, Ph.D., P.Eng. Office: SEB 3078
519-661-2111, x 88234 ksiddiqui@eng.uwo.ca

Research Interests: Experimental Fluid Mechanics; Turbulence; Interfacial Fluid Dynamics and Heat Transfer; Alternative Energy Systems; Energy Conversion



Singh, A.V., Professor, Ph.D., P.Eng. Office: SEB 2059A
519-661-2111, x 88321 avsingh@eng.uwo.ca

Research Interests: – Computational Methods; Vibrations of Plates and Shells; Mechanics of Composite Materials; MEM and Nano Structures

Straatman, A.G., Professor, Ph.D. P.Eng. Office: SEB 2069B
519-661-2111, x 88249 astraatman@eng.uwo.ca

Research Interests: Computational Fluid Dynamics; Porous Materials; Convective Heat Transfer; Turbulence

Sun, X.A. (Andy), Associate Prof, Ph.D. Office: SEB 3059
519-661-2111, x 87759 xsun@eng.uwo.ca

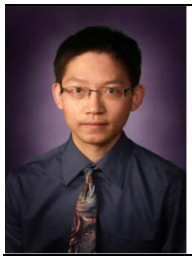
Research Interests: Nanotechnology; Nanomaterials; Clean Energy Fuel Cells; Lithium Ion Batteries; Energetic Materials

Tutunea-Fatan, O.R., Assistant Prof, Ph.D Office: SEB 2063A
519-661-2111, x 88289 rtutunea@eng.uwo.ca

Research Interests: Multi-Axis CNC Machining; Computer-Aided Design and Manufacturing; Intelligent Machining Systems; Numerical Methods

Wood, J.T., Associate Prof, Ph.D., P.Eng. Office: SEB 3061
519-661-3482 jwood@eng.uwo.ca

Research Interests: Structure – Property Relationships; Lightweight Structural Materials for Automotive Applications; Magnesium Die-Casting; Composite Materials



Yang, J., Associate Prof, Ph.D., P.Eng. Office: SEB 3089
519-661-2111, x 80158 jyang@eng.uwo.ca

Research Interests: Nanofabrication; Atomic Force Microscopy (AFM); MEMS/NEMS; BioMEMS; Lab-on-a-chip; Microfluidics; Nanomaterials; Polymers; Biomedical Devices; Biophysics

Zhang, C., Professor, Ph.D., P.Eng. Office: SEB 2065
519-661-2111, x 88345 czhang@eng.uwo.ca

Research Interests - Computational Fluid Dynamics; Gas-Solid Two-Phase Flows; Vapor-Liquid Two-Phase Flows; Combustions and Emission Controls

2. PROFESSOR EMERITI

D.M. Shinozaki, Professor, D.Phil (Oxon)-Materials
J.D. Tarasuk, Professor; P. Eng.; Ph.D.-Mechanical

3. ADJUNCT ACADEMIC PROFESSORS

A Barari, Ph.D
Faculty of Engineering and Applied Science
UOIT
905-721-8666, x 2321
Email: ahmad.barari@uoit.ca

Automotive Body and Structural Design and Analyses, Geometric Inspection and Coordinate Metrology, Tolerance Analyses, Computer-Aided Design, DFM

E. Bordatchev, Ph.D., Dr.Sc.(Eng)
National Research Council- IMTI
519-430-7107
Email: Evgueni.Bordatchev@nrc.gc.ca

High-precision microfabrication; dynamics, monitoring, diagnostics, control and optimization of micromachining processes; micro molds/dies; micromechatronics; MEMS/MOEMS; micromechanisms; microsensors; micromanipulations.

R. Canas, Ph.D.
National Research Council-IMTI
519-430-7102
Email: Roberto.canas@nrc.gc.ca

Mathematics and physics modeling. Finites element, Computational Fluid Dynamics, Particle modeling, High performance computing and high performance graphic. Haptics and Virtual Environment. Non Destructive Testing. Application for Manufacturing, Automotive, Aerospace and Nuclear Energy.

H.Y. Feng, Ph.D.
Associate Professor, Dept of Mechanical Engineering
The University of British Columbia
6250 Applied Science Lane, Vancouver, B.C. V6T 1Z4
604-822-1366
Email: feng@mech.ubc.ca

Precision CNC Machining; Computer-Aided Design and Manufacturing; Precision Geometric Inspection.

R. Gurka, Ph.D.
Department of Chemical Engineering
Ben-Gurion University of the Negev
Beer Sheva, 84105, Israel
Email: gurka@bgu.ac.il

Turbulent and complex flows; Transport phenomena in biological flows; Experimental fluid dynamics.

F. Henning, Ph.D.
Fraunhofer Institute for
Chemical Technology, ICT,
Germany
490721-4640-420
Email: frank.henning@ict.fraunhofer.de

Composite materials, in-line compounding of long-fibre reinforced polymers, injection moulding,design and construction of composite parts.

N. Kaloni, M. Tech.,Ph.D.
Professor Emeritus, University of Windsor
519-253-3000, ext. 3024
E-mail: Kaloni@uwindsor.ca, Pkaloni@uwo.ca

Mathematical Modeling of Physical Problems in Fluid Mechanics; Non-Newtonian Fluids; Viscoelastic Fluids; Magnetic Fluids; Flow and Heat Transfer in Porous Media; Linear and Non-linear Stability of Convection Problems.

R. Martinuzzi, Ph.D., P.Eng.
Dept. of Mechanical & Manufacturing Engineering
University of Calgary, Calgary, Alberta
403-220-6627
Email: rmartuni@ucalgary.ca

Turbulence research; heat transfer in external, cross-flow heat exchanges and internal flows; three-dimensional anisotropic flow fields.

S. Nikumb, Ph.D.
National Research Council-IMTI
519-430-7058
Email: suwas.nikumb@nrc.gc.ca

Laser micro-processing of materials, high power laser development, photonic band gap materials, porous semiconductors, machine & process dynamics, micro-devices & sensor fabrication, micro-electro-mechanical-systems (MEMS), diode laser joining of materials and multi-kilowatt carbon di-oxide lasers.

M. Sadayappany, Ph.D.
CANMET - Materials Technology Laboratory
Natural Resources Canada, McMaster Innovation Park
289-922-8567
Email: Ksadayap@nrcan.gc.ca

Permanent mold casting of non-ferrous metals, development of lead-free copper alloys for plumbing applications, alloy development and solidification processing of light metals including aluminum and magnesium.

L. Wang, P.Eng., Ph.D.
Email: lwang35@uwo.ca

Distributed machining process planning; Adaptive assembly process planning; Web-based real-time monitoring and control of distributed machines; Function block-based integration of planning, scheduling, and execution monitoring.

L. Xue, Ph.D.
Group Leader, Material Addition Processes
National Research Council-IMTI
519-430-7059

Email: Lijue.Xue@nrc-cnrc.gc.ca

Development of laser and other materials processing technologies, new materials, metallurgical characterization and evaluation of material's properties and responses (including corrosion, wear, tensile, compression, fatigue, etc.).

4. VISITING PROFESSORS

Dr. Xiaobing Cai, Beijing Institute of Technology, P.R. China
Dr. Hong Chen: Chongqing University, P.R. China
Dr. Alberto Garcia Pinar, Universidad Politecnica de Cartagena, Spain
Dr. Ayumu Inasawa, Tokyo Metropolitan University, Tokyo, Japan
Dr. WenPing Mou, Chengdu Aircraft Industrial Group Co.Ltd., P.R. China
Dr. Botao Peng: Trojan UV Technologies, London, Ontario
Dr. Eva Potyra, Fraunhofer Institute for Chemical Technology, Germany
Dr. Tobias Potyra, Fraunhofer Institute for Chemical Technology, German
Dr. Xiaolong Wang, The Hong Kong Polytechnic University, Hong Kong
Dr. Lin Wang: Beijing Institute of Technology, P.R. China

5. ADMINISTRATIVE SUPPORT STAFF

Chris Seres
Administrative Assistant
Telephone: 519-661-2136
Fax: 519-661-3020 Email: cseres@.uwo.ca

Joanna Blom
Graduate Coordinator
Telephone: 519-850-2939
Fax: 519-661-3020 Email: jblom@uwo.ca

Claire Naudi
Coordinator, Undergraduate and MEng Programs
Telephone: 519-661-4122
Fax: 519-661-3020 Email: cnaudi@uwo.ca

6. TECHNICAL SUPPORT STAFF

Walid Altahan
Laboratory Manager
Spencer Engineering Building, Room 1063
Telephone: 519-661-2111 Ext: 88293
Email: waltahan@eng.uwo.ca

Dave Lunn
Laboratory Supervisor
Spencer Engineering Building, Room 1066
Telephone: 519-661-2111 Ext: 81516
Email: dalunn@uwo.ca

Adam Woodhouse
Laboratory Supervisor
Spencer Engineering Building, Room 1065
Telephone: 518-661-2111 Ext: 88282
Email: awoodhou@uwo.ca

UNDERGRADUATE EDUCATION

The Department of Mechanical and Materials Engineering offers an accredited program in Mechanical Engineering. In preparation for a career in Mechanical Engineering, the program at Western endeavours to balance the theory and applications necessary for the spectrum of work situations. The first year courses are common with all other disciplines in Engineering. The second and third year courses focus on the fundamental areas of Mechanical Engineering. In the fourth year, students are given an opportunity to select electives in areas of interest or specialization. The program focuses on a broadly based Mechanical & Materials Engineering education that stresses: fundamental engineering concepts, contemporary design practices, development of interpersonal skills, and interaction with engineering practitioners.

1. MECHANICAL ENGINEERING PROGRAM

Second Year Program
Applied Mathematics 2413, ES 2211F/G, MME 2202A/B, MME 2204A/B, MME 2213A/B, MME 2259A/B, MME 2260A/B, MME 2273A/B, MME 2285A/B, Statistical Sciences 2143A/B, 0.5 non-technical elective*. *Selection of the non-technical elective must be approved by the Department Counselor to satisfy the CEAB requirements of subject matter that deals with central issues, methodologies, and thought processes of the humanities and social sciences. An approved list can be found on the Engineering website.

Third Year Program
Applied Mathematics 3413A/B, ECE 3373A/B, ECE 3374A/B MME 3303A/B, MME 3307A/B, MME 3334A/B, MME 3360A/B, MME 3379A/B, MME 3380A/B, MME 3381A/B.

Fourth Year Program
There are four options: Mechanical Engineering Option; Mechanical Engineering and Law Option; Mechanical and Medicine Option; Mechanical Engineering and Business Option

Mechanical Engineering Option

Business Administration 2299, ES 4498F/G, MME 4499. Six of the following technical electives: MME 4401Y, MME 4414A/B, MME 4422A/B, MME 4423A/B, MME 4424A/B, MME 4425A/B, MME 4427A/B, MME 4428A/B, MME 4429A/B, MME 4443A/B, MME 4445A/B, MME 4446A/B, MME 4450A/B, MME 4452A/B, MME 4453A/B, MME 4459A/B, MME 4460A/B, MME 4464A/B, MME 4469A/B, MME 4473A/B, MME 4474A/B, MME 4475A/B, MME 4479A/B, MME 4480A/B, MME 4481A/B, MME 4482A/B, MME 4483A/B, MME 4485A/B, MME 4486A/B, MME 4487A/B, MME 4491A/B, MME 4492A/B. Students may elect to substitute technical electives from other engineering disciplines or from the Faculty of Science, provided they have the required prerequisites, and provided at least half of their technical electives are chosen from the above list. A maximum of two 0.5 courses may be taken from the Faculty of Science and used towards the BESc degree. All courses outside of the MME list must be approved by the Department of Mechanical and Materials

Mechanical Engineering and Law Option

Admission
Before entering the combined BESc/LLB degree program, students must have completed the first three years of the Mechanical Engineering program at Western (or equivalent). In addition to applying for the combined degree program through the Office of the Associate Dean - Academic of the Faculty of Engineering, students must also make a separate application to the Faculty of Law for admission into the LLB program by the published deadline, May 1. In the application to the Law School, the applicant must indicate that he or she is applying to the combined BESc/LLB program.

Admission Criteria
To be eligible for the combined degree program, students must have completed all the requirements of the first year curriculum in the Faculty of Engineering, and the second and third year program, Option B, in the Department of Mechanical Engineering with either a minimum cumulative weighted average (CWA) of 80% or stand in the top 10% of the class. In addition, the applicant must meet the minimum LSAT requirement

established by the Law School Admission Committee for all combined degree programs. Entrance into the combined degree program is competitive and limited.

Progression Standards
Once admitted to the combined program, students are required to maintain a minimum year weighted average of 75% in their Engineering curriculum courses and a B average in their Law courses.

Failure to Meet Progression Standards
A student who fails to meet the combined program progression standards in any year will be required to withdraw from the combined program. However, a student who has met the progression standards of either the Engineering or LLB program, will be allowed to proceed to the next year of that program. If the progression standards of both individual programs have been satisfied, the student may continue in either program and may petition the Faculty whose program was not selected for permission to complete that program at a later date. A student who is required to withdraw from the combined program and wishes to pursue either or both of the individual programs, must complete all the degree requirements of the individual program or programs in order to graduate from that program or those programs.

First Year Program
Common first year of Engineering.

Second Year Program
Applied Mathematics 2413, ES 2211F/G, MME 2202A/B, MME 2204A/B, MME 2213A/B, MME 2259A/B, MME 2260A/B, MME 2273A/B, MME 2285A/B, Statistical Sciences 2143A/B, 0.5 non-technical elective*. *Selection of the non-technical elective must be approved by the Department Counsellor to satisfy the CEAB requirements of subject matter that deals with central issues, methodologies, and thought processes of the humanities and social sciences. An approved list can be found on the Engineering website.

Third Year Program
Applied Mathematics 3413A/B, ECE 3373A/B, ECE 3374A/B MME 3303A/B, MME 3307A/B, MME 3334A/B, MME 3360A/B, MME 3379A/B, MME 3380A/B, MME 3381A/B

Fourth Year Program
First year Law curriculum. No courses outside Law may be taken during this year.

Fifth and Sixth Year Programs
MME 4450A/B, MME 4425A/B
MME 4499
In years five and six students must complete the following requirements for the LLB:
• The two compulsory upper-year Law courses
• At least three Law core-group courses (must include Law 5220)
• Additional Law courses equaling at least 25 credit hours (must include one of the optional courses listed below under “The Impact of Technology on Society”)
• One Law course must have an essay requirement of at least two credit hours.
Notes: Fulfillment of the Faculty of Engineering requirement of courses that expose students to the impact of technology on society, ethical issues, and economics must be taken as follows:
• Ethical Issues: Law 5130 “Legal Ethics & Professionalism” – part of the first year Law curriculum.
• The Impact of Technology on Society: One of: Law 5615 “Biotechnology Law”, Law 5605 “Advanced Issues in Technology Law”, Law 5350 “Media Law”, Law 5600 “Advanced Intellectual Property”, Law 5620 “Information Law”, the former Law 453 “Internet Law”, Law 5625 “Intellectual Property”, Law 5630 “International Protection of Intellectual Property”, or Law 5610“Advanced Patent Law”.
In addition, there may be a Selected Topics course offered which may be approved on an individual basis.
• Economics: Law 5220 “Income Taxation”.

Exchange Programs
Students enrolled in the combined program are not eligible for an exchange program with the Faculty of Engineering; however, they may be eligible for an exchange through the Faculty of Law in Year Five or Six. This will require advanced planning with both faculties.

Mechanical Engineering and Medicine Option

Admission
Before entering the concurrent BESc/MD degree program, students must have completed the first three years of the Mechanical Engineering program at Western, Option C (Mechanical Engineering and Medicine). In addition to applying for the concurrent degree program through the Office of the Associate Dean - Academic of the Faculty of Engineering, students must also make a separate application for admission into the MD program. As a part of the application process, students must write a letter to the Schulich School of Medicine & Dentistry (Admission Office) indicating their intent to proceed into the concurrent BESc/MD program.

Admission Criteria
To be eligible for the concurrent degree program, students must have completed all the requirements of the first year curriculum in the Faculty of Engineering with a minimum year weighted average (YWA) of 80%, and the second and third year program of Option C (Mechanical Engineering and Medicine), in the Department of Mechanical and Materials Engineering, with a minimum year weighted average (YWA) of 80% in each year. In addition, the applicant must meet the minimum performance standards in the MCAT and GPA, determined by the Schulich School of Medicine & Dentistry, and must be invited and attend a personal interview with the Schulich School of Medicine & Dentistry. A confidential assessment form, proficiency in English and Basic Life Support Training is also required. Entrance into the concurrent degree program is competitive and limited.

Admission Procedures
A student interested in the concurrent BESc/MD program will apply during the February registration period of the first common year of the Engineering program for admission to the Mechanical Engineering program, Option C (Mechanical Engineering and Medicine). The student must write the MCAT before the third year of the Mechanical Engineering and Medicine program, for the following year's admission into the MD program. Students must apply to the MD program by the deadline established (usually October) by the Ontario Medical School Application Service (OMSAS) during the third year of the Mechanical Engineering and Medicine program.
Admission to the BESc program does not guarantee admission to the MD program.

Progression Requirements
A student enrolled in the concurrent BESc/MD degree program must satisfy the following progression requirements:
Year 2: a minimum YWA of 80% in courses taken as a part of Option C (Mechanical Engineering and Medicine)
Year 3: a minimum YWA of 80% in courses taken as a part of Option C (Mechanical Engineering and Medicine)
Year 4: progression requirements of the MD program and successful completion of Engineering courses.
Year 5: progression requirements of the MD program
Year 6: progression requirements of the MD program
Year 7: progression requirements of the MD program and successful completion of Engineering courses.
If the student fails to satisfy the conditions above, he or she will be required to withdraw from the concurrent program and will be required to transfer out of Option C into Option A of the Mechanical Engineering program.

Concurrent Degree Program

First Year Program
Common first year of Engineering.

Second Year Program
Applied Mathematics 2413, MME 2202A/B, MME 2204A/B, MME 2213A/B, MME 2259A/B, MME 2260A/B, MME 2273A/B, MME 2285A/B, Statistical Sciences 2143A/B, ES 2211F/G, Business Administration 2299.

Third Year Program
Applied Mathematics 3413A/B, ECE 3373A/B, ECE 3374A/B, ES 4498F/G, MME 3303A/B, MME 3307A/B, MME 3334A/B, MME 3360A/B, MME 3379A/B, MME 3380A/B, MME 3381A/B

Fourth Year Program
MME 4425A/B, MME 4450A/B.
Regular Year 1 of the MD program.

Fifth Year Program
Regular Year 2 of the MD program.

Sixth Year Program
Regular Year 3 of the MD program.

Seventh Year Program
Regular Year 4 of the MD program less the Advanced Communication Skills course.
MME 499 (will count as an "elective" credit in the fourth year of the MD program).

Mechanical Engineering and Business Option

Admission Requirements
Normally, students apply to the HBA program during their second year in Engineering by the published deadline. Application for the combined program is made during the first year in the HBA program. Students applying to the Ivey Business School's Academic Excellence Opportunity (AEO) are also eligible to be considered for the combined program. Admission to the program is competitive and limited. Upon completion of the program students will receive both an HBA and a BESc degree.

To be eligible for the combined program, all students, including those admitted via the AEO route, must have completed all the requirements of the first year curriculum in the Faculty of Engineering and the second year program in the Department of Mechanical and Materials Engineering. Students must obtain a weighted average (YWA) of 78% in each year. During the second year of the program students are required to complete Business Administration 2257 with a minimum grade of 70%. Demonstrated participation in extra curricular and/or community activities, leadership and work experience are also admission criteria.

Progression Standards
Students in this combined program must meet the following progression standards: Students enrolled in first year HBA (Year Three) must attain at least 78%.

In Years Four and Five, students must attain a minimum weighted average of 75% in their 4000 level HBA courses and a 75% average in their Engineering courses.

Failure to Meet Progression Standards
A student who fails to meet the progression standards in any year must withdraw from the combined program. However, a student who has met the progression standards of either the HBA or BESc program will be allowed to proceed to the next year of that program. If the progression standards of both individual programs have been satisfied, the student may continue in either program and may petition the School or Faculty whose program was not selected for permission to complete that program at a later date. A student who is required to withdraw from the combined program and wishes to pursue either or both of the individual programs, must complete all the degree requirements of the individual program or programs in order to graduate from that/those program(s).

First Year Program
Regular first year curriculum in the Engineering program.

Second Year Program
Applied Mathematics 2413, MME 2202A/B, MME 2204A/B, MME 2213A/B, MME 2259A/B, MME 2260A/B, MME 2273A/B, MME 2285A/B, Statistical Sciences 2143A/B, Business Administration 2257.

Third Year Program
Business Administration 3300, 3301, 3302Y, 3303, 3304, 3305Q/R/S/T, 3307, 3308A/B, 3316.

Fourth Year Program
Applied Mathematics 3413A/B, MME 3303A/B, MME 3307A/B, MME 3334A/B, MME 3360A/B, MME 3379A/B, MME 3380A/B, MME 3381A/B, MME 3385Y, ECE 3373A/B, ECE 3374A/B, Business Administration 4430.

Fifth Year Program

MME 4499, MME 4492A/B, ES 4498F/G
Two 0.5 technical electives
Business Administration 4415Q/R/S/T, 4505A/B, 4466A/B, three 4400 level Business half course equivalents.

Exchange Programs
Academic exchange opportunities are not available for the combined degree program because of the core and elective courses required in Years Four and Five.

2. UNDERGRADUATE ENROLLMENT

Full Time

	Year 1	Year 2	Year 3	Year 4	TOTAL
Mechanical	n/a	76	82	54	212

Part Time

	Year 1	Year 2	Year 3	Year 4	TOTAL
Mechanical	n/a	5	13	1	19

3. DEGREES GRANTED

Fall 2011	Spring 2012
6	52

4. UNDERGRADUATE AWARDS

Recipients (Fall 2011) – Students registered in the Department of Mechanical and Materials

ASHRAE Award
Awarded annually to a student in his/her fourth year in the Department of Mechanical and Materials Engineering based on academic achievement and the candidate's mark in Thermodynamics II, continuing educational studies, and career goals in the heating, refrigeration and air conditioning profession. This award is made possible by the generosity of ASHRAE, London Chapter, Canada.

Awarded To: Mayank Sharma

Andrea Bailey Memorial Award
4th Year MME Awarded to a female student entering fourth year of Mechanical and Materials Engineering who demonstrates financial need, a minimum 75% academic average and involvement in extracurricular activities at the University and in the community. Preference will be given to a student meeting the stated criteria who is in a concurrent degree program. The recipient must not be in receipt of any other award in the Department of Mechanical and Materials Engineering. This award was established by friends and family in memory of Andrea Bailey.

Awarded to: Rebecca Dean

Ian Duerden Memorial Award
3rd Year MME Awarded to a full-time undergraduate student in his or her third year of the Mechanical and Materials Engineering program who demonstrates financial need and achieves a minimum 75% academic average. This award was established through Foundation Western in memory of Ian Duerden, a former Associate Dean of the Faculty of Engineering.

Awarded to: David Rozhko

Lynda Diane Shaw Memorial Award
4th Year MME Awarded to a student entering the fourth year of the Mechanical Engineering program in good standing. This student must have been active in community service activities, student clubs and extra-curricular activities and possess good interpersonal skills. Established by friends, colleagues and family in memory of Lynda Diane Shaw.

Awarded to: David Drysdale

125th Anniversary Alumni Award in Engineering
Awarded to a full-time undergraduate student in Year 2 or higher in the Faculty of Engineering based on academic achievements.

Awarded to: Daniel Rozhko

Andrade Family Award in Engineering
Awarded annually to a full-time undergraduate student in 2nd or 3rd year of the Mechanical and Materials Engineering program, based on a minimum 75% average, and demonstrated volunteer and leadership skills through participation in university life.

Awarded to: Nathan Curiale

Dr. Clement Bowman Award for Energy Innovation
Awarded annually to a full-time student in the Faculty of Engineering who is in their final year of an undergraduate program, has achieved a minimum 76% average, and has worked on a project that is related to energy innovation.

Awarded to: Raphael Kopala

Lynn Fordham Awards in Science and Engineering
Awarded annual to students in Engineering who demonstrate academic excellence and possess leadership qualities.

Awarded to: Daniel Rozhko

Donald P. Morris Engineering Award
Awarded to a full-time undergraduate student in year 2 or higher of any Engineering program based on academic achievement and involvement in extra-curricular activities that demonstrate leadership skills.

Awarded to: Mayank Sharma

Craig O'Hagan Memorial Award
Awarded to a full-time undergraduate student in the third year of a program in Mechanical Engineering, Biochemical and Environmental Engineering or Civil and Environmental Engineering based on academic achievements.

Awarded to: Aaron Yurkewich

Vladimir Stritesky Engineering Award
Awarded annually to a full-time undergraduate student in any engineering program. Preference will be given to a student who has immigrated to Canada.

Awarded to: Mayank Sharma

D. Carlton Williams Scholarship
Awarded to: Lauren Cuthbertson

Four Year Continuing Admission Scholarship Program
Awarded to: Malcolm Chorel, Mehan; Patricia Clynick; Jacob Mckenzie Reeves; Daniel Rozhko

General Motors of Canada Limited Scholarship of Distinction in Engineering
Awarded to: Daniel Rozhko

T.R. Meighen Family Foundation
Awarded to: Sarah Goodridge

Walker Wood Foundation Continuing Scholarship
Awarded to: Jacob Reeves

Recipients (Spring 2012) Awards of the Graduating Class June 2012 – Students registered in the Department of Mechanical and Materials

The John E.K. Foreman Gold Medal in Mechanical and Materials Engineering

This medal is named in honour of the late Dr. J.E.K. Foreman, the first Professor and Group Chair of Mechanical Engineering in the Faculty of Engineering. It is awarded to the fourth year engineering student in the Mechanical Engineering program with the highest aggregate final marks for the third and fourth years.

Awarded to: Jacob Reeves

The ASHRAE Award (1-$500.00 & One Year Membership/Fundamentals Handbook)

Awarded to the fourth-year engineering student in the Department of Mechanical and Materials Engineering, based on the candidate's marks in HVAC I and HVAC II. The student must have a minimum Year Weighted Average of 70

Awarded to: Ethan Doan

The Donald D.C. McGeachy Award for Materials Engineering

Awarded to the fourth-year engineering student in the Department of Mechanical and Materials Engineering, who in the opinion of the Faculty has the highest academic standing in Materials Engineering

Awarded to: Matthew De Jeu
The Canadian Society for Mechanical Engineering Award

Sponsored by the Canadian Society for Mechanical Engineering, this award is given to a fourth-year engineering student in the Department of Mechanical and Materials Engineering, who demonstrated outstanding achievement.

Awarded to: Jacob Reeves

5. DESIGN PROJECTS

Projects at a Glance

Project Title	Student(s)	Faculty Advisor(s)
Design of an Elbow Motion Simulator Team 1	Vanessa Brathwaite, Jennifer Ng, Tyler Orchard, Derek Wideman	L. Ferreira
Design of an Elbow Motion Simulator Team 2	Hussein Abushehada, Jacob Reeves, Kevin Samaranayake, Mayank Sharma	L. Ferreira
Hydro Generator for a Small Village	Daniel Bouillon, Malini Jhaver, Chris Kirk	J.M. Floryan
HVAC Design for the	Sarah Goodridge, Mike Knowlton,	W. Altahan, R.O. Buchal

University of Chicago Library Team 1	Eric Laval, Katie Sivell	
HVAC Design for the University of Chicago Library Team 2	Ethan Doan, Anne Engler, Laurie Klarner, Jonathon Ripley	W. Altahan, R.O. Buchal
Formula Electric Racecar	Vincey Chui, Andrew Kisielewski, Andrew McIlroy, Tyler Ouellet	R.O. Buchal
Sustainable Personal Mobility System (SPMS) vehicle design team	Will Bonnycastle, Kelvin Kwok, Jay Pellerin	R. O. Buchal
SPMS vehicle layout and ergonomics team	Adam Lau, Kamil Omozik, Andrew Ravenhurst	R.O. Buchal
SPMS Business team	Reggie Adams, Chris Bacik, David Drysdale	R.O. Buchal
SPMS vehicle sharing system design team	Michael Bunt, Tom Kruk, Charles Vitanza	R.O. Buchal

Industry-sponsored Projects

D-Jet Flap Design Team 1*	Scott Freeman, Alex MacKenzie, Owen Marble, Adam Shea	R.O. Buchal Sponsor: Diamond Aircraft
D-Jet Flap Design Team 2	Joel Armstrong, Adam Spadotto, Justin Valenti	R.O. Buchal Sponsor: Diamond Aircraft
Design of a Toilet Flush Valve Team 1	Richard Levick, Kevin Sin, Milan Tepavac, Zhao Wang	P. Kurowski Sponsor: Masco Canada
Design of a Toilet Flush Valve Team 2	Jeff Fox, Taylor Godbout, Alice Lok Donald Nickle	P. Kurowski Sponsor: Masco Canada
Linear Winch Design Team 1	Joshua Fredlich, Branden Lomato, Brett Martin	P. Kurowski Sponsor: Timberland Equipment Ltd.
Linear Winch Design Team 2	Matthew DeJeu, Kevin Graham, Peter Visser	P. Kurowski Sponsor: Timberland Equipment Ltd.
Linear Winch Design Team 3	Louis Kaptur, Raphael Kopala, Andrew Mitchell	P. Kurowski Sponsor: Timberland Equipment Ltd.

*Best project

MME 4401y Presentations

The Development of a Release Mechanism for Studying Downburst Flows	David Drysdale	E. Savory
Elbow Positioning and Muscle Activation on Radiocapitellar Joint Load	Jennifer Ng	J. Johnson
The Redesign of an Impact Loading Machine for Cadaveric Fracture Testing	Jacob Reeves	C. Dunning
Hemodynamic Forces on Monolayers of Endothelial Cells	Mayank Sharma	E. Savory

6. INTERNSHIP PROGRAM

The Faculty of Engineering offers an Internship Program for those students interested in gaining practical engineering employment experience in industry. In this program, students spend 12 to 16 consecutive months working in industry between their third and fourth years of the Bachelor of Engineering Science program. Time spent in internship may count as one-year of pre-graduation experience toward the four years experience required for licensing as a Professional Engineer in the Province of Ontario. Any engineering student who is completing third year, has at least a 65% average, is permitted to work in the country in which the job is located and who is in good academic standing may enroll in the program.

The following students from the MME Department completed an Internship in 2011-12.

Last Name	First Name	Placement
Benacquista	Anthony	EVANTAGE
Capitano	Kyle	GE Canada
Belanger	Alexandre	GM, CAMI Assembly
Ali	Faiz	GM Canada Ltd., CAMI assembly
Park	Daniel	LifeLike Bio Tissue Corporation
Hartnagle	J.D.	Schaeffler Canada Inc.
Kelly	Bradyn	Schaeffler Canada Inc.
Spurdza	John	Schaeffler Canada Inc.
Mcphail	Kent	SNC Lavalin
Donovan	Dean	Suncor Energy
Zimmer	Richard	Trudell Medical International
Dittmer	Andrew	Trudell Medical International
Che	Nicole	Union Gas
Scalesse Lagendyk	Carlie	Union Gas

7. SUMMER ENGINEERING CO-OP PROGRAM

Last Name	First Name	Placement
Bouillon	Daniel	W.G. Spencer Engineering Inc.
Chee	Allen	Oil Lift Technology Inc.
*Chorel	Malcolm	Hammerstone Corporation
Colbran	Clayson	RIM
Deloyer	Christopher	Salford Farm Machinery Ltd.
Fonseca	Graham	Crossey Engineering Ltd.
Freeman	Scott	Bell's Machining, Welding & Hydraulics
Goodridge	Sarah	Imperial Oil (NFLD)

Kisielewski	Andrew	Energy Box (2002) Inc.
Lau	Adam	True North Molds Ltd.
Lyle	Michelle	Linamar
Mackenzie	Kenneth	Meridian Lightwieght Technologies Inc.
Nevin	Daniel	Siemens Canada Limited
Nickle	David	TDI Power
Ouellet	Tyler	Armatec Survivability
Schmitt	Michael	Schaeffler
*Waters	Allison	Intlvac
Wideman	Derek	Armatec Survivability

***1st year placements – went into Mechanical Program this year.**

8. PEME PROGRAM

Practical Elements in Mechanical Engineering is a certificate program developed by the MME Department at UWO in collaboration with Fanshawe College of Applied Arts and Technology. The PEME program is comprised of practical courses in machining, welding, metrology, etc. and was designed specifically to give university engineering students exposure to the practical side of their profession.

The PEME program was developed mainly in response to the changing backgrounds of students entering university engineering programs. PEME provides an opportunity for interested students to get exposure to some practical courses outside the traditional Mechanical engineering curriculum. The PEME program is thus a formal avenue whereby students have an opportunity to enrich their practical knowledge of their profession by taking specialized courses offered by experts.

Students in the Mechanical & Materials Engineering program at UWO who have at least a 60 percent yearly weighted average with no failures may apply for PEME following their 2nd or 3rd years of study. Since PEME is offered every year, students can combine PEME with a concurrent degree program, summer Co-op or Industry Internship; there are no limitations!

Our major industrial employers are thrilled with the introduction of PEME in the MME program at UWO. PEME gives our students incredible insight into how things are made and enables our graduates to have an immediate impact in industry.

Since the inaugural offering in 2010-2011, 24 Western engineering students have taken the PEME program. Graduates from the 2011-12 offering are:

Last Name	**First Name**
Barnwell	Tyler
Fernandez	Jonathan
Gilbson	Philip
Lazo-Castro	Adelberto
Martinuzzi	Veronick
O'Gorman	Katelyn
Roddy	Matthew
Rodger	Cameron
Tsaltas	Julia

9. EXCHANGE PROGRAMS AND INTERNATIONAL STUDENTS

MME is actively promoting international exchange programs as this enriches students' experience. Individual programs with the National University of Singapore and the University of Hong Kong have been established through direct department to department contacts, and an additional one is being established with the Tokyo Metropolitan University in Japan. In 2011/12 MME hosted 16 exchange students from 10 institutions located in Asia, Europe and Central America. One MME student completed an exchange year at Leeds University, UK.

MME has further established an exchange program with the Department of Mechanical Engineering at UBC in order to promote cross-country mobility, and is finalizing an program with the Tokyo Metropolitan University in Japan.

Incoming students

Last Name	First Name	Home University	Home Country
Aranda	Hugo	Monterrey Institute of Technology and Higher Education	Mexico
Flores	Omar	Monterrey Institute of Technology and Higher Education	Mexico
Garcia Rodriguez	Jaime Arnoldo	Monterrey Institute of Technology and Higher Education	Mexico
Guyoton	Alexis	Polytech Annecy-Chambery	France
Herrera	Duran	University of Costa Rica	Costa Rica
Huang	Huguang	National University of Singapore	Singapore
Joshi	Prachi	Vishwakarma Institute of Technology	India
Ng	Lay Hiong	Nanyang Technological University	Singapore
Nguyen	Thu Mai	INSA Toulouse	France
Omozik	Kamil	Stuttgart University	Germany
Padilla	Carolina	University of Costa Rica	Costa Rica
Vossing	Michael	Karlsruhe Institue of Technology	Germany
Wang	Kaidi	Jiangsu University	China
Yap	Hong Kai	National University of Singapore	Singapore
Yong	Cheng	Nanyang Technological University	Singapore

Outgoing students

Last Name	First Name	University attended
Eden	Remy	University of Leeds

Self-sponsored Incoming students

Last Name	First Name	Year
Alkhamis	Ammar	2
Bilal	Muhammad	2 country ????

Castellanos	Johan	2
Castellanos	Samuel	2
Ferreira	Gabrielle	2
Khan	Fawad	2
Mahmoud	Khalid	2

10. UNDERGRADUATE STORIES

Industry-sponsored undergraduate design projects

Several teams of undergraduate students worked with local companies on industry-sponsored capstone design projects. Three teams worked with Timberland Equipment Ltd. (Woodstock ON) on the design and analysis of a high capacity linear winch. Two teams worked with Diamond Aircraft (London ON) on the design of a wing flap actuation system for the new D-JET private jet being developed by Diamond. Two teams worked with Masco Canada (St. Thomas ON) on competing concepts for proportional control of flush valves . All of these projects were supported by the Ontario Centres of Excellence (OCE) Connections program.

High School Outreach

MME offered a very successful Summer Academy course in the summer of 2011, and further developed the course to be offered again in the summer of 2012. The Summer Academy is a one-week camp offered to high-achieving high school students in grades 9 to 12. The one-week camp is offered twice, to twelve students at a time. The MME camps were fully subscribed, with students attending from all over Ontario.

GRADUATE EDUCATION

The Department offers two types of graduate programs, i.e., research programs leading either to the Master of Engineering Science (M.E.Sc.) degree or to the Doctor of Philosophy degree (Ph.D.) and course-based Professional Degree Programs leading to the degree of Master of Engineering (M.Eng.) All programs are fully accredited by the Ontario Council of Graduate Studies.

1. GRADUATE RESEARCH PROGRAMS

The M.E.Sc. program is structured to assist high achieving students in acquiring specialized knowledge and to train them in research and development techniques. The objective of this program of study is to introduce the student to research and to permit some modest degree of specialization in the chosen field. The requirements for completion of the program are four half courses, through specialist training by the thesis supervisor, by attendance at research seminars and through preparation and successful Master's thesis defense. Participation, where applicable, as a teaching assistant for the undergraduate courses adds further strength.

The Ph.D. program is structured to assist high achieving students in acquiring specialized, state-of-the-art knowledge and to train them in research and development techniques. The graduates should expect careers in academia as well as in industrial research and development organizations. Graduates are expected to develop the ability to undertake independent research, to prepare papers for publication, and to develop leading edge expertise in one specific sub discipline. Specialized training is undertaken by the professor supervising the research, in addition to other faculty members acting to advise the student. The requirements for completion of the program are a combination of formal course work (4 "half courses"), teaching assistantships, independent research, participation in research seminars, journal papers, and preparation and successful thesis defense.

The M.E.Sc. and Ph.D. programs are offered in the following subject areas:

(1) Thermo-fluids,

(2) Materials and Solid Mechanics,

(3) Automation Technologies and Systems,

(4) Mechanical Engineering.

Thermo-fluids

The *Thermo-fluids Graduate Research Program* offers training in many areas of thermodynamics and fluid mechanics including: **theoretical fluid mechanics of Newtonian and non-Newtonian flows, hydrodynamic stability, Computational Fluid Dynamics (CFD), convective heat transfer, turbulence modeling, microfluidics, energy systems** and **experimental techniques**, in additional to applications in all of the mentioned areas. Students interested in the admission to the M.E.Sc. program should have a Bachelor's degree in Engineering, or an equivalent degree, from an accredited University with a minimum A grade average. In some cases, students with a similar degree from another scientific discipline may be admitted. In exceptional circumstances, students in the final year of their undergraduate studies can be admitted into the accelerated M.E.Sc. program. Students interested in the admission to the Ph.D. program should have completed the M.E.Sc. degree. In exceptional circumstances, students can be transferred directly from the M.E.Sc. into the Ph.D. program without completing the M.E.Sc. program. All students admitted into the graduate research programs are offered full financial support.

Students registered in the Thermo-fluids M.E.Sc. graduate program must complete four graduate-level half courses, and must prepare a research thesis. The program requires approximately two years for completion. The Ph.D. program requires four additional half courses and a research dissertation, and requires approximately four years to complete. Courses available in the Thermo-fluids area are:

- MME 9617 Energy Conversion
- MME 9611 Continuum Mechanics
- MME 9613 Aerodynamics for Engineers
- MME 9614 Applied Computational Fluid Dynamics and Heat Transfer
- MME 9710 Advanced Computational Fluid Dynamics
- MME 9711 Convection Heat Transfer
- MME 9712 Experimental Measurements in Fluid Mechanics
- MME 9713 Hydrodynamic Stability
- MME 9714 Introductory Computational Fluid Dynamics and Heat Transfer
- MME 9715 Mechanism and Theory of Turbulent Flow
- CEE 9639 Viscous and Boundary Layer Theory
- MME 9724 Microfluidics and Lab-on-a-Chip
- MME 9732 Biotransport Phenomena

Students may also select elective courses offered by other research groups from the Department of Mechanical and Materials Engineering, other Departments from the Faculty of Engineering and other Faculties from the University of Western Ontario upon consultation with the advisor and approval of the MME Associate Chair Graduate.

Materials and Solid Mechanics

Materials and Solid Mechanics offers advanced research in experimental and theoretical aspects of traditional materials engineering, with specific emphasis on: **mechanical properties, microstructural characterization, nano-structured materials, materials modeling, microfabrication methods, electroactive materials, MEMS, and mechanics at small scales**. Students interested in the admission to the M.E.Sc. program should have a Bachelor's degree in Engineering, or an equivalent degree, from an accredited University with a minimum A grade average. In some cases, students with a similar degree from another scientific discipline may be admitted. In exceptional circumstances, students in the final year of their undergraduate studies can be admitted into the accelerated M.E.Sc. program. Students interested in the admission to the Ph.D. program should have completed

the M.E.Sc. degree. In exceptional circumstances, students can be transferred directly from M.E.Sc. into Ph.D. program without completing the M.E.Sc. program. All students admitted into the graduate research programs are offered full financial support.

Students registered in the Materials and Solid Mechanics graduate program must complete four graduate-level half courses, and must prepare a research thesis. The program requires approximately two years for completion. The Ph.D. program requires four additional half courses and a research dissertation, and requires approximately four years to complete. Courses available in the Materials and Solid Mechanics areas are:

- MME 9611 Continuum Mechanics
- MME 9612 Finite Element Methods
- MME 9616 Composite Materials
- MME 9618 Fracture of Materials
- MME 9619 Fundamentals of MEMS and NEMS
- MME 9620 Nanomaterials and Nanotechnology
- MME 9624 Modelling and Interfacing of sensors and actuators
- MME 9716 Mechanics of Thin Films
- MME 9717 Deformation of Polymers
- MME 9719 Microstructure of Polymers
- MME 9720 Strengthening Methods in Materials
- MME 9721 X-ray Diffraction in Engineering
- MME 9722 Fuel Cell Science and Engineering
- MME 9725 Piezoelectric Materials
- MME 9726 Advanced Nanomaterials

Students may also select elective courses offered by other research groups from the Department of Mechanical and Materials Engineering, other Departments from the Faculty of Engineering and other Faculties from the University of Western Ontario upon consultation with the supervisor and approval of the MME Associate Chair Graduate.

Automation Technologies and Systems.

The *Automation Technologies and Systems Graduate Research Program* offers interested students the opportunity to investigate novel techniques, devices and systems to address challenging problems related to **automation technologies, inertial systems and control, machine vision, sensor development and micromachining**. Students interested in admission to the M.E.Sc. program should have a Bachelor's degree in Engineering, or an equivalent degree, from an accredited University with a minimum A grade average. In some cases, students with a similar degree from another scientific discipline may be admitted. In exceptional circumstances, students in the final year of their undergraduate studies can be admitted into the accelerated M.E.Sc. program. Students interested in the Ph.D. program should have completed the M.E. Sc. degree. In exceptional circumstances, students can be transferred directly from the M.E.Sc. into the Ph.D. programs without completing the M.E.Sc. degree. All students admitted into the graduate research program are offered full financial support.

Students registered in the M.E.Sc. program must take four half courses and complete a research thesis. This program of study takes approximately two years to complete. Registrants in the Ph.D. program must take an additional four half courses and complete a dissertation based on original research. A typical Ph.D. program will require four years to complete. Graduate Courses available for the Automation Technologies and Systems Program are:

- MME 9610 Applied Measurement and Sensing Systems
- MME 9612 Finite Element Methods
- MME 9619 Fundamentals of MEMS and NEMS
- MME 9622 Advanced Kinematics and Dynamics

- MME 9624 Actuator Principles, Integration and Control (ECE 9509)
- MME 9727 Computer-Aided Design and Manufacturing
- MME 9728 Computer-Aided Geometric Modelling
- MME 9729 Optomechatronic Systems: Techniques and Applications
- MME 9730 Principles and Applications of Neural Networks
- MME 9731 Stochastic Dynamics and Stability of Mechanical Systems

Students may also select elective courses offered by other research groups from the Department of Mechanical and Materials Engineering, other Departments from the Faculty of Engineering and other Faculties from the University of Western Ontario upon consultation with the advisor and approval of the MME Associate Chair Graduate.

Mechanical Engineering

The General *Mechanical Engineering Program* offers students opportunity to follow personalized program within the general area of Mechanical Engineering. Course can be selected according to the needs of the individual program and within research areas of the Department. Three of the available research areas discussed above are complemented by **Biomechanics**, which exposes students with an opportunity for graduate level training in both in the theory and application of mechanical engineering to primarily orthopaedic and cardiovascular medicine. Students interested in the admission to the M.E.Sc. program should have a Bachelor's degree in Engineering, or an equivalent degree, from an accredited University with a minimum A grade average. In some cases, students with a similar degree from another scientific discipline may be admitted. In exceptional circumstances, students in the final year of their undergraduate studies can be admitted into the accelerated M.E.Sc. program. Students interested in the admission to the Ph.D. program should have completed the M.E.Sc. degree. In exceptional circumstances, students can transfer directly from M.E.Sc. into Ph.D. program without completing M.E.Sc. degree. All students admitted into the graduate research program are offered full financial support.

2. PROFESSIONAL DEGREE PROGRAMS

The M.Eng. program is specially structured to assist qualified engineers in the advancement of their professional careers and to provide students with the skills necessary to address key technological challenges. The program may be taken with or without an optional qualified work term component. If enrolled full-time, a student can complete the degree in one year. The M.Eng. program is focused to become an effective tool to address the significant need for education and integration of internationally trained engineers. It provides new Canadians who are trained further in engineering outside Canada, with a venue to update their knowledge in accordance with the needs of the Canadian technology sector. The requirement for completion of the program is ten half courses, or eight half courses and a project. Term start dates are September 1st, January 1st, and May 1st.

The M.Eng. program is offered in the following subject areas:

(1) Thermo-fluids,

(2) Materials and Solid Mechanics,

(3) Automation Technologies and Systems,

(4) Mechanical Engineering with two options (i) General Mechanical Engineering and (ii) Engineering in Medicine.

Thermo-fluids

The program is comprised of the following:

A) 4 of the 6 core half courses in Mechanical and Materials Engineering; and

- MME 9610 Applied Measurements & Sensing Systems
- MME 9612 Finite Element Methods
- MME 9617 Energy Conversion
- MME 9621 Computational Methods in Engineering
- MME 9622 Advanced Dynamics and Kinematics
- MME 9623 Theory and Practice of Plasticity

B) 2 of the 4 core half courses in Professional Engineering (offered in Summer term); and

- CBE 9185 Risk Assessment and Management in Engineering Systems
- CEE 9510 Engineering Planning and Project Management
- ECE 9010 Intellectual Property for Engineers
- MME 9670 Engineering Communication

C) 4 elective half courses (if not enrolling in a MEng Project), or 2 elective half courses with the MEng Project.

For elective courses, students may take any graduate courses offered by the MME Department listed below. Courses marked in bold text with an asterisks (*) are recommended for those wishing to specialize in the Thermofluids area. Please note that the 95xx-level courses are combined courses accessible to the graduate and undergraduate students. However, the number of credits that graduate students can get for such courses cannot be greater than 30% of the degree requirement (i.e., maximum of 3 courses for M.Eng. degree):

- MME 9510* Advanced Vibration Analysis
- MME 9511 Biomechanics of the Musculoskeletal System
- MME 9512 Computer Integrated Manufacturing
- MME 9513 Computer Numerically Controlled (CNC) Machining
- MME 9514 Corrosion and Wear
- MME 9515* Fluid Machinery
- MME 9516* HVAC I
- MME 9517* HVAC II
- MME 9518 Mechanical Properties of Materials
- MME 9519 Production Management for Engineers
- MME 9520 Robotics and Manufacturing Automation
- MME 9521 Systems and Control
- MME 9522* Spacecraft System Design
- MME 9523* Flight Dynamics
- MME 9611* Continuum Mechanics
- MME 9613* Aerodynamics for Engineers
- MME 9614* Applied Computational Fluid Mechanics and Heat Transfer
- MME 9615 Biomechanics of Human Joint Motion
- MME 9616 Composite Materials
- MME 9618 Fracture of Materials
- MME 9619 Fundamentals of MEMS and NEMS
- MME 9620 Nanomaterials and Nanotechnology
- MME 9624 Actuator Principles, Integration and Control (ECE 9509)
- MME 9639* Viscous Layer and Boundary Flow

Interested student may also be able to enroll in some 97xx-level courses offered by the MME Department with the approval of the course instructor and the MME Associate Chair Graduate. Courses may also be chosen from Electrical and Computer Engineering, Chemical and Biochemical Engineering, Civil & Environmental Engineering, Applied Math, and Physics & Astronomy with approval of the MME Associate Chair Graduate.

Materials and Solid Mechanics

The program is comprised of the following:

A) 4 of the 6 core half courses in Mechanical and Materials Engineering; and

- MME 9610 Applied Measurements & Sensing Systems
- MME 9612 Finite Element Methods
- MME 9617 Energy Conversion
- MME 9621 Computational Methods in Engineering
- MME 9622 Advanced Dynamics and Kinematics
- MME 9623 Theory and Practice of Plasticity

B) 2 of the 4 core half courses in Professional Engineering (offered in Summer term); and

- CBE 9185 Risk Assessment and Management in Engineering Systems
- CEE 9510 Engineering Planning and Project Management
- ECE 9010 Intellectual Property for Engineers
- MME 9670 Engineering Communication

C) 4 elective half courses (if not enrolling in a MEng Project), or 2 elective half courses with the MEng Project.

For elective courses, students may take any graduate courses offered by the MME Department listed below. Courses marked in bold text with an asterisks (*) are recommended for those wishing to specialize in the Materials and Solid Mechanics area. Please note that the 95xx-level courses are combined courses accessible to the graduate and undergraduate students. However, the number of credits that graduate students can get for such courses cannot be greater than 30% of the degree requirement (i.e., maximum of 3 courses for M.Eng. degree):

- MME 9510* Advanced Vibration Analysis
- MME 9511 Biomechanics of the Musculoskeletal System
- MME 9512 Computer Integrated Manufacturing
- MME 9513 Computer Numerically Controlled (CNC) Machining
- MME 9514* Corrosion and Wear
- MME 9515 Fluid Machinery
- MME 9516 HVAC I
- MME 9517 HVAC II
- MME 9518* Mechanical Properties of Materials
- MME 9519 Production Management for Engineers
- MME 9520 Robotics and Manufacturing Automation
- MME 9521 Systems and Control
- MME 9522 Spacecraft System Design
- MME 9523 Flight Dynamics
- MME 9611* Continuum Mechanics
- MME 9613 Aerodynamics for Engineers
- MME 9614 Applied Computational Fluid Mechanics and Heat Transfer
- MME 9615 Biomechanics of Human Joint Motion
- MME 9616* Composite Materials
- MME 9618* Fracture of Materials
- MME 9619* Fundamentals of MEMS and NEMS
- MME 9620* Nanomaterials and Nanotechnology
- MME 9624 Actuator Principles, Integration and Control (ECE 9509)
- MME 9639* Viscous Layer and Boundary Flow

Interested students may also be able to enroll in some 97xx-level courses offered by the MME Department with the approval of the course instructor and the MME Associate Chair Graduate.Courses may also be chosen from Electrical and Computer Engineering, Chemical and Biochemical Engineering, Civil & Environmental Engineering, Applied Math, and Physics & Astronomy with approval of the MME Associate Chair Graduate.

Automation Technologies and Systems

The program is comprised of the following:

A) 4 of the 6 core half courses in Mechanical and Materials Engineering; and

- MME 9610 Applied Measurements & Sensing Systems
- MME 9612 Finite Element Methods
- MME 9617 Energy Conversion
- MME 9621 Computational Methods in Engineering
- MME 9622 Advanced Dynamics and Kinematics
- MME 9623 Theory and Practice of Plasticity

B) 2 of the 4 core half courses in Professional Engineering (offered in Summer term); and

- CBE 9185 Risk Assessment and Management in Engineering Systems
- CEE 9510 Engineering Planning and Project Management
- ECE 9010 Intellectual Property for Engineers
- MME 9670 Engineering Communication

C) 4 elective half courses (if not enrolling in a MEng Project), or 2 elective half courses with the MEng Project.

For elective courses, students may take any graduate courses offered by the MME Department listed below. Courses marked in bold text with an asterisks (*) are recommended for those wishing to specialize in the Automation Technologies and Systems area. Please note that the 95xx-level courses are combined courses accessible to the graduate and undergraduate students. However, the number of credits that graduate students can get for such courses cannot be greater than 30% of the degree requirement (i.e., maximum of 3 courses for M.Eng. degree):

- MME 9510* Advanced Vibration Analysis
- MME 9511 Biomechanics of the Musculoskeletal System
- MME 9512* Computer Integrated Manufacturing
- MME 9513* Computer Numerically Controlled (CNC) Machining
- MME 9514 Corrosion and Wear
- MME 9515 Fluid Machinery
- MME 9516 HVAC I
- MME 9517 HVAC II
- MME 9518 Mechanical Properties of Materials
- MME 9519* Production Management for Engineers
- MME 9520* Robotics and Manufacturing Automation
- MME 9521* Systems and Control
- MME 9522 Spacecraft System Design
- MME 9523 Flight Dynamics
- MME 9611 Continuum Mechanics
- MME 9613 Aerodynamics for Engineers
- MME 9614 Applied Computational Fluid Mechanics and Heat Transfer
- MME 9615 Biomechanics of Human Joint Motion
- MME 9616 Composite Materials
- MME 9618 Fracture of Materials
- MME 9619 Fundamentals of MEMS and NEMS
- MME 9620 Nanomaterials and Nanotechnology
- MME 9624* Actuator Principles, Integration and Control (ECE 9509)
- MME 9639 Viscous Layer and Boundary Flow

Interested student may also be able to enroll in some 97xx-level courses offered by the MME Department with the approval of the course instructor and the MME Associate Chair Graduate. Courses may also be chosen from Electrical and Computer Engineering

Mechanical Engineering

(i) General Mechanical Engineering Option

The program is comprised of the following:

A) 4 of the 6 core half courses in Mechanical and Materials Engineering; and

- MME 9610 Applied Measurements & Sensing Systems
- MME 9612 Finite Element Methods
- MME 9617 Energy Conversion
- MME 9621 Computational Methods in Engineering
- MME 9622 Advanced Dynamics and Kinematics
- MME 9623 Theory and Practice of Plasticity

B) 2 of the 4 core half courses in Professional Engineering (offered in Summer term); and

- CBE 9185 Risk Assessment and Management in Engineering Systems
- CEE 9510 Engineering Planning and Project Management
- ECE 9010 Intellectual Property for Engineers
- MME 9670 Engineering Communication

C) 4 elective half courses (if not enrolling in a MEng Project), or 2 elective half courses with the MEng Project.

For elective courses, students may take any graduate courses offered by the MME Department listed below. Please note that the 95xx-level courses are combined courses accessible to the graduate and undergraduate students. However, the number of credits that graduate students can get for such courses cannot be greater than 30% of the degree requirement (i.e., maximum of 3 courses for M.Eng. degree):

- MME 9510 Advanced Vibration Analysis
- MME 9511 Biomechanics of the Musculoskeletal System
- MME 9512 Computer Integrated Manufacturing
- MME 9513 Computer Numerically Controlled (CNC) Machining
- MME 9514 Corrosion and Wear
- MME 9515 Fluid Machinery
- MME 9516 HVAC I
- MME 9517 HVAC II
- MME 9518 Mechanical Properties of Materials
- MME 9519 Production Management for Engineers
- MME 9520 Robotics and Manufacturing Automation
- MME 9521 Systems and Control
- MME 9522 Spacecraft System Design
- MME 9523 Flight Dynamics
- MME 9611 Continuum Mechanics
- MME 9613 Aerodynamics for Engineers
- MME 9614 Applied Computational Fluid Mechanics and Heat Transfer
- MME 9615 Biomechanics of Human Joint Motion
- MME 9616 Composite Materials
- MME 9618 Fracture of Materials

- MME 9619 Fundamentals of MEMS and NEMS
- MME 9620 Nanomaterials and Nanotechnology
- MME 9624 Actuator Principles, Integration and Control (ECE 9509)
- MME 9639 Viscous Layer and Boundary Flow

Interested students may also be able to enroll in some 97xx-level courses offered by the MME Department with the approval of the course instructor and the MME Associate Chair Graduate. Courses may also be chosen from Electrical and Computer Engineering, Chemical and Biochemical Engineering, Civil & Environmental Engineering, Applied Math, and Physics & Astronomy with approval of the MME Associate Chair Graduate.

(ii) Engineering in Medicine Option

The program is comprised of the following:

A) Two introductory half-courses on Engineering in Medicine

- MME 9550 Medical Device Design
- MME 9511 Biomechanics of the Musculoskeletal System
- BME 9502 Eng. Analysis of Physiological System
- BME 9520 Fundamentals of BioMEMS
- BME 9525 Introduction to Biomaterials Engineering

B) Two core half-courses in Mechanical and Materials Engineering; and

- MME 9610 Applied Measurements & Sensing Systems
- MME 9622 Advanced Dynamics and Kinematics

C) Four half-courses that cover advanced topics (or 2 courses plus an MEng project in related topic):

- MME 9612 Finite Element Methods
- MME 9615 Biomechanics of Human Joint Motion
- MME 9620 Nanomaterials and Nanotechnology
- MME 9621 Computational Methods in Engineering
- MME 9624 Actuator Principles, Integration and Control (ECE 9509)
- MME 9724 Microfluidics and Lab-on-a-Chip
- MME 9728 Computer Aided Geometric Modeling
- MME 9729 Optomechatronic Systems
- BME 9509 Introduction to Digital Image Processing

Students who satisfy the course prerequisites, and obtain permission from both the instructor and MME Associate Chair-Graduate, may substitute up to 2 courses in category D with the following:

- BME 9526 Tissue Engineering
- ECE 9200 Software Eng'g for Human-Computer Interface Design
- ECE 9202 Advanced Image Processing and Analysis
- ECE 9503 Robot Manipulators
- MME 9724 Microfluidics and Lab-on-a-Chip
- MME 9725 Piezoelectric Materials
- MME 9726 Advanced Nanomaterials
- MME 9732 Biotransport Phenomena
- MME 9733 Current Topics in Biomechanical Engineering

Interested students may also enroll in some advanced BME courses and 9xxx-level courses offered by the MME Department with the approval of both the course instructor and the MME Associate Chair-Graduate.

D) Two half-courses in Professional Engineering (offered in Summer term):

- CBE 9185 Risk Assessment and Management in Engineering Systems
- ECE 9010 Intellectual Property for Engineers

HVAC Systems

The program is comprised of the following:

A) 4 of the following 6 half courses in Mechanical and Materials Engineering; and

- MME 9515 Fluid Machinery
- MME 9610 Applied Measurements & Sensing Systems
- MME 9612 Finite Element Methods Eng. Analysis of Physiological System
- MME 9614 Applied Computational Fluid Mechanics and Heat Transfer
- MME 9617 Energy Conversion
- MME 9621 Computational Methods in Engineering

B) 2 of the 4 core half-courses in Professional Engineering (offered in Summer term); and

- CBE 9185 Risk Assessment and Management in Engineering Systems
- CEE 9510 Engineering Planning and Project Management
- ECE 9010 Intellectual Property for Engineers
- MME 9670 Engineering Communications

C) Four half-courses in Mechanical Engineering (if not enrolling in a MEng Project), or 2 elective half courses with the MEng Project:

- MME 9517 HVAC I
- MME 9517 HVAC II
- MME 9641 Thermal Systems Engineering

The MEng project in the HVAC Systems option will be mainly industry sponsored project which will provide students a real working experience in the HVAC industry. The MEng project option will only be available to the students who have already completed HVAC I and HVAC II or equivalent courses in the previous degree

3. GRADUATE ENROLLMENT

	M.Eng	M.E.Sc.	Ph.D.	Total
Summer 2011	27	31	56	114
Fall 2011	23	32	58	113
Winter 2012	16	28	54	98

4. GRADUATE DEGREES GRANTED

OCTOBER 2011 CONVOCATION – Mechanical and Materials Engineering Program					
Student name	**Degree**	**Completion Date**	**Thesis Exam Date**	**Supervisor/ Co-supervisor**	**THESIS TITLE**
Basu, Indranil	MESc	June 17,	June 2,	Wood, J.	Solidification of Magnesium

		2011	2011		Alloys
Berta, Tesfaye	MEng	Aug 30, 2011	n/a	n/a	n/a
Chadi, Mounib	MEng	Aug 30, 2011	n/a	n/a	n/a
Ehtesham, Mussayab	MEng	Aug 30, 2011	n/a	n/a	n/a
Leung, Kar Man	PhD	Aug 30, 2011	Aug 22, 2011	Yang, J.	Exploring Bacterial Nanowires: From Properties to Functions and Implications
Ma, Ji	PhD	Aug 29, 2011	Aug 18, 2011	Feng, S.	Surface Reconstruction from Unorganized Point Cloud Data via Progressive Local Mesh Matching
Meng, Xiangbo	PhD	Aug 31, 2011	Aug 19, 2011	Sun, X.	Developing Energy-Related Nanostructured Materials by Atomic Layer Deposition
Neuert, Mark	MESc	July 15, 2011	July 12, 2011	Dunning, C.E.	Strain Adaptive Finite Element Modelling of the Distal Ulna
Singh, Amandeep	MEng	Aug 30, 2011	n/a	n/a	n/a
Singh, Vikas Jeet	MEng	Aug 30, 2011	n/a	n/a	n/a
Tadikonda, Ganesh	MEng	Aug 30, 2011	n/a	n/a	n/a
Xiong, Jia Ming	MEng	Aug 30, 2011	n/a	n/a	n/a
Zhang, Qi	MESc	Aug 10, 2011	Aug 3, 2011	Briens,C. Berruti, F.	Improving Jet Attrition in Fluidized Beds
Zhang, Limin	MESc	May 11, 2011	May 3, 2011	Yang, J.	Effects of Multiple Reflections and Refractions at Interfaces and Water Temperature on Disinfection Efficiency in UV Reactors
Zhou, Jianyou	MEng	Aug 30, 2011	n/a	n/a	n/a

JUNE 2012 CONVOCATION – Mechanical and Materials Engineering

Student Name	Degree	Completion Date	Thesis Exam Date	Supervisor/ Co-supervisor	THESIS TITLE
Afrose Ronny, Rahima	MESc	Dec 19, 2011	Dec 13, 2011	Knopf, G.	Design and Microfabrication of Edge-lit Curtains for Automotive Applications
Book, Joel	PhD	Jan 25, 2012	Jan 16, 2012	Asokanthan, S.	Experimental Model Analysis of Micron-Scale Structures
Breetzke, Jeremy	MESc	Dec 9, 2011	Nov 18, 2011	Naish, M.D.	Design and Development of a Tele-Operated Surgical Simulation Environment
Bruce, Thomas	PhD	Dec 23, 2011	Nov 30, 2011	Wood, J.	Mechanistic Mixed-Mode Failure Criterion for Continuous Fiber-Polymer Composites
Chen, Xin	MEng	Dec 31, 2011	n/a	n/a	n/a

Chen, Fang	MEng	Dec 31, 2011	n/a	n/a	**n/a**
Chow, Michael	MESc	Sept 19, 2011	Sept 12, 2011	Knopf, G.	Impact of Initial Micro-Geometry and Process Parameters on the Final Roughness of Laser Micro-Polished Surfaces
Fan, Yaxi	MESc	Sept 22, 2011	Sept 15, 2011	Yang, J.	Fast Prototyping and Small Volume Production of Micro-Devices by Hybrid Master Molds using Hot Embossing Lithography
Fischer, Christian	MESc	Nov 4, 2011	Oct 28, 2011	Straatman, A.G.	A Finite Volume Model for Predicting Water Vapour Transport in Conjugate Fluid/Porous/Solid Domains
Gao, Shuwen	MEng	Dec 31, 2011	n/a	n/a	n/a
Gomez, Fernando	MEng	Dec 31, 2011	n/a	n/a	n/a
Hossain, Mohammad Zakir	PhD	Dec 1, 2011	Nov 16, 2011	Floryan, J.M.	Convection Control Using Spatially Distributed Heating
Li, Xiaoyan	MEng	Dec 31, 2011	n/a	n/a	n/a
Lu, Hongmei	MESc	Sept 8, 2011	Sept 7, 2011	Buchal, R.O.	Computer-Supported Collaborative Knowledge Building in Engineering Program
Mallette, Michael	MEng	Dec 31, 2011	n/a	n/a	n/a
Shrivastava, Parikshit	MEng	Dec 31, 2011	n/a	n/a	n/a
Sun, Shuhui	PhD	Dec 13, 2011	Dec 8, 2011	Sun, X.A.	Development of Novel Nanomaterials for High-Performance and Low Cost Fuel Cell Applications
Uppal, Hardeep	MEng	Dec 31, 2011	n/a	n/a	n/a
Vijiprasath, Selvaratnam	MEng	Dec 31, 2011	n/a	n/a	n/a
Zhong, Yu	PhD	Dec 20, 2011	Dec 12, 2011	Sun, X.A.	Synthesis and Characterization of One- and Two-Dimensional Novel Nanomaterials

5. GRADUATE AWARDS

Qualified students in MESc and PhD programs have access to a financial support package, which may consist of a combination of program-based funding (e.g. from a supervisor's research grant or Graduate Research Assistantship), scholarships from the Faculty of Engineering (Western Engineering Scholarship), and income from employment (e.g. a Graduate Teaching Assistantship). This package is designed to cover a substantial portion of a student's expenses for the eligible period of funding in his/her program. To be eligible for this financial support, students must be registered full-time. Incoming students must have a minimum admission average of 78% as

determined by the Faculty of Graduate Studies. Continuing students must meet the graduate program conditions for progression towards the degree, as well as a minimum requirement of 78% based on all graduate courses completed in the current program. Students in Master's Engineering (M.Eng.) program is expected to fund their own education, for example, through OSAP.

Minimum Support Level

May 2011 term	MESc	PhD
Canadian/Permanent Resident	Tuition + 12,000 (approx). $19,000	Tuition + 12,000 (approx.) $19,000
International	Tuition + 12,000 (approx). $27,000	Tuition + 12,000 (approx.) $27,000
September 2011 term	MESc	PhD
Canadian/Permanent Resident	Tuition + 12,000 (approx). $19,000	Tuition + 12,000 (approx.) $19,000
International	Tuition + 12,000 (approx). $27,000	Tuition + 12,000 (approx.) $27,000
January 2012 term	MESc	PhD
Canadian/Permanent Resident	Tuition + 12,000 (approx). $19,000	Tuition + 12,000 (approx.) $19,000
International	Tuition + 12,000 (approx). $27,000	Tuition + 12,000 (approx.) $27,000
May 2012 term	MESc	PhD
Canadian/Permanent Resident	Tuition + 12,000 (approx). $19,000	Tuition + 12,000 (approx.) $19,000
International	Tuition + 12,000 (approx). $27,000	Tuition + 12,000 (approx.) $27,000

External Scholarships

During their period of fundability, i.e., 6 terms for MESc, and 12 terms for PhD, students may apply for external scholarships for which they are eligible, such as National Sciences and Engineering Research Council (NSERC), Ontario Graduate Scholarship (OGS), and Ontario Graduate Scholarships in Science and Technology (OGSST).

Ontario Graduate Scholarship (OGS):

The Ontario Graduate Scholarship (OGS) program is designed to encourage excellence in graduate studies at the master's and doctoral levels. Each award is tenable at the Ontario University of the student's choice. The value of the OGS is $5,000 per term to be held for two or three consecutive terms. One-term awards are not granted.

Ontario Graduate Scholarships in Science and Technology (OGSST):

Master's students can receive the scholarship for a maximum of two years and doctoral students for a maximum of four years, subject to a lifetime maximum of 4 years per student. The value of this scholarship is $5,000 per term, and may be held for either two or three full terms. One term awards are not allowed. OGSST awards must be held for at least 2 full consecutive terms and are paid monthly through Human Resources.

National Sciences and Engineering Research Council (NSERC):

NSERC is the national instrument for making strategic investments in Canada's capability in science and technology. NSERC's products are innovations, scientific discoveries, and highly qualified people. NSERC's unique Industrial Postgraduate Scholarship (IPS) provides financial support for highly qualified science and engineering graduates to gain research experience in industry while undertaking advanced studies in Canada. These scholarships are aimed at encouraging scholars to consider research careers in industry where they will be able to contribute to strengthening Canadian innovation.

External Scholarships Recipients: 2011-2012

Name	Program	Award	Award Duration
Bashar, Mohammad	GMME	Queen Elizabeth II Graduate Scholarship in Science	May 2011 to Jan 2012
DeGroot, Christopher	GMME	NSERC-CGSD	May 2009 to Jan 2012
Elliott, Kevin	GMME	OGS	May 2011 to Jan 2012
Farrokhnejad Roudsari, Mehdi	GMME	OGS	May 2011 to Jan 2012
Johnson, Chelsea	GMME	OGS	May 2011 to Jan 2012
Khalaji, Iman	GMME	Queen Elizabeth II Graduate Scholarship in Science	Sept 2009 to May 2012
McLachlin, Stewart	GMME	NSERC – CGSD	Sept 2009 to May 2012
Neuert, Mark	GMME	NSERC – PGSD	Sept 2011 to May 2014
Norouzi Banis, Mohammad	GMME	OGS	Sept 2011 to May 2012
Yan, Zhi	GMME	OGS	Sept 2011 to May 2012

6. GRADUATE SEMINAR

Fall 2011

Date	Student or Guest Lecturer Name	Supervisor/ Co-Supervisor	Presentation Title	Seminar Facilitator
Sept. 19	Prof. Igor Bellow City University, Hong Kong		Advances in Synthesis of Materials with Extreme Properties	
Sept. 26	Ziad Boutanios	H. Hangan	Eulerian-Eulerian CFD Snowdrift Analysis	Rajeev Kumar
	Lingmin Shao	J. Yang	System Level Simulation Method of Automotive Sensor	
Oct. 17	Mehdi Farrokhenjad	A.G. Straatman/ J. Wood	Microporosity Modelloing of Magnesium Die-Casting	Khaled Al-Aribe
	Dongniu Wang	X. Sun/ T. Sham	Sn and $Sn0_2$ based Graphene Nanocomposites with Enhanced Performance as Anodes for LIB	
Oct. 24	Prof. J. Peter King BLWTL, UWO		The Boundary Layer Wind Tunnel 46 Years of Wind Engineering	
Oct. 31	Alireza Mohammadi	J.M. Floryan	Drag Reduction Potential of grooves due to Superhydrophobic Effect	Mona Hazzanzadeh
	Meysam Haghshenas	R. Klassen	Analysis of the Length Dependence and Strain Rate Sensitivity of the Indentation Stress of 6061 Aluminum Alloy	
Nov. 7	Jinli Yang	X. Sun	Synthesis of 3D Porous $LiFeP0_4$ as Cathode Materials for Lithium Ion Batteries used in Electric Vehicles	Alireza Mohammadi

Nov. 14	Mohammad Mahdavi	L. Jiang/X. Sun	Mechanical Characterization of Nanomaterials	Mehdi Farrokhnejad
	Mona Hazzanzadeh	K. Siddiqui	Investigation of Two Phase Flow in an Effervescent Atomizer	
Nov. 21	Prof. P. Sullivan, Chair Mechanical and Mechatronics Engineering University of Waterloo		The Life of Shaped Polymers	
Nov. 28	Kuldeep Sareen	G. Knopf	Information Extraction from Point Clouds of Occupies Building Interiors	Ziad Boutanios
	Masoud Noroozi	L. Jiang	The Instability of Thin Film Structures	
Dec. 5	Moradi Vafadar	J.M. Floryan	Flow in Grooved Annuli	Yu Zhong
	Iman Khalaji	M.D. Naish	Does Lung Cancer Treatment Path Pass through B-Splines?	
Dec. 12	Yongliang Li	X. Sun	N-CNTs & GNSs as Cathode Materials for Lithium-Air Batteries	Hadi Mahdavi
	Stewart McLachlin	C. Dunning	Cervical Spine Unilateral Facet Injuries: Simulation, Quantification, and Visualization of Mechanisms and Treatment	

Winter 2012				
Jan. 16	Sina Arghavan	A.V. Singh	Vibration of carbon-based nano-structures	Maryam Refan
	Zhi Yan	L. Jiang	Modelling and analysis of piezoelectric nanostructure with surface effects	
Jan. 23	Prof. Y. Sun, Department of Mechanical and Industrial Engineering, University of Toronto		Manipulation and Characterization of Biological Cells: MEMS and Micro-Nanorobotics Approaches	
Jan. 30	Bipasha Bose	R. Klassen	Effect of Temperature on the Anistropic Deformation of Zr-2.5% Nb Pressure Tube Material During Micro-Indentation	Hamid Aghayan
	Richard Oviasuyi		Investigation of the use of Micro-Mechanical Testing to Analyze the Mechanical Anistropy of the Zr-2.5% Nb Pressure Tube Alloy	
Feb. 6	Tingjie Li	J. Yang	Lab-on-a-CD for parallel blood analysis	Lingmin Shao
	Taravat Khadivi	E. Savory	Flow structures associated with yawed elliptical cavities	

Feb. 13	Hamidreza Azimian	M.D. Naish	Optimal Preoperative Planning of Robotics-Assisted Minimally Invasive Cardiac Surgery Under Uncertainty	Sina Arghavan
	Adam Kirchhefer	R. Gurka/G. Kop	The Wake of a Freely Flying European Starling (Sturgis Vulgaris)	
Feb. 27	Prof. C. Butcher Mechanical and Mechatronics Engineering, University of Waterloo		Multi-scale Modelling of Ductile Fracture	
Mar. 5	Dr. B. Ashrafi, Institute for Aerospace National Research Council of Canada		Opportunities for Nano-based Polymers and Composites for Structural Applications	
Mar. 12	Prof. A. Inasawa, Department of Aerospace Engineering, Tokyo Metropolitan University		Study on the Stability and Vortices in the Wake of Rectangular Cylinder with Small Aspect Ratio	
Mar. 19	Maryam Refan	H. Hangan	Developing similarity analysis for laboratory simulated and field tornatoes	Rahim Mohammadhassani
	Ahmed Elatar	K. Siddiqui	Wall heating effects in low Reynolds number channel flows	
Mar. 26	Abdullah Hafiz	R. Tutunea-Fatan/ E. Bordatchev	Modeling, analysis and process planning of micro-laser polishing process	Jamaloddin Jamali
	Jian Liu	X. Sun	Synthesis of zirconium oxide by atomic layer deposition and its applications in lithium-ion batteries	
Apr. 2	Mohammad Norouzi Banis	X. Sun	Development of Metal Silicide Networked Nanostructures as Catalyst Support for PEMFC's	Iman Khalaji
	Khaled ElBannan	S. Salisbury/ J.M. Floryan	Development of a Compact Piezoworm Actuator for MER-guided Medical Procedures	
Apr. 9	Rajeev Kumar	C. Zhang/E. Savory	Flow structures in the wakes of finite height square prisms	Zhi Yan
	Hamid Aghayan	J. Yang/E. Bordatchev	On-line monitoring of engine health through the analysis of contaminants in engine lubricant	
Apr. 16	Prof. G. Bitsuamiak Civil Engineering, Western University		Multi-scale computational wind engineering	
Apr. 23	Jamaloddin Jamali	J. Wood	Fracture of Polymer Matrix Composite	Meysam Haghshenas
	Rahim Mohammadhassani	R. Khayat	Thermal Convectionof FLuids with Non-Fourier Effect	
Apr. 30	Christopher DeGroot	A.G. Straatman	Numerical Modelling of Transport in Complex Porous Media: The Human Lung	Hamidreza Azimian
	Seyed Mostafavi Yazdi	R. Tutunea-Fatan/ J. Johnson	Computational Methods to Determine the Fit between Implant and Humerus during	

			Total Elbow Arthroplasty	

7. GRADUATE STORIES

C. Dunning

Stewart McLachlin – PhD Candidate, Jack McBain Biomechanical Testing Lab
At the 39th Annual Meeting of the Cervical Spine Research Society (Scottsdate, AZ; Dec. 2011), Stew received 2 honours. His podium presentation was awarded "1st Place Basic Science Paper", and his poster was noted as a "Top 10 Poster".

Tim Burkhart – Post-doctoral Fellow; Jack McBain Biomechanical Testing Lab
At the annual Symposium on Computational Methods in Orthopaedic Biomechanics (San Francisco, CA; Feb., 2012), Tim was awarded the "Best Paper" for the conference.

J.M.Floryan

Mr. Alireza Mohammadi, doctoral student working with Professor Floryan, received and CFD Society of Canada Graduate Scholarship Award for 2012. In addition, he has been awarded the Ontario Graduate Scholarship for 2012-2013 and the Queen Elizabeth II Graduate Scholarship in Science and Technology for 2012-2013.

L. Jiang

Zhi Yan was awarded the Ontario Graduate Scholarship for 2012-2013.

J. Johnson

Dan Langohr, a PhD student in BME under Jim Johnson's supervision, received the prestigious Vanier Award for 2012-15.

X. Sun

Western Engineering alumnus Shuhui Sun has been honoured with the 2012 Governor General's Gold Medal for graduate study at Western University. These medals recognize students who have completed their graduate studies at the highest level of academic standing.

Western's School of Graduate and Postdoctoral Studies presents the award annually to two PhD graduates and one master's graduate.

Sun, who completed his PhD in Mechanical and Materials Engineering in December 2011, came to Western University in 2008 after completing a master's degree at China's University of Science and Technology. Throughout his PhD coursework at Western, Shuhui was praised for his superior performance, which culminated in an outstanding graduating average of 94.5 per cent. In addition, his work was recognized through several competitive awards, including the prestigious doctoral-level NSERC Canada Graduate Scholarship.

"It is truly my great honour to receive this prestigious award," said Sun. "This recognition reinforces my self-confidence and gives me greater resilience in the face of any future challenges to my research. I appreciate the support from my supervisor and from Western Engineering, without which it would have been impossible to achieve what I have so far."

Shuhui's research with Western Engineering's Department of Mechanical and Materials Engineering has produced exemplary results, including two U.S. patents, and has been covered in several high-impact, peer-

reviewed industry journals. He is highly regarded as an innovator in his field, pioneering a new approach to the design of electrocatalysts and, most recently, achieving a breakthrough in catalysis for fuel cells.

“Dr. Shuhui is a highly productive researcher who has demonstrated a progressive and creative approach to his work with nanotechnology and clean energy,” said Andy Sun, professor and Sun’s PhD supervisor. “The Governor General’s Gold Medal is only the latest addition to Shuhui’s growing collection of academic awards, showcasing the valuable contribution that his research has already made to the field.”

Sun is continuing his research as an assistant professor at Institut National de la Recherche Scientifique in Montreal.

J. Wood

Ian Swentek: Ian was funded by the OBW exchange program during the summer of 2011, which enabled him to conduct research, take a course and experience working in a state-of-the-art polymer composite research facility at the Karlsruhe Institute of Technology and the Fraunhofer Institute for Chemical Technology.

Mehdi Farrokhnejad: Mehdi is the recipient of the Ontario Graduate Scholarship both in 2011 and in 2012 and has been elected Chair of the HQPAC for AUTO21 NCE. He was an invited as speaker to AUTO21 Conference both in 20111 and 2012

RESEARCH

1. MAJOR RESEARCH AREAS

The current graduate program in the Faculty of Engineering is fully accredited by the Ontario Council of Graduate Studies. This brief seeks to further the decentralization of the program as recommended in the previous accreditation cycle by requesting the accreditation through the departmental graduate programs. Each Department has restructured the Graduate Research Programs by focusing on the individual areas of strength. In the case of the Department of Mechanical and Materials Engineering the Master’s and PhD programs comprise the following fields:

- Mechanical Engineering
- Thermofluids
- Materials and Solid Mechanics
- Automation Technologies and Systems

2. FACILITIES

Laboratory Facilities

The description of laboratory facilities is divided into sections dealing separately with each of the four research groups. Note that there may be an overlap in the facilities listed as different groups may be using the same

facilities, and the individuals may be contributing to different groups. There are in excess of 30,000 sq. ft. of laboratory and office spaces for the members of the program with state of the art research infrastructure and computing facilities (PCs and Workstations).

Thermofluids Group

Aerodynamic testing facilities:

- Two low-speed wind tunnels
- Unique small-scale downburst outflow simulator
- Automotive cooling fan module underhood rig simulator and plenum chamber
- Unique hemodynamic flow rig
- 3-component laser Doppler velocimetry system and additional lasers

Micro/Nano Fluids Laboratory facilities:

- OLYMPUS IX81 Inverted Fluorescence Microscopy
- Photometrics Cascade high speed Imaging system
- Patchman NP2 Micromanipulation system

Access to other fluid dynamic related test facilities:

- Boundary Layer Wind Tunnel Laboratory (four wind tunnels and a water tunnel)
- 3-component laser Doppler velocimetry system
- Stereoscopic particle image velocimetry system
- High-speed camera system for flow visualization
- Laser Scanning Confocal Microscope (Dept of Anatomy and Cell Biology)
- Insurance Research Lab for Better Homes (CFI Facility)

Specialized computing resources:

- 4 SUN Blade 2000 workstations and 1 SUN Ultra 60 workstation and 12 high-end, single processor PCs.
- 4 dual core PCs with 4 Gb memory each, 2 dual core PCs each with 2Gb memory, 4 single core PCs each with 2 Gb memory each, one 4-processor Compaq machine (9Gb memory), one 2-processor Compaq machine (2 Gb memory), network and printing facilities.
- Server network (2 Tb, with additional 2 Tb back-up storage) and 5 PC workstations
- Commercial CFD codes, notably FLUENT and CFX

Materials and Solid Mechanics Group

Access to Nanofab and Surface Science Western:

- Photolithography
- LEO 1530 E-beam Lithography
- LEO 1540XB FIB Lithography
- Plasma Enhanced Chemical Vapour Deposition (PECVD)
- Reactive Ion Etch - STS
- SIMS - Secondary Ion Mass Spectrometry
- ToF-SIMS - Time-of-Flight Secondary Ion Mass Spectrometry
- SEM-EDX - Scanning Electron Microscopy with Energy Dispersive X-ray analysis
- FESEM - Field Emission Scanning Electron Microscopy
- XPS - X-ray Photoelectron Spectroscopy
- Laser Raman Spectroscopy
- SAM/AES - Scanning Auger Microprobe/Auger Electron Spectroscopy
- AFM - Atomic Force Microscopy
- FTIR - Fourier Transform Infrared Spectroscopy

Metal Forming Laboratory (SEB 24):

- Four combined bending and torsion test labs
- Four beam bending labs

- Four buckling test labs
- Four Asymmetric bending labs
- Two thick cylinders testing labs
- Eight P3 Vishay strain gauge indicators
- Five PCs with windows7 and data acquisition labs
- Five variable power supplies
- Various temperature and pressure sensors
- Thick Cylinder Apparatus (no. 1)
- Thick Cylinder Apparatus (no. 2)
- Unsymmetrical Bending Apparatus (no. 1)
- Unsymmetrical Bending Apparatus (no. 2)
- Column Buckling Apparatus (no. 1)
- Column Buckling Apparatus (no. 2)
- Combined Bending and Torsion Apparatus (no. 1)
- Combined Bending and Torsion Apparatus (no. 2)

Heat Treating Laboratory (SEB 3049):

- Megatronic e42wri quartz quad elliptical radian heating furnace model 30393-2 with controller
- Lindberg blue box furnace maximum temperature 1100 degree centigrad serial no x01f313762xf
- Lindberg box furnace maximum temperature 1100 degree centigrad model no 59545
- Lindberg box furnace maximum temperature 1200 degree centigrad model no T51333
- Lindberg tube furnace maximum temperature 1200 degree centigrad
- 6 thermolyne tube furnaces model 21100 maximum temperature 1200 degree centigrad
- Lindberg tube furnaces model 55035a maximum temperature 1100 degree centigrad
- Hardness testing
- Vickers pyramid hardness tester serial no 255032
- Clark rockwell type hardness tester model c8a 50340
- Clark rockwell type hardness tester model c8a
- 3Macromet rockwell type hardness tester
- Satec impact tester model Si-1B

Composite Fabrication Laboratory (SEB 6):

- Freezer
- oven,
- autoclave and heated platen press for two- and three-dimensional wet lay-up and prepreg processes.

Nanomaterials Fabrication and Characterization Laboratories (SEB 3072, .SEB 3074, TEB 324):

- Chemical Vapour Deposition and sputtering facilities
- Inverted Fluorescence Microscopy
- NanoScope V MultiMode SPM
- Photometrics Cascade high speed Imaging system
- Patchman NP2 Micromanipulation system
- Cell Culture Room
- Photonic Instrument
- MicroPoint Laser System
- Fuel Cell station

Mechanical Testing Laboratories (SEB 10)

- Mechanical and servohydraulic load frames ranging from 1kN to 500kN capacity

Properties of Materials Laboratory (SEB 3052)

- Shopcraft bench grinder
- Unitek spot welder model 113203

- Atlas 6 inch lathe
- Drill press canadian blower co size 18
- Drill press rockwell beaver
- Oliver rolling mill
- Imptech C-10 Cut off Machine (5 year)
- Carver press model C-24,000 lbs, 11 metric tons

Polymer Engineering Laboratory (SEB 3055):

- FTIR, micro-indenter (DMTA, deep penetration)
- thin film tensile tester
- grad student desks

Tribology Laboratory (SEB 3064):

- A variety of wear testing machines including a Plinth and a Direct Observation Wear Machine.

Materials Characterization Laboratories (SEB 3045, 3047)

- Optical and Electron microscopy
- X-ray diffractometer
- Differential scanning calorimeter
- Electrical resistivity (4-300K),
- “Grindosonic” ultrasonic probe
- High-temperature nanoindentation

Optical Microscopy Laboratory (SEB 3051)

- Buehler micromet automatic polishers 2
- Leitz stereo microscope
- Unitron stereo microscope
- Olympus stereo microscope
- Leitz aristophot
- Reichert bench type microscope with micro hardness tester 005 263
- Olympus bh2 microscope
- Sony monitor pvm 1340
- Sony video printer up850
- Microscope video black and white camera dage mti nc65
- Leitz laborlux microscope
- Fibre optics light source intralux 150 watt
- Technical copy stand TCI
- Clemex Vision Pe Image Analyzer
- Microscope xillix digital camera 0042
- Leitz microscope with discussion attachment model laborlux (2)
- Wild stereo microscopy with discussion attachment
- Unitron metallurgical inverted microscope model mec (2)
- Wild metallurgical inverted microscope model m50 (6)
- Microgram atic balance maximum 19 grams 5 decimal places resolution
- Sartorius digital micro balance maximum 120 grams 4 decimal places resolution
- Sartorius micro balance 160 grams maximum
- Metler micro balance model p1200n
- Leitz Laborlux Microscope

Polymer Engineering Laboratory (SEB 3068):

- DSC
- DMTA

- thin film/microprobe dielectric spectrometer
- Brabender high shear mixer
- Centrifuge
- annealing ovens
- thin film spinner
- grad student desks

Dynamic and Sensing Systems Laboratory (SEB 3072):

- Vibration transducers
- electrodynamic shakers
- real-time signal and modal analysis software

In addition to the departmental facilities, faculty and students in the Materials and Solid mechanics group have access to the following major equipment and common facilities:

MME Undergraduate Teaching Laboratories: Metallographic preparation, Rockwell and Vickers hardness, Charpy impact pendulum

Surface Science Western and Nanofabrication Facility: A variety of state-of-the-art materials characterization tools including electron and atomic force microscopy and a wide variety of spectroscopic techniques, Photo-, E-beam and Focussed Ion Beam Lithography

Dept of Microbiology and Immunology: Transmission Electron Microscope

The Automation Technologies and Systems Group

Dynamic and Sensing Systems Laboratory (SEB 2070):

- Micron-scale and macroscopic vibration transducers
- Electro-dynamic shakers
- Real-time signal analyzers and modal analysis software
- Real-time control hardware/software

CNC Machining Laboratory (SEB 37/37A):

- The Fadal 4020-5 Axis CNC Machine with tooling package.
- The “Swift” DEA-Coordinating Measuring machine with Controllers and PC-Pentium I-120 MHz and “Tutor” Software.
- PC-Pentium III-350 MHz with “Surfcam 99” CAD/CAM Package
- PC-Pentium II-233 MHz with “Surfcam 99” CAD/CAM Package
- Techno Isel, 3-Axis CNC Machine with Mac 200 Controller, connected to a Pentium 150 MHz Computer System
- Dyna Myte Model 2400, 3-Axis CNC machine with optional rotary axis, connected to a Pentium 150 MHz Computer System
- 40” LCD screen for demonstration and presentation purposes

Geometric Modeling & Virtual Sculpting Laboratory (SEB 3025A):

- Immersion MicroScribe G2 hardware/software
- PHANTOM Omni haptic device
- VRMesh 3.5 Studio software
- Claytools for Rhino modeling software
- Rhino3D NURBS modeling software

Bioelectronics and Biosensor Laboratory: (TEB 18) (Note: This laboratory contains equipment not readily available elsewhere on campus)

- Optical Bench (2 types) – including various optical breadboards and plates

- Micralyne biochip toolkit
- Optikon High-Speed Sensicam VGA cooled color digital CCD camera
- Tunable ArKr laser system
- Argon-Ion laser (457nm)
- He-Ne yellow laser (594nm)
- Infiniium oscilloscope (2GSa/s)
- Wavestar U spectrometer
- Broadband amplitude modulator (3 units)
- Electro-optical modulator and drivers (2 units)
- Acousto-optic deflector and driver
- Radiometer ION 450
- Linear and rotational precision stages (multiple)

Visualization and Virtual Reality Laboratory: (TEB 206)

- Cyberware 3D RGB head & shoulder scanner
- Fakespace Immersadesk R-2 virtual reality display

Sensing and Mechatronic Systems Laboratory: (SEB 2048)

- Active modular omnidirectional vision systems with multiple Firewire cameras
- Modular sensor/actuator building blocks

Robotics and Automation Laboratory: (SEB 1068)

- (21) Mini Desktop Computer with INTEL 2.8GHZ - Dual Core Processor, 1GB Ram, 256Mb PCI-E Video Card, 160GB HD, DVD+-RW, 17" LCD, Windows XP Pro.
- (15) Dell OptiPlex GX1p Computer, P3-550, 512MB Ram, 80GB HDD
- (20) Tektronix Oscilloscope, Model # TDS1002
- (10) Tektronix Oscilloscope, Model # TDS210
- (20) B&K PRECISION Power Supply
- (10) Global Series 12Vdc Power Supply
- (12) Fluke Digital Multimeter
- (10) General Purpose Multimeter
- (12) Fluke 3 MHz Sweep Function Generator
- (10) Hewlett Packard Function Generator
- (10) NI PCI-6221 M Series DAQ with SCB-68 Shielded I/O Connector Block
- (10) NI USB-6009 DAQ
- (3) PLC Controlled Industrial Workcells for Term Projects
- (1) Motoman Robot with Controller - MRC II SV3
- (1) GMFanuc S-110R Robot and Controller
- (1) GMFanuc A-510 Robot and Controller
- (1) CRS Plus M1A Robot and Controller
- (1) 8-Axis Motion Control System with 4 Linear and 2 Rotary Stages
- (5) Vision System, IEEE 1394 Firewire Colour Camera, IMAQ Advanced Vision software
- (1) Vision Development System, IMAQ PCI-1408 (4 B&W Video Inputs)
- (1) Omron F300 Vision System
- (3)Vibratory Bowl Feeders
- (9) Allen Bradley SLC 5/02 PLC - Basic Trainer
- (10) Allen Bradley SLC 5/05 PLC - Advanced Trainer
- (10) SMC Pneumatic Training Kits
- (40) PIC16F877 Microcontrollers
- (15) MPLAB-ICD (In-Circuit Debugger and Programmer)
- (5) MPLAB PICDEM Training Boards
- (1) PicStart Plus Programmer
- (1) EEPROM Programmer and EEPROM Eraser
- (20) Battery Chargers
- (20) Stepper Motor Driver Board

- (20) DC Motor Driver Board
- (10) RC Servo Motors
- (2) Soldering Irons
- Various Electronic Components (555 Timers, Op-Amps, Logic Gates, motors, etc…)
- Various Mechanical Components (gears, castors, wheels, gearbox, springs etc…)
- Various Automation Related Equipment (i.e. sensors, valves, cylinders, motors, conveyors etc…)
- RSLogix 500 Programming Software, RSEmulate 500 PLC Emulation Software, RSLinx PLC Communication Software, RSView32 Visualization Software
- National Instruments Academic Site License - LabVIEW Professional Development System, Measurement Studio for Visual Studio .NET and many Advanced Toolkits

Research facilities available at National Research Council's Integrated Manufacturing Technologies Institute (NRC-IMTI):

- 5 high precision laser micromachining systems with different lasers
- 2 high speed micromilling systems
- Micro-EDM
- Micro-welding system
- Micro/nano-injection moulding system
- Dynamic optical profilometer
- Scanning electron microscope
- 5-axis CNC milling machine
- ABB industrial robot
- Multi-camera motion tracking system
- FARO single-target laser tracker
- FARO laser scene scanner
- HYSCAN 3D laser scanning probe
- Equipment for virtual environment technologies
- Equipment for precision fabrication processes

Research facilities available at Canadian Surgical Technologies and Advanced Robotics (CSTAR):

- 2 Mitsubishi robots
- Zeus MIS system
- 3 Aesop arms
- 2 ultrasound machines
- Haptic input devices
- Electromagnetic and optical tracking systems

The Nanofabrication Laboratory: (Physics & Astronomy Room 10) – restricted fee access

Biomechanics Group

The Jack McBain Biomechanical Testing Laboratory: (Dr. Cynthia Dunning)

The Biomechanical Testing Laboratory primarily conducts experimental in vitro research related to orthopaedic biomechanics. The current lab focus includes orthopaedic implant fixation and implant design for the upper limb and spine, as well as the assessment of lower limb impact injury. The primary equipment available includes two Instron materials testing machines, one of which is tension-compression and the other which has three actuators (tension-compression, as well as 2 torque axes). Data acquisition is achieved through National Instruments hardware and custom-written LabVIEW software.

The Wolf Biomechanics and Imaging Laboratories: (Dr. Tom Jenkyn)

The two facilities described below conduct basic and clinical biomechanics research into in vivo human motion in health, sport, disease (primarily osteoarthritis, ligament and other soft tissue injuries) and the result of surgery, bracing and other clinical interventions. Primarily studied is the lower limb, but research is being conducted on spine and upper limb biomechanics as well.

The Wolf Orthopaedic Biomechanics Lab (WOBL) is located adjacent to the Fowler-Kennedy Sports Medicine Clinic. Composed of an 8-camera motion analysis system (Motion Analysis Corp, Santa Rosa, CA, USA), a floor-mounted forceplate (AMTI, Amherst, NY, USA) and a telemetric electromyography system (Telemyo, Noraxon, MA, USA). This facility is one of only eight in Canada.

The Wolf Orthopaedic Quantitative Imaging Lab (WOQIL) is located immediately adjacent to WOBL. The WOQIL is equipped with 2 x-ray fluoroscopes (Siremobil Compact-L C-arm, Siemens Inc, Mississauga, ON), a 4-camera motion analysis system (Motion Analysis Corp, Santa Rosa, CA, USA) and a forceplate instrumented treadmill (Kistler Gaitway, Amherst, NY, USA). This facility is unique in Canada and one of only 3 worldwide. This facility is developing the technique of dynamic radiostereometric analysis (RSA).

Both of these facilities are located within the Fowler Kennedy Sport Medicine Clinic and tests clinical patients as part of their standard care by primary care physicians, orthopaedic surgeons and physiotherapists. This arrangement is unique in Canada.

The facilities have desktop computers for 8 graduate students or research assistants and are equipped with wireless networking for additional use of student laptops (table space is available for up to 3 laptops). This has been recently expanded with external funding from a national agency. There are no plans in the next 3 years to expand further, but expansion is possible in the longer term into the adjacent Zimmer Conference room (3M bldg).

The Bioengineering Research Laboratory: (Dr. Graham King and Dr. James Johnson)

The Bioengineering Research Laboratory of the Hand and Upper Limb Centre is located in Lawson Health Research Institute of St. Joseph's Health Care London. The proximity of this laboratory to the outpatient clinics, therapy department and operating rooms allows a close interaction between researchers, clinicians and patients. This has resulted in a fertile environment for our graduate and medical students, and residents who have been stimulated by the clinical correlations of their research. All surgeries are conducted by Dr. King (PI) with surgical fellows and residents, and all engineering components are managed by Dr. Johnson (co-applicant), research engineers and graduate students.

The electromagnetic tracking device has six sensors and is linked to LabView on a personal computer. We have recently developed "Motion Station", a Lab View based program that provides a real-time graphical description of bone and joint motion. We have access to advanced imaging facilities in house.

3. RESEARCH SUPPORT

Operating Research Funding by Source and year				
Year	**Granting Councils [2]**	**Other Peer Adjudicated [3]**	**Contracts[4]**	**Others [5]**
2011	$5,194,907.83	$2,507,301.30	$3,229,293.84	$1,549,492.33

[2]NSERC Discovery Grants (this column does include equipment grants and conference grants)
[3]CFI grants, Centres of Excellence Grants (Federal and Provincial), Equipment Grants, Industrial Grants
[4]Industry grants
[5]University allocated grants (Academic Development Fund, UWO Internal Funding)

4. RESEARCH IN THE NEWS

C.E. Dunning

Dr. Dunning co-chaired the 2012 Ontario Biomechanics Conference, along with two other professors from Western's Faculty of Health Sciences, Dr. Jeff Holmes (Occupational Therapy) and Dr. Jim Dickey (Kinesiology). The two meeting was held at the Kempenfelt Centre in Barrie, Ontario in March 2012, and attracted 150 participants from 12 Ontario universities.

L. Ferreira

Research conducted in the Hand and Upper Limb Centre Bioengineering and Surgical Mechatronics labs has been the focus of a St. Joseph's Foundation public campaign. Mostly print and online news letters have been released. A media release went out August 29, 2012, directed to TV and radio.

R. Klassen

The 24th Canadian Materials Science Conference (CMSC) was hosted at Western from 5-8 June, 2012. The department of Mechanical and Materials Engineering (MME) at Western was instrumental in organizing this conference: The conference chairman was Dr. R.J. Klassen (MME) and the organizing committee members were Drs. J.T. Wood (MME), X.A. Sun (MME), J. Yang (MME), A. Rizkalla (CBE), J.F Corrigan (Chem), and M.J. Gordon.

Two hundred and twenty people attended the conference. The conference had 133 oral presentations, presented in 4 concurrent sessions over 2.5 days, and 44 poster presentations. The conference was considerably larger than past CMSCs. Much of this expansion has resulted from the efforts of the organizing committee to expand the scope of the conference to include new, highly topical, areas of materials science. The conference therefore had concurrent technical sessions on Biomaterials, Composites, Materials for Energy Storage, Nuclear Materials, NEMS/MEMS, Nanomaterials, in addition to the conventional topics of Mechanical Metallurgy and Chemical Metallurgy.

The CMSC conference invited 21 Canadian materials scientists who were recognized leaders in their particular areas of materials research to deliver invited lectures to the various technical sessions. The keynote lecture of this conference was delivered by Dr. Carlos Tome of the Los Alamos Nuclear laboratories.

K. Siddiqui

Prof gets more from solar
ENERGY: Trackers move panels so they follow the sun all day
Call it a smarter take on solar energy.

Sun-powered electricity systems are becoming more popular than ever amid rising energy costs. Homes, businesses -- even farms now have them. Although some solar panels track the sun, many solar systems don't move, capturing only a fraction of the sun's energy over the course of a day. A University of Western Ontario mechanical engineering professor, Kamran Siddiqui, has come up with two new ways to squeeze more juice out of the sun's rays while lowering the operating costs for solar systems. Siddiqui's smart solar tracker moves solar panels that capture the sun's light so they follow the sunlight throughout the day, while a load compensator uses energy that's been collected -- along with small motors -- to help move the panels.

"The tracker is very accurate and the good thing is the overall cost is very low," Siddiqui said. Both systems are add-ons that can be attached to solar panels. Because most solar panels are fixed, they can only collect sunlight when it hits them. "Typically, panels face south, so for only about two hours a day the panel is well aligned with the sun," Siddiqui said. He said that studies show efficiency goes up 40% when a panel tracks the sun, instead of staying in a fixed position. Siddiqui said that with the load compensator, only a small motor is needed to help move the panel since it carries between 60% and 75% of the panel's weight. "You're working against gravity, so you need extra power to lift the panel up," he said. "This mechanical system releases the energy to help push the system up, so you don't need a large motor." With the load compensator, there's a build-up of energy which is used to slow down the panel and operate as a braking system so the panel doesn't move too fast.

The prototype system is located on the roof of Western University's Claudette MacKay-Lassonde Pavillion building. Siddiqui has applied to patent the system and is trying to take the system to market through UWO's commercial arm for new technology. He estimates when the two add-ons go to market, the cost will likely start at $3,000.

Dr. Siddiqui also had radio interviews in *The Biggs Show* on CJBK and XFM Radio to explain the novel solar tracking technology

A.G. Straatman

Professor Straatman was elected President of the CFD Society of Canada

The goal of the CFD Society of Canada is to promote computational fluid dynamics and to provide a framework for communication and collaboration between researchers, developers and practitioners, in industry, government and academia. Since its founding in 1992, the CFD Society of Canada has been a vibrant society that has grown under the leadership of 11 different presidents and numerous board members from Canadian academia and industry. The Society provides a unique network for graduate students, professors and practitioners to discuss advancements, applications and issues in CFD.

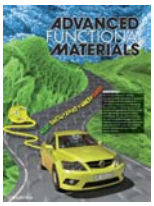
The annual conferences held by the CFDSC draw together researchers to highlight recent advances and challenges encountered in a broad spectrum of application areas and to facilitate scientific and technical exchange. The conference is hosted annually in several different locations in Canada spanning from Vancouver to St. Johns and Halifax. Western University served as host of the 18th annual conference on May 17-19, 2010 under the coordination of professors Straatman and Siddiqui, and attracted more than 115 delegates from academia and industry. The conference comprised 84 technical presentations in four parallel sessions held over two full days, and included keynote lectures from Dr. Andrew Pollard, founding president of CFDSC, and Dr. Marian Nemec of Eloret Corp. (California).

Prof. Anthony Straatman of Western Engineering is serving as the current president of CFDSC for the term May 2012 – April 2014, with the mandate of enhancing the membership, sponsorship and visibility of the Society. Prof. Straatman has previously served on the CFDSC Board of Directors and brings with him the enthusiasm to grow the society.

X. Sun

Western Engineering researcher receives funding from the Canadian Foundation for Innovation (CFI) for the project “Facility for Applications of Advanced Nanomaterials in Energy Storage for Electric Vehicles.”
Engineering News, January 24, 2012

Prof. Sun’s paper about Batteries for Electric Vehicles, was highlighted in “Advanced Functional. Materials”, a journal with Impact Factor of over 10.



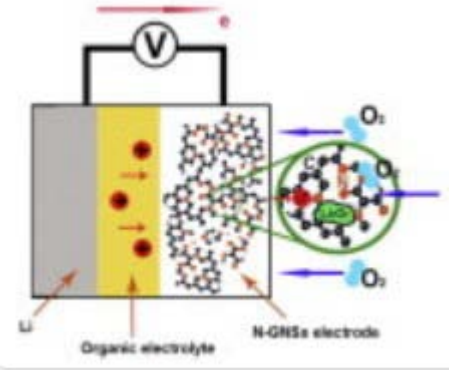
Tin Oxide with Controlled Morphology and Crystallinity by Atomic Layer Deposition onto Graphene Nanosheets for Enhanced Lithium Storage (Advanced Function Materials 22 (2012), 1647-1654. Atomic layer deposition derived amorphous $Sn0_2$ decorated on grapheme nanosheets is demonstrated to be a very effective approach for addressing the challenges of electrochemical and mechanical degradation of $Sn0_2$ anodes with high energy capacity for lithium ion batteries. As reported by Xueliang Sun and co-workers on page 1647, this important finding shows promise for the application of the composite in hybrid electric vehicles and plug-in hybrid electric vehicles

Prof. Sun's paper about "Lithium-Air Batteries" was Highlighted by "Green Car Congress","New Energy and Fuel" and "Materials Today", One of ten most downloaded articles from Feb. to May. in 2012)
http://www.greencarcongress.com/2012/02/uwo-20120206.html

http://newenergyandfuel.com/http:/newenergyandfuel/com/2012/02/08/the-best-lithium-air-batteries-get-a-33-boost/

http://www.materialstoday.com/view/23959/doping-makes-a-difference/

U of Western Ontario researchers find nitrogen-doped graphene nanosheet cathodes significantly increase performance of Li-oxygen batteries; 11,660 mAh g^{-1} at 75 mA g^{-1}
6 February 2012
Researchers at the University of Western Ontario (Canada) report that using nitrogen-doped graphene nanosheets as cathode materials significantly increases the performance of a non-aqueous lithium-oxygen battery, even compared to the use of the high-performance pristine graphene nanosheets they had developed earlier. (Earlier post.)



In a paper accepted for publication in the journal Electrochemistry Communications, Yongliang Li and his colleagues found that their nitrogen-doped graphene nanosheet (N-GNS) cathode materials delivered a discharge capacity of up to 11,660 mAh g^{-1}; the pristine graphene nanosheets (GNSs) had shown a capacity of up to 8,706 mAh g^{-1}—at that time, the highest capacity of any carbon-based materials in lithium-oxygen batteries reported, according to the team.
In their new study, they found that the electrocatalytic activity of N-GNSs for oxygen reduction in the non-aqueous electrolyte is 2.5 times that of GNSs. They attributed the excellent electrochemical performance of N-GNSs to the defects and functional groups as active sites introduced by nitrogen doping.
Recent studies reported that nitrogen-doped carbon powder and carbon nanotubes showed higher discharge capacities than the pristine counterparts, however, there is no report on nitrogen-doped graphene nanosheets (N-GNSs) as cathode materials for lithium-oxygen batteries. In this study, for the first time, N-GNSs were employed in lithium-oxygen batteries, and it was found that they show excellent electrocatalytic activity for oxygen reduction, therefore, increasing about 40% of the discharge capacity compared to GNSs. This finding not only shows that N-GNSs are promising electrode materials, but also gives a rational direction to modify other carbon materials for application in lithium-oxygen batteries.

—Yi et al.

In the current study, Yi et al. prepared both GNS and N-GNS cathodes; findings included:

- The initial discharge capacity of the GNS electrode was 8,530 mAh g^{-1} at a current density of 75 mA g^{-1}, while the N-GNS electrode delivered 11,660 mAh g^{-1} for N-GNSs—about 37% higher.

- As current densities increased, the discharge capacities of both samples decreased: 5,333 and 3,090 mAh g^{-1} for GNS and 6,640 and 3,960 mAh g^{-1} for N-GNS at current densities of 150 and 300 mA g^{-1}, respectively.

The research was supported by Natural Sciences and Engineering Research Council of Canada, Canada Research Chair Program, Canada Foundation for Innovation, Ontario Early Researcher Award and the University of Western Ontario.

Resources

- Yongliang Li, Jiajun Wang, Xifei Li, Dongsheng Geng, Mohammad N. Banis, Ruying Li, Xueliang Sun (2012) Nitrogen-doped Graphene Nanosheets as Cathode Materials with Excellent Electrocatalytic Activity for High Capacity Lithium-oxygen Batteries. Electrochem. Commun. doi: 10.1016/j.elecom.2012.01.023

J.T. Wood

Western Engineering researcher receives funding through the AUTO21 Network of Centres of Excellence for the project “Computational Tools for Magnesium Die-Casting”
Western News, May 31, 2012

Fraunhofer Project Centre

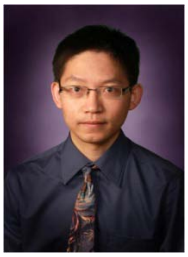
Western University and the Fraunhofer Institute of Chemical Technology (ICT) in Pfinztal, Germany have launched a long-term research collaboration on composite technologies for weight reduction. This joint venture represents the first comprehensive initiative between a Canadian university and an institute of Fraunhofer. Together, Western and Fraunhofer will work on composite technologies adapted to the local demands of each region’s industry in the joint Fraunhofer Project Centre for Composites Research at Western (FPC) – focusing on the development of light weight composites for the transportation and building materials sectors – set to open in November 2012.

Academic collaboration with the FPC is primarily through the International Composites Research Centre (ICRC) - a virtual research cluster hosted by Western and led by Prof. J. T. Wood of the Department of Mechanical & Materials Engineering. Formed as a result of a successful $7.2M Ontario Research Fund proposal, the ICRC embodies academic research expertise that spans the entire value-chain of the polymer composites industry. The mission of the ICRC is to train graduate and undergraduate engineers and scientists for maximum impact to the polymer composites industry.

The centrepiece of the FPC is a state-of-the-art, 2500 ton compression moulding press. Initially, this press is fed by two full-scale composite material production lines - a Direct, Long-Fibre Thermoplastic (LFT-D) and a Direct Sheet Moulding Compound (D-SMC) line. Future plans call for a third manufacturing technology - High-Pressure Resin Transfer Moulding (HP-RTM) and associated preform production equipment to be added to the suite of high-volume manufacturing technologies.

The activities of both research entities will utilize and increase the expertise to accelerate composite innovations as lightweight solutions for the transportation, construction, renewable energy and aerospace.

The activities of the Fraunhofer Project Centre at Western and the International Composites Research Centre were highlighted in Business London: (http://www.myvirtualpaper.com/doc/Business-London-Magazine/bl_june_2012/2012060601/#2)



J. Yang

Jun Yang, Department of Mechanical & Materials Engineering, Faculty of Engineering, received WIF funds for a project, A technique for fabrication of unique high-quality microfiltration membranes.

http://communications.uwo.ca/western_news/stories/2012/June/western_projects_get_internal_boosts.html
http://www.eng.uwo.ca/news/2012/Western_projects_get_internal_boost.htm

5. RESEARCH COLLABORATION WITH EXTERNAL PARTNERS

S. Asokanthan

Ministry of Transportation Ontario (MTO) - Feasibility of using solar roadways in place of conventional asphalt-based are studied considering material characterization, mechanical strength of solar roadway panel systems, electrical power storage/transmission via smart grid and innovative power control devices. Computational as well as experimental investigations are also carried out for the purpose of developing suitable vibration-based energy harvesting systems.

T. Jenkyn

Collaboration with the **Division of Plastic and Reconstructive Surgery, Department of Surgery, Schulich School of Medicine and Dentistry.** I am working with Dr. Arjang Yazdani, MD, FRCSC on the biomechanics of concussion and craniofacial skeleton fractures. This is funded by a Dept. of Surgery start-up grant and a Lawson Health Science Center research grant.

Collaboration with **3M Canada**. I am working with the Research and Development Department at 3M to test a novel type of sport grip tape. There is an application for an NSERC Engage grant to support this work.

L. Jiang

Dr. Jiang is working on a collaborating project to develop new green chemistry and engineering methods for the fabrication of high-value-added polymer surface and devices. In particular, Dr. Jiang will contribute her modeling expertise to investigate the mechanical and electrical properties of conductive polymers nanocomposites. This work is in collaboration with **Dr. Jun Yang (Department of Mechanical & Materials Engineering), Dr. John de Bruyn (Department of Physics and Astronomy), Dr. Gianluigi Botton (Department of Materials Science & Engineering, McMaster University) and researchers of LANXESS.** This project is funded by ORF, OCE, LANXESS and NSERC.

R. Klassen

On March 2012, R.J. Klassen was awarded a 4-year NSERC CRD grant to work with **Natural Resources Canada (NRCan) and the Atomic Energy of Canada Ltd (AEC**L) to study “The effect of irradiation on the mechanical properties of nuclear fuel cladding and insulating materials for the Gen. IV pressure tube super critical water reactor”. This grant has a total value of $320,000.

G. Knopf

National Research Council of Canada – Industrial Materials Institute (NRC-IMI)
Collaborating Researchers: Drs. Suwas Nikumb and Evgueni Bordatchev (NRC-IMI, London)
Laser material processing and microfabrication
Laser material processing is a complex nonlinear process with numerous stochastic parameters related to the laser apparatus, optics and the material specimen. Researchers at UWO and NRC-IMI have developed nonlinear models to predict the level of pulse energy needed to create a dent with specific depth and diameter. Laser

micromachining has also been used to rapidly construct mould masters for fabricating large volumes of disposable polymeric micro-devices. More recent research explores how laser micro-polishing (LμP) can be used to reduce the surface roughness of micro-machined structures and parts.

National Research Council of Canada – Institute for Research in Construction (NRC-IRC)
Collaborating Researchers: Dr. Roberto Canas (NRC-IRC, London)
Range sensing and geometric modeling for virtual reality environments
Range scanners have become the primary tool for capturing arbitrary surface geometry of pre-existing objects or large civil structures and spaces. However, the digitization process generates an immense cloud of 3D coordinate data that exhibit significant measurement errors due to scanner noise, partial or missing information, and data density variations. Researchers at UWO and NRC-IRC are developing new methods to reduce scanning errors and improve spatial accuracy by exploiting redundant data in multiple partial scans. The captured data is used to create 3D virtual reality models of buildings and structures. Another collaborative project involves the development of a computational framework for manipulating deformable free-form objects in virtual environments. The core algorithms for haptic rendering, collision detection and physics-based modeling assume that all deformable objects can be represented as parametric B-spline surfaces.

K. Siddiqui

Gas Turbine Laboratory, Institute of Aerospace Research, National Research Council, Ottawa
Project: Development of efficient effervescent fuel injector
Two of the most pressing challenges presently faced by the gas turbine industry are improvement in combustion efficiency and reduction in pollutant emissions. For gas turbines burning liquid fuels, the solution lies in the ability to improve and control spray atomization. Effervescent atomization has the potential to give the required spray quality for gas turbine combustion. This collaborative research work is focused on the development of efficient effervescent fuel injector for gas turbines.

Lor-don Limited/Team Enterprise, London
Project: Solar assisted Geo-Exchange system
Geothermal heat pumps provide heating and cooling by utilizing clean, reliable and continuous thermal energy of Earth as a source and sink, respectively. The system cost and the degradation of its heating performance in the winter season are major obstacles in the wide scale utilization of this clean energy system. This research project was focused on the development of a novel hybrid solar-geothermal system to enhance the overall performance of the system and to reduce the overall cost. A prototype system has been developed and installed at a residential site and the performance evaluation is currently underway.

EnerMotion Inc. Bolton, ON
Project: Thermodynamic Improvement and Operational Efficiencies to Hybrid Auxiliary Power Unit Harnessing Waste Exhaust Energy from a Heavy Truck
Heavy trucks consume additional power during driving and operator's rest/idle time to provide necessary heating/cooling to the cab/sleeper. During driving, this additional power requirement is provided by the truck engine resulting in increased fuel consumption and corresponding emissions as well as extra load on the truck engine. During the rest time, the power for the heating/cooling is either provided by idling the main engine or by operating a diesel-based auxiliary power unit which also leads to increased fuel consumption and gas emissions. EnerMotion has developed a novel Hybrid Auxiliary Power Unit that recovers waste engine heat, and converts it to a usable energy form by storing and releasing thermal energy. This project was focused on an in-depth analysis of the underlying thermodynamic processes and the associated design improvements to enhance heat transfer and thermal storage.

Dyverga Energy Corporation, Waterloo, ON
Project: Thermo-fluid analysis of a novel waste heat to electricity conversion system
Dyverga Energy Corporation has developed a novel system to produce electricity from the waste heat. The Dyverga innovative turbine concept utilizes waste heat as the energy source and produces mechanical torque to drive a generator to produce electricity. A unique feature which distinguishes it from the conventional heat recovery systems, is its ability to extract heat at low temperature range (i.e. 10^{o}C to 90^{o}C) and generate electricity. This ongoing project is focused on the investigation of underlying thermo-fluid processes and a parametric study that will lead to an optimal design of the system.

A.G. Straatman

MITACS Accelerate application was approved for collaboration with **St. Mary's Cement**. The work involves a study of the pressure drop in a pneumatic transport system that moves cement powder from the milling to the filtration station. St. Mary's Cement/MITACS is supporting Ethan Doan (MESc) to conduct the work under my supervision.

E. Savory

University of Toronto (J Scott) – Development and application of a mould sensor for use in housing wall assemblies and grain storage bins. Development of new standard testing methodologies for mould-resistant building materials.

University of Calgary (R Martinuzzi) – Experimental and numerical modeling of new jet engine compressor stages (**in collaboration with Pratt and Whitney Canada**).

Central Michigan University, **USA** (L Orf) – Large-scale numerical modeling of downburst-producing thunderstorm clouds.

Purdue University, USA (P Karava) – Wind-induced convective heat transfer from building-integrated photovoltaic systems and other solar collectors.

Ecole Centrale de Nantes, France (L Perret) – Experimental modeling of the dynamics of the wind flow in and above urban street canyons.

X. Sun

General Motors of Canada (Fuel Cell and Li Ion Batteries for Electric Vehicles): Since 2005, we have been collaborating with GM scientists to develop one-dimensional nanomaterials in fuel cell applications. Our ideas are to integrate metal oxide and metal silicide nanowires into fuel cell electrodes through an NSERC CRD. In 2011, we are working on NSERC strategic project. We found that metal oxide nanowires as Pt-based catalyst supports for fuel cell electrodes have unique advantages compared with the carbon black supports used currently, to reduce cost and improve durability of fuel cells. Also, we are also working on Sn-based anodes for Li Ion Batteries for electric vehicles through an NSERC CRD in 2011-2014.

Ballard Power Systems (Fuel cell studies): After an NSERC CRD on carbon nanotubes as Pt catalyst support for fuel cells, in 2011, we are working on graphene as Pt support for fuel cells through NSERC strategic project. This will significantly improve mass transport and utilization of expensive Pt electrocatalyst and therefore reduce fuel cell cost.

National Defense (Nanotechnology): Since 2005, we have been developing various methods to obtain mass production of nitrogen-doped carbon nanotubes (CNx) and their applications for Energetic Materials as defense application. Recently, we are also working on Nano photocatalysts for spliting water for hydrogen production through a research contract, in collaboration with Profs. Hong Guo and Zetian Mi in McGill University.

Lithium Phostech Inc.(Li Ion Batteries for Electric Vehicles): Over the past few years, there is a dramatic increase of interest in large scale batteries for energy storage, especially for the transportation sector and energy storage (smart grid). Lithium-ion battery (LIB) is one of the most promising power systems because it can offer a higher operative voltage and energy density. Recently, in collaboration with scientists in Phostech, we got involved in the development of novel nanomaterials as cathodes for LIB. We focus on understanding and synthesis of LiFePO4/carbon composites through an NSERC CRD (2010-2013).

O.R. Tutunea-Fatan

Work in collaboration with **National Research Council** (R. Tutunea-Fatan): We are working in collaboration with researchers from the **Centre for Automotive Materials and Manufacturing at the National Research Council's Institute for Industrial Materials (NRC-IMI)** located in London to investigate multi-axis CNC laser polishing operations, in an attempt to determine correlations between process parameters and quality of the surface produced, typically characterized by an average roughness in the nanometer domain. The applications of this technology span over a broad range of engineering applications, from mold and die to biomedical industries.

Work in collaboration with **Hand and Upper Limb Center from St. Joseph Hospital** (R. Tutunea-Fatan and J. Johnson): We are working in collaboration with surgeons and researchers from the Hand and Upper Limb Centre from St. Joseph Hospital in London to develop computer assisted techniques capable to optimize the insertion trajectory of the implant within the medullary canal of the targeted bone. This work will translate into preoperative computer assisted software to be used for surgical simulation and training, as well as implant shape optimization purposes.

Work in collaboration **Scisense Inc.** (R. Tutunea-Fatan and S. Salisbury): We are working in collaboration with industrial partner's R&D staff to develop precise manufacturing strategies capable to produce miniaturized housings to encapsulate the MEMS sensor used in circulatory pressure and volume measurements. These blood flow parameters have clinical significance during the animal testing phase of the new experimental drugs with action on the cardiovascular system. The proposed hot-embossed housing will be integrated in a new generation of catheterized devices to be developed by the industrial partner for large-sized mammals.

J. Wood

Research funded by AUTO21 in the field of magnesium-based automotive structures continues with **Meridian Lightweight Technologies** (Strathroy, ON). Related research, funded by the Automotive Partnership Canada program includes Meridian, COSMA, 3M, Huys Industries, CANMET-MTL and researchers from McMaster and Waterloo and is part of the three-country (Canada, US, China) Magnesium Front-End Research and Development project.

In the field of composite materials, industrial partners include **Ford Motor Company, General Motors, Continental Structural Plastics, DSM Composite Resins and Dieffenbacher North America.**

J. Yang

Dr. Jun Yang (Department of Mechanical and Materials Engineering), Dr. John de Bruyn (Department of Physics and Astronomy), Dr. Gianluigi Botton (Department of Materials Science & Engineering, McMaster University) and Dr. Liying Jiang (Department of Mechanical & Materials Engineering) have been collaborating with researchers of **LANXESS**, the world's second largest producer of butyl rubber, on developing new green chemistry and engineering methods for the fabrication of conductive polymers and self-cleaning polymer products. These projects have been funded by ORF-RE and LANXESS.

Dr. Jun Yang has been collaborating with researchers of **Rosstech Signals Incorporation**, Orillia, Ontario to develop multifunctional solar systems.

Dr. Jun Yang has been collaborating with **Oxygon Technologies Inc**. to develop a new design of spray bottles.

C. Zhang

Research project with **Renix Inc.** in London, Ontario. The objective of this project is to develop a comprehensive three-dimensional Computational Fluid Dynamics (CFD) model of a Liquid-Solid Circulating Fluidized Bed (LSCFB) ion-exchange system including the ion exchange adsorption and desorption models. The CFD model proposed in this study will be able to predict the overall efficiency of the ion exchange process and the production rate under different operating conditions. This project is expected to have important contribution to the development of LSCFB ion-exchange systems in Canada to conserve the limited natural resources. The proposed CFD model will be able to optimize the operating condition of the LSCFB ion-exchange systems, which

can be applied for different types of chemical extraction processes to recover various functional materials such as proteins from large volume of industrial processes.

Research project with **Trojan Technologies Inc**. in London, Ontario. The objectives of this project are (a) to numerically model the UV disinfection occurring in a typical open-channel UV reactor using a two-phase approach, paying special attention to inlet and outlet 3D flow characteristics, hydraulic regimes and the microbial transport and inactivation occurring at the air-water interface (free surface phenomena) and (b) to investigate the effect of different configurations of the two flow banks in series, in order to determine the impact of decreasing water level from upstream to downstream. The work from this research will provide a better understanding of the detailed flow field in UV reactors, UV dose distribution and water level control for multiple flow banks. The CFD results will be used in optimizing the performance of UV systems in open channels, and developing more efficient UV systems.

Research project with **Biorem Technologies Inc**. in Guelph, Ontario. The objective of this project is to develop an advanced biofiltration system for large sewage plant odour control applications. Computational Fluid Dynamics (CFD) modeling will be carried out to visualize the air flow inside the biofilters on a computer. The design for inlet and outlet plenums and internal features will be optimized based on the CFD simulation results. Small prototype systems will be built and tested to validate CFD modeling. A final product will then be designed using the CFD tools followed by detailed engineering and costing. Benefits to the industrial partner include a better penetration of the municipal wastewater treatment market, creation of jobs in Ontario, and associated economic activity.

Research project with **Pratt and Whitney Canada** in Mississauga, Ontario. The objective of this project is to develop numerical models for the simulation of the flow field in the novel compact mixed flow compressor. To further improve the performance of aero engines, it is necessary to understand the flow fields in the compressor at both the design-point and at/near-stall and assess system behavior as the stall margin is approached. In this project, the computer simulation method will be used to predict the flow patterns in the compressor. The outcome of this project will be a computer simulation model that can be used by Pratt and Whitney Canada for designs of its advanced compressors. The computer simulations are expected to reduce the time and cost of new product development at Pratt and Whitney Canada, thereby helping the company maintain its competitiveness.

PUBLICATIONS

1. REFEREED JOURNAL ARTICLES

1. Book J M, **Asokanthan S F**, Wang T (2011) Experimental Modal Characterization of MEMS Switches, Advanced Materials Research – MEMS, Nano and Smart Systems, Vols. 403-408, pp. 4598-4605. doi:10.4028/www.scientific.net/AMR.403-408.4598.

2. Ma, J., **Asokanthan, S.F**., and Jiang, L.Y (2011) Surface effects considerations for the design of Casimir actuated nanoswitches, Applied Mechanics and Materials, Vols. 110-116, pp. 1036-1043 doi:10.4028/www.scientific.net/AMM.110-116.1036.

3. Khanal, Y.P., **Buchal, R.O**. Towards an Object-Oriented Engineering Design Pattern Language, *Journal of Design Research*, in press.

4. Khanal, Y.P., **Buchal, R. O.** Object-Oriented Multi-perspective Framework of Technical System Design, Journal of Design Research , Vol.9 No.4, pp. 376-389, 2011

5. Mohammadi M. **Dryden J.R**., Jiang L.Y., “Stress Concentration around a Hole in an Inhomogeneous Plate”, International Journal of Solids and Structures, Vol. 48, 3-4, pp. 483-491,2011.

6. Jafar R., **Dryden J.R.**, “Nonlinear Electric Flow across Parallel Plates”, International Journal of Engineering Science, Vol. 49, pp. 378-385, 2011.

7. **Dryden J.R.**, “Stress Concentration in Polymer Extrusion Dies”, Acta Mechanica, Vol. 219,3, pp. 269-279 2011.

8. **Dryden J.R.**, Batra R.C., "Optimizing Young's Modulus of a Homogeneous Cylinder Energetically Equivalent to a Functionally Graded Cylinder", submitted to the Journal of Elasticity, September 21, 2011.

9. Austman RL, King GJW, **Dunning CE**. (2011). Bone Stresses Before and After Insertion of Two Commercially Available Distal Ulnar Implants using Finite Element Analysis, Journal of Orthopaedic Research, 29(9):1418-1423

10. Quenneville CE, **Dunning CE**. (2011). Evaluation of Energy Attenuating Floor Mats for Protection of Lower Limbs from Anti-vehicular Landmines, Journal of Battlefield Technology, 14(3), Article 14-3-1.

11. Burkhart TA, **Dunning CE**, Andrews DM. (2011). Determining the Optimal System-Specific Cut-off Frequencies for Filtering In-vitro Upper Extremity Impact Force and Acceleration Data through Residual Analysis, Journal of Biomechanics, 44(15):2728-2731.

12. McCabe CMJ, McLachlin SD, Bailey SI, Gurr KR, Bailey CS, **Dunning CE**. (2012). The Effect of Soft Tissue Restraints After Type II Odontoid Fractures in the Elderly: A Biomechanical Study, Spine, 37(12):1030-1035.

13. Burkhart TA, Andrews DA, **Dunning CE**. (2012). Failure Characteristics of the Isolated Distal Radius in Response to Dynamic Impact Loading, Journal of Orthopaedic Research; 30(6):845-1012.

14. Quenneville CE, **Dunning CE**. (2012). Evaluation of the Biofidelity of the HIII and MIL-Lx Lower Leg Surrogates under Axial Impact Loading, Traffic Injury Prevention; 13(1):81-85.

15. Hosein YK, Clynick MP, McLachlin SD, King GJW, **Dunning CE**. (2012). The Effect of Intramedullary Stem Curvature on the Torsional Stability of Cemented Joint Replacement Systems, Journal of Applied Biomaterials and Functional Materials, published online 22/06/2012, DOI:10.5301/JABFM.2012.9266.

16. Nadeau M, McLachlin SD, Bailey SI, Gurr KR, **Dunning CE**, Bailey CS. (in press). Qualitative and Quantitative Assessment of Soft Tissue Damage in the Cervical Spine Following a Unilateral Facet Injury, Journal of Bone and Joint Surgery, accepted June 2012.

17. **Ferreira LM**, Bell TH, Johnson JA, King GJW. The Effect of Triceps Repair Techniques Following Olecranon Excision on Elbow Stability and Extension Strength: An In-Vitro Biomechanical Study. Journal of Orthopaedic Trauma, 2011 July, 25(7):420–424.

18. "Spectral Algorithm for Analysis of Flows in Grooved Channels " by A. Mohammadi & **J. M. Floryan**. Int. J. Num. Methods Fluids, 2011, DOI: 10.1002/fld.2577

19. "Mechanism of drag generation by surface corrugation" by A. Mohammadi and **J. M. Floryan**. Phys.Fluids, v.24, 013602 ,2012; doi: 10.1063/1.3675557

20. "Algorithm for Analysis of Flows in Ribbed Annuli" by H. Vafadar Moradi & **J.M. Floryan**. Int. J. Numer. Meth. Fluids 2012, v. 68, pp. 805–838, DOI: 10.1002/fld.2581

21. "Dynamics of water droplet distortion and break-up in a uniform electric field" by K. Adamiak and **J.M. Floryan**. The IEEE Transactions on Industry Applications, v.47, #6, 2011, pp.2374-2383.

22. "On the transition between distributed and isolated surface roughness and its effect on the stability of channel flow" by **J.M.Floryan** and M.Asai. Phys. Fluids, v. 23, 104101, 2011.

23. "Spectral Method for Analyzing Motions of Ellis Fluid over Corrugated Boundaries" by M. Fazel Bakhsheshi, **J.M. Floryan** & P.N. Kaloni, Journal of Fluids Engineering, v.133, #2, February 2011, DOI: 10.1115/1.4003356.

24. "Immersed Boundary Conditions Method for Heat Conduction Problems in Slots with Time-Dependent Geometry" by David César Del Rey Fernandez, S.Z. Husain and **J.M. Floryan**. Int. J. Numer. Meth. Fluids 2011, v. 67, pp. 478–500, DOI: 10.1002/fld.2363

25. "Spectrally-Accurate Method for Analysis of Stationary Flows of Second-Order Fluids in Rough Micro-Channels" by A. Mohammadi, **J.M. Floryan** and P.N. Kaloni. Int. J. Numer. Meth. Fluids 2011; v. 66, pp.509–536, DOI 10.1002/fld.2269

26. Schultz, R., **Jenkyn, T.** Determining the maximum diameter for holes in the shoe without compromising shoe integrity when using a multi-segment foot model. Medical Engineering and Physics. Jan 2012.

27. Bechard, D.J., Birmingham, T.B., Zecevic, A.A., Jones, I.C., Griffin, J.R., **Jenkyn, T.R.** Toe-out, lateral trunk lean, and pelvic obliquity during prolonged walking in patients with medial compartment knee osteoarthritis and healthy control. Arthritis care and research. April 2012.

28. Kedgley, A.E., Fox, A.M., **Jenkyn, T.R.** Image intensifier distortion correction for fluoroscopic RSA: the need for independent accuracy assessment. Journal of applied clinical medical physics / American College of Medical Physics. 2012

29. Lalone EA , Fox AM , Kedgley AE , **Jenkyn TR** , King GJ , Athwal GS , Johnson JA , Peters TM The effect of CT dose on glenohumeral joint Congruency measurements using 3D reconstructed patient-specific bone models. Physics in Medicine and Biology. Oct 21, 20111.

30. Fox AM , Kedgley AE , Lalone EA , Johnson JA , Athwal GS , **Jenkyn TR** The effect of decreasing computed tomography dosage on radiostereometric analysis (RSA) accuracy at the glenohumeral joint. Journal of Biomechanics. Nov 10, 2011.

31. Leitch, KM, Birmingham, TB, Jones, IC, Griffin, JR, **Jenkyn, TR** In-shoe plantar pressure measurements for patients with knee osteoarthritis: Reliability and effects of lateral heel wedges. Gait and posture. July 2011.

32. Shultz, R., Birmingham, TB, Jenkyn R Differences in neutral foot positions when measured barefoot compared to in shoes with varying stiffness. Medical engineering and physics. December 2011.

33. Moyer, RF, Birmingham, TB, Dombroski, CE, Walsh, RF, Leitch, KM, **Jenkyn, TR,** Griffith, JR Combined effects of a valgus knee brace and lateral wedge foot orthotic on the external knee adduction moment in patients with varus gonarthrosis. Archives of physical medicine and rehabilitation. Sept 17, 2012

34. Yan, Z., and **Jiang, L.Y**., Surface effects on the vibration and buckling of piezoelectric nanoplates, EPL (Europhysics Letters) (2012, in press).

35. Yan, Z., and **Jiang, L.Y.**, Vibration and buckling analysis of a piezoelectric nanoplate considering surface effects and in-plane constraint, Proceedings of the Royal Society A (2012, in process).

36. Noroozi, M., and **Jiang, L.Y.**, Buckling and wrinkling of a functionally graded material (FGM) thin film, International Journal of Applied Mechanics, 4(2): 1250012 (2012).

37. Yan, Z., and **Jiang, L.Y.**, Surface effects on the electroelastic responses of a thin piezoelectric plate with nanoscale thickness, Journal of Physics D: Applied Physics, 45: 255401 (2012).

38. Mahdavi, M.H., **Jiang, L.Y.**, and Sun, X., Nonlinear vibration and postbuckling analysis of a single layer graphene sheet embedded in a polymer matrix, Physica E: Low-dimensional Systems and Nanostructures, 44: 1708-1715 (2012).

39. Yan, Z., Zaman, M., and **Jiang, L.Y.**, Thermo-electro-mechanical analysis of a curved functionally graded piezoelectric actuator with sandwich structure, Materials (special issue: Advances in Functionally Graded Materials), 4: 2151-2170 (2011).

40. Ma, J., Asokanthan, S.F., and **Jiang, L.Y.**, Surface effects considerations for the design of Casimir actuated nanoswitches, Applied Mechanics and Materials, 110-116: 1036-1043 (2012).

41. Yan, Z. and **Jiang, L.Y.**, Electromechanical response of a curved piezoelectric nanobeam with the consideration of surface effects, Journal of Physics D: Applied Physics 44: 365301 (2011).

42. Ferreira LM, Bell TH, **Johnson JA**, King GJW. The effect of triceps repair technique following olecranon excision on elbow stability and extension strength: an in-vitro biomechanical study. Journal of Orthopaedic Trauma. Jul;25(7):420-4, 2011.

43. Sabo MT, McDonald CP, Ng J, Ferreira LM, Johnson JA, King GJ.A morphological analysis of the humeral capitellum with an interest in prosthesis design. J Shoulder Elbow Surg. 2011 Sep;20(6):880-4. Epub 2011 Mar 30.

44. Brownhill JR, Pollock JW, Ferreira LM, **Johnson JA**, King GJ. The effect of implant malalignment on joint loading in total elbow arthroplasty: an in vitro study. J Shoulder Elbow Surg. 2012 Aug;21(8):1032-8. Epub 2011 Aug 24.

45. Sabo MT, Shannon HL, Deluce S, Lalone E, Ferreira LM, **Johnson JA**, King GJ. Capitellar excision and hemiarthroplasty affects elbow kinematics and stability. J Shoulder Elbow Surg. 2012 Aug;21(8):1024-1031.e4. Epub 2011 Aug 3.

46. Alolabi B, Gray A, Ferreira LM, **Johnson JA**, Athwal GS, King GJ. Reconstruction of the coronoid using an extended prosthesis: an in vitro biomechanical study. J Shoulder Elbow Surg. Epub 2011 Jul 20.

47. Lalone EA, Fox AM, Kedgley AE, Jenkyn TR, King GJ, Athwal GS, **Johnson JA**, Peters TM. The effect of CT dose on glenohumeral joint congruency measurements using 3D reconstructed patient-specific bone models. Phys Med Biol. 21;56(20):6615-24, 2011.

48. Lalone EA, McDonald CP, Ferreira LM, Peters TM, King GW, **Johnson JA**. Development of an image-based technique to examine joint congruency at the elbow. Comput Methods Biomech Biomed Engin. Epub 2012 Jan 13.

49. Fox AM, Kedgley AE, Lalone EA, **Johnson JA**, Athwal GS, Jenkyn TR. The effect of decreasing computed tomography dosage on radiostereometric analysis (RSA) accuracy at the glenohumeral joint. J Biomech. 2011 Nov 10;44(16):2847-50. Epub 2011 Sep 29.

50. Giles JW, Elkinson I, Ferreira LM, Faber KJ, Boons H, Litchfield R, **Johnson JA**, Athwal GS. Moderate to large engaging Hill-Sachs defects: an in vitro biomechanical comparison of the remplissage procedure, allograft humeral head reconstruction, and partial resurfacing arthroplasty.J Shoulder Elbow Surg. Epub 2011 Oct 29.

51. Lalone EA, Peters TM, King GW, **Johnson JA**. Accuracy assessment of an imaging technique to examine ulnohumeral joint congruency during elbow flexion. Comput Aided Surg. 2012;17(3):142-52.

52. Sabo MT, Shannon H, De Luce S, Lalone E, Ferreira LM, **Johnson JA**, King GJ. Elbow kinematics after radiocapitellar arthroplasty. J Hand Surg Am. 2012 May;37(5):1024-32. Epub 2012 Apr 4.

53. Elkinson I, Giles JW, Faber KJ, Boons HW, Ferreira LM, **Johnson JA**, Athwal GS.The effect of the remplissage procedure on shoulder stability and range of motion: an in vitro biomechanical assessment.J Bone Joint Surg Am. 2012 Jun 6;94(11):1003-12.

54. Z. Ahmed and **R. E. Khayat**. Three-dimensional stability of film casting. J. Fluids Eng. (in press 05/2012).

55. **Roger E. Khayat**, Michael Hanyk and Moinuddin Ahmed. A spectral approach to thin jet flow. App. Num. Math. **62** (2012) 187.

56. Yahia Hussain and **Roger E. Khayat**. Upstream flow near channel exit for free-surface jet. J. Basic App. Phys. **1** (2012) 24-32.

57. Z. Ahmed, **R. E. Khayat**, C. Mathis and P. Maissa. Axisymmetric stability of annular curtains. Fluid Dyn. Res. **44** (2012) 31401-314024.

58. Patrice Laure and **Roger E. Khayat**. A spectral approach to internal confined thin-film flow. Int. J. Num. Meth. Fluids (in press 12/2011).

59. K. Alba, **R. E. Khayat** and P. Laure. Transient two-layer flow in a narrow channel. Phys. Rev. E **84** (2011) 026320..

60. Bashar Albaalbaki and **Roger E. Khayat**. Comparative studies of solution methodologies in thermal convection. Int. J. Num. Meth. Fluids (in press 07/2011).

61. Bashar Albaalbaki and **Roger E. Khayat**. Pattern selection in the thermal convection of non-Newtonian fluids. J. Fluid Mech. **668** (2011) 500

62. **Roger E. Khayat** and M. Ostoja-Starzewski. On the objective rate of change of heat and stress fluxes. Connection with micro/nano-scale heat convection. Discrete Continuous Dynamical Systems B **15** (2011) 991.

63. R. Pandher and **Roger E. Khayat**. Transient two-layer flow. Int. J. Num. Meth.. Fluids **66** (2011) 581.

64. R. Oviasuyi and **R.J. Klassen**; “Deducing the stress-strain response of anisotropic Zr-2.5%Nb pressure tubing by spherical indentation testing” Accepted, Journal of Nuclear Materials, June 22, 2012.

65. M. Haghshenas, J.T. Wood, and **R.J. Klassen**; “Effect of strain-hardening rate on the grain-to-grain variability of local plastic strain in spin-formed fcc metals” In press, Materials Science and Engineering A, February 27, 2012.

66. R. Oviasuyi and **R.J. Klassen**; “Assessment of the anisotropic flow stress and plastic strain of Zr-2.5%Nb pressure tubes at temperature from 25°C to 300°C”, In press, Journal of Nuclear Materials, February 15, 2012.

67. M. Haghshenas, L. Wang, **R.J. Klassen**; “depth dependence and strain rate sensitivity of the indentation stress of the 6061 aluminum alloy”, In press, Materials Science and Technology, February 14, 2012.

68. D.O. Costa, B.A. Allo, **R. Klassen**, J.L. Hutter, S.J. Dixon, and A.S. Rizkalla; “Control of Surface Topography in Biomimetic Calcium Phosphate Coatings”, In press, Langmuir, January, 2012.

69. R. Oviasuyi and **R.J. Klassen**; “Effect of Zr ion irradiation on the anisotropic deformation of Zr-2.5%Nb micro-pillars” Journal of Nuclear Materials, 421(2012) pg. 54-57.

70. Al-Aribe,K., **Knopf, G.K.** and Bassi, A.S. (2012) “Fabrication of an optically driven pH-gradient generator based on self-assembled proton pumps”, Microfluidics and Nanofluidics, vol. 12, pp, 325-335 [DOI:10.1007/s10404-011-0876-4]

71. Shiu, P.P., **Knopf, G.K.**, Ostojic, M. and Nikumb, S. (2012) “Non-lithographic fabrication of metallic micro-mold masters by laser machining and welding”, The International Journal of Advanced Manufacturing Technology, vol. 59, no.1-4, pp. 157-167 [DOI: 10.1007/s00170-011-3477-1] (online July 7, 2011)

72. Sareen, K.K., **Knopf, G.K.** and Canas, R. (2011) "Consistent point clouds of narrow spaces using multiscan domain mapping", Computer-Aided Civil and Infrastructure Engineering. [DOI: 10.1111/j.1467-8667.2011.00742.x] (online Nov. 2011)

73. Sareen, K., **Knopf, G.K.** and Canas, R. (2011) “Hierarchical data clustering approach for segmenting colored 3D point clouds of building interiors”, Optical Engineering, vol. 50, no.7, pp. 077003-077003-11 (2011) [DOI: 10.1117/1.3599868] (online July 2011)

74. M.L. Guckert and **M.D. Naish**, "A Compact 3 Degree of Freedom Spherical Joint," ASME Journal of Mechanisms and Robotics, vol. 3, no. 3, pp. 031005-1–031005-9, August 2011.

75. C.D.W. Ward, A.L. Trejos, **M.D. Naish,** R.V. Patel and C.M. Schlachta, "The WHaSP: A Wireless Hands-Free Surgical Pointer for Minimally Invasive Surgery," accepted for publication in IEEE/ASME Transactions on Mechatronics, January 2012.

76. K. El Bannan, W. Handler, C. Wyenberg, B. Chronik and **S. Salisbury**, "Prediction of force and image artifacts under MRI for metals used in medical devices," IEEE/ASME Transactions on Mechatronics, accepted Mar. 27, 2012.

77. M. Heydari Araghi and **S. Salisbury**, "Improved evaluation of dynamic mechanical properties of soft materials with applications to minimally-invasive surgery," IEEE/ASME Transactions on Mechatronics, accepted Mar. 27, 2012.

78. T. Mohammad and **S. Salisbury**, "An improved stiffness model for piezo-actuated complementary clamp flexures," International Journal of Mechatronics and Automation, accepted Mar. 22, 2012.

79. Orf L G, Kantor E & **Savory E** (2012) "Simulation of a downburst-producing thunderstorm using a very high-resolution three-dimensional cloud model", J Wind Eng Ind Aero, 104-106, 547-557.

80. Karava P, Chowdhury M J & **Savory E** (2012) "Effect of incident flow conditions on the forced convective heat transfer from the inclined windward roof of a low-rise building" J Wind Eng Ind Aero, 104-106, 428-438.

81. Lin W E, **Savory E**, McIntyre R P, Vandelaar C S & King J P C (2012) "The response of an electrical overhead power transmission line to two types of wind forcing", J Wind Eng Ind Aero, 100, 58-69.

82. **Savory E**, Sabarinathan J, Sauer A & Scott J A (2012) "An optoelectronic sensor for monitoring of mould growth in concealed spaces", Building & Environment, 49, 9-16.

83. Abderrahmane, H. A., Amaouche, M., Fayed, M., Ng, H. D., Vatistas, G. H., and **Siddiqui, K.** "Azimuthal solitary surface wave in cylindrical tank" Physical Review E, **84**, 037302, 2011

84. Greig, D, **Siddiqui, K.**, and Karava, P. "An experimental investigation of the flow structure over a corrugated waveform in a transpired air collector" Int. J. Heat and Fluid Flow (In press)

85. S. Arghavan**, A. V. Singh**, 2011, Atomic lattice structure and continuum plate theories for the vibrational characteristics of graphenes, Journal of Applied Physics vol. 110, 084308.

86. S. Arghavan, **A. V. Singh**, 2011, Free vibration of single layer graphene sheets: lattice structure vs. Continuum plate theories, ASME Journal of Nanotechnology in Engineering and Medicine, vol. 02(03), 031005 (six pages).

87. Betchen, L.J.**, Straatman, A.G.**, "Entropy generation-based computational geometry optimization of the pore structure of high-conductivity graphite foams for use in enhanced heat transfer devices," Accepted in Int. J. Heat and Mass Transfer, April 2012.

88. Betchen, L.J.**, Straatman, A.G.**, "A computational method for geometric optimization of enhanced heat transfer devices based upon entropy generation minimization," Int. J. Numerical Methods in Fluids, DOI: 10.1002/fld.3670, March 2012.

89. DeGroot, C.T.**, Straatman, A.G.,** "Closure of non-equilibrium volume-averaged energy equations in high-conductivity porous media," Int. J. Heat and Mass Transfer, **54**(23-24), 5039-5048, 2011.

90. X. Li, X. Meng, J. Liu, D. Geng, Y. Zhang, M. Banis, Y. Li, R. Li, **X. Sun**, M. Cai, M. Verbrugge, **Tin Oxide with** Controlled Morphology and Crystallinity by Atomic Layer Deposition onto Graphene Nanosheets for Enhanced Lithium Storage. Adv. Funct. Mater**.** 22 (2012) 1647-1654. (Highlighted as "Frontispiece" in Adv. Funct. Mater.).

91. X. Meng, X.-Q. Yang, **X. Sun**, Emerging Applications of Atomic Layer Dposition for Lithium-ion Battery Studies. Adv. Mater. (2012) In press. (DOI: 10.1002/adma.201200397).

92. Y. Li, J. Wang, X. Li, D. Geng, M. Banis, R. Li, **X. Sun**, Nitrogen-doped Graphene Nanosheets as Cathode Materials with Excellent Electrocatalytic Activity for High Capacity Lithium-oxygen Batteries.Electrochem. Commun. 18 (2012) 12-15. (Highlighted by "Green Car Congress","New Energy and Fuel" and "Materials Today", One of ten most downloaded articles from Feb. to May. in 2012).

93. J. Wang, R. Li, **X. Sun**, Understanding and Recent Development of Carbon Coating on $LiFePO_4$ Cathode Material for Lithium-ion Batteries. Energy Environ. **Sci.** 5 (2012) 5163-5185. (One of ten most-read articles in ENERGY ENVIRON. SCI. in Nov. 2011).

94. X. Li, J. Liu, Y, Zhang, Y. Li, H. Liu, X. Meng, J. Yang, D. Geng, D. Wang, R. Li, **X. Sun**, High Concentration Nitrogen Doped Carbon Nanotube Anodes with Superior Li^+ Storage Performance for Lithium Rechargeable Battery Application. J. Power Sources 197 (2012) 238-245.

95. J. Yang, J. Wang, X. Li, D. Wang, J. Liu, G. Liang, M. Gauthier, Y. Li, R. Li, X. Sun, Hierarchically Porous $LiFePO_4$/Nitrogen-doped Carbon Nanotube Composite for Lithium Ion Batteries Cathodes. J. Mater. Chem. 22(2012) 7537-7543.

96. J. Yang, J. Wang, D. Wang, X. Li, D. Geng, G. Liang, M. Gauthier, R. Li, X. Sun, 3D Porous $LiFePO_4$-graphene Hybrid Electrodes with Enhanced Performance for Li-ion Batteries. J. Power Sources 208 (2012) 340-344.

97. D. Geng, Y. Hu, Y. Li, R. Li, **X. Sun**, One-pot Solvothermal Synthesis of Doped Graphene with the Designed Nitrogen Type Used as a Pt Support for Fuel Cells.Electrochem. Commun. 22 (2012) 65-68.

98. M. H. Mahdavi, L.Y. Jiang, **X. Sun**, Nonlinear Vibration and Postbuckling Analysis of A Single Layer Graphene Sheet Embedded in A Polymer Matrix. Physica E 44 (2012) 1708-1715.

99. S. Sun, G. Zhang, **X. Sun**, M. Cai, M. Ruthkosky, Highly Stable and Active PtNb-TiO2 Carbon-Free Electrocatalyst for Proton Exchange Membrane Fuel Cells**.** J. Nanotechnology (2012) in press.

100. S. Yang, D. Wang, G. Liang, Y. Yiu, J. Wang, L. Liu, **X. Sun**, T.-K. Sham, Soft X-ray XANES Studies of Various Phases Related to $LiFePO_4$ Based Cathode Materials.Energy Environ. Sci. 5 (2012) 7007-7016.

101. X. Li, A. Dhanabalan, X. Meng, L. Gu, **X. Sun**, C. Wang, Nanoporous tree-like SiO_2 Films Fabricated by Sol-gel Assisted Electrostatic Spray Deposition. Microporous and Mesoporous Materials 15 (2012) 488-494.

102. D. Wang, J. Yang, X. Li, J. Wang, R. Li, M. Cai, T. K. Sham, **X. Sun**. Observation of Surface/Defect States of SnO_2 Nanowires on Different Substrates from X-ray Excited Optical Luminescence**.** Cryst. Growth Des. 12(2012) 397-402.

103. J. Liu, X. Li, J. Yang, D. Geng, Y. Li, D. Wang, R. Li, **X. Sun**, Microwave-assisted Hydrothermal Synthesis of Nanostructured Spinel $Li_4Ti_5O_{12}$ as Anode Materials for Lithium Ion Batteries**.** Electrochim. Acta 63 (2012) 100-104.

104. J. Liu, X. Meng, M. Banis, M. Cai, R. Li, **X. Sun**, Crystallinity-Controlled Synthesis of Zirconium Oxide Thin Films on Nitrogen-doped Carbon Nanotubes by Atomic Layer Deposition. J. Phys. Chem. (2012) In press. (dx.doi.org/10.1021/jp3028462).

105. M. Ionescu, Y. Zhang, R. Li, H. Abou-Rachid, **X. Sun**, Nitrogen-doping Effects on the Growth, Structure and Electrical Performance of Carbon Nanotubes Obtained by Spray Pyrolysis Method. Appl. Surf. Sci. 258 (2012) 4563-4568.

106. Y. Li, J. Wang, Y. Zhang, M. Banis, J. Liu, D. Geng, R. Li, **X. Sun**, Facile Controlled Synthesis and Growth Mechanisms of Flower-like and Tubular MnO_2 Nanostructres by Microwave-assisted Hydrothermal Method. J. Colloid Interface Sci. 369 (2012) 123-128.

107. M. Saha, M. Cai, **X. Sun**, Carbon-coated Tungsten Oxide Nanowires Supported Pt Nanoparticles for Oxygen Reduction. Int. J Hydrogen Energy 37 (2012) 4633-4638.

108. H. Liu, Y. Zhang, R. Li, M. Cai, **X. Sun**, Synthesis and Characterization of TiO_2@C Core-shell Nanowires and Nanowalls via Chemical Vapor Deposition for Potential Large-scale Product. J. Colloid Interface Sci. 367 (2012) 115-119.

109. Y. Li, J. Wang, X. Li, D. Geng, R. Li, **X. Sun**, Superior Energy Capacity of Graphene Nanosheets for Nonaqueous Lithium-Oxygen Battery. Chem. Commun. 47 (2011) 9438-9440. (Highlighted by "Green Car Congress" and "Materials Today").

110. X. Li, D. Geng, Y. Zhang, X. Meng, R. Li, **X. Sun**, Superior Cycle Stability of Nitrogen-doped Graphene Nanosheets as Anode for Lithium Ion Batteries.Electrochem. Commun. 13 (2011) 822-825. (One of ten most downloaded articles from Oct. to Dec. in 2011).

111. N. Cheng, H. Li, G. Li, H. Lv, S. Mu, **X. Sun**, M. Pan, Highly Active Pt@Au Nanoparticles Encapsulated in Perfluorosulfonic Acid for the Reduction of Oxygen. Chem. Commun. 47 (2012) 12792-12794.

112. M. Ionescu, Y. Zhang, R. Li, **X. Sun**, Selective Growth, Characterization, and Field Emission Performance of Single-walled and Few-walled Carbon Nanotubes by Plasma Enhanced Chemical Vapor Deposition **.**Appl. Surf. Sci. 258 (2011) 1366-1372.

113. F. Wang, R. Li, **X. Sun**, Z. Ding, Confocal Raman Spectromicroscopy for Tin-core/Carbon-shell Nanowire Heterostructure. Appl. Surf. Sci. 258 (2011) 394–398.

114. J. Wang, Y. Chen, Y. Zhang, M. Ionescu, R. Li, **X. Sun**, S. Ye, S. Knights, 3D Boron doped Carbon Nanorods/Carbon-Microfiber Hybrid Composites: Synthesis and Applications as Highly Stable Proton Exchange Membrane Fuel Cells. J. Mater. Chem. 21 (2011) 18195-18198.

115. H. Ismaili, D. Geng, **X. Sun**, T. Kantzas, M. Workentin, Light-Activated Covalent Formation of Gold Nanoparticle Graphene and Gold Nanoparticle Glass Composites**.** Langmuir 27 (2011) 13261-13268.

116. M. Liu, Y. Chen, Q. Guo, R. Li, **X. Sun,** J. Yang, An Economic Method for Large-Scale Patterning and Electric Measurement of Nanowires**.** J. Nanoelectron. Optoelectron. 6 (2011) 1-8.

117. J. Liu, H. Liu, Y. Zhang, R. Li, G. Liang, M. Gauthier, **X. Sun**, Synthesis and Characterization of Phosphorus-nitrogen doped Multiwalled Carbon Nanotubes. Carbon 49 (2011) 5014-5021.

118. Y. Chen, J. Wang, X. Meng, Y. Zhong, R. Li, **X. Sun**, S. Ye, S. Knights, Atomic Deposition Assisted Pt-SnO_2 Hybrid Catalysts on Nitrogen-doped CNTs with Enhanced Electrocatalytic Activities for Low Temperature Fuel Cells. Int. J Hydrogen Energy 36 (2011) 11085-11092.

119. D. Fu, P. Keech, **X. Sun**, J. Wren, Iron Oxyhydroxide Nanoparticles Formed by Forced Hydrolysis: Dependence of Phase Composition on Solution Concentration**.** Phys. Chem. Chem. Phys. 13 (2011) 18523-18529.

120. D. Geng, S. Yang, Y. Zhang, J. Yang, J. Liu, R. Li, T.-K. Sham, **X. Sun**, S. Ye, S. Knights, Nitrogen Doping Effects on the Structure of Graphene**.** Appl. Surf. Sci. 257 (2011) 9193-9198.

121. Y. Chen, J. Wang, H. Liu, M. Banis, R. Li, **X. Sun**, T. Sham, S. Ye, S. Knights, Nitrogen Doping Effects on Carbon Nanotubes and the Origin of the Enhanced Electrocatalytic Activity of Supported Pt for Proton Exchange Membrane Fuel Cells. J. Phys. Chem. C 115 (2011) 3769-3776.

122. M. Mahdavi, L. Jiang, **X. Sun**, Nonlinear Vibration of A Double-walled Carbon Nanotube Embedded in A Polymer Matrix. Physica E: Low-dimensional Systems and Nanostructures 43 (2011) 1813-1819.

123. J. Liu, Y. Zhang, M. Ionescu, R. Li, **X. Sun**, Nitrogen-doped Carbon Nanotubes with Tunable Structure and High Yield Produced by Ultrasonic Spray Pyrolysis**.** Appl. Surf. Sci. **257** (2011) 7837-7844.

124. Y. Zhang, D. Geng, H. Liu, M. Banis, M. Ionescu; R. Li, M. Cai, **X. Sun**, Designed Growth and Characterization of Radially Aligned Ti_5Si_3 Nanowire Architectures. J. Phys. Chem. C 115 (2011) 15885-15889.

125. **Tutunea-Fatan, O.R**., Bernick, J.H., Lalone, E., McDonald, C.P., King, G.J.W, and Johnson, J.A., 2012, "Assessing the Performances of Collision Driven Numerically-Simulated Implantation in Elbow Replacement Surgery," accepted on Jun. 3, 2012 for publication in the International Journal of Computer Aided Engineering Technology.

126. Mostafavi, K., **Tutunea-Fatan, O.R**., Lalone, E., King, G.J.W, and Johnson, J.A., 2012, "Determination of Elbow Flexion-Extension Axis Based on Planar and Closed B-Splines," accepted on Mar. 3, 2012 for publication in Computer-Aided Design and Applications.

127. Bhuiya, M.S.H., and **Tutunea-Fatan, O.R**., 2012, "Reduction of geometry-based errors in five-axis machining through enhanced 5D interpolation," International Journal of Advanced Manufacturing Technology, published "Online First" on Mar. 19, 2012.

128. Abolghasemi Fakhri, M., Bordatchev, E.V., and **Tutunea-Fatan, O.R.,** 2011, "An image-based methodology to establish correlations between porosity and cutting force in micromilling of porous titanium foams," International Journal of Advanced Manufacturing Technology, 60:841-851.

129. **Tutunea-Fatan, O.R.**, and Bhuiya, M.S.H., 2011, "Comparing the kinematic efficiency of five-axis machine tool configurations through nonlinearity errors." Computer-Aided Design, 43:1163-1172.

130. M. Haghshenas, **J. T. Wood**, and R. J. Klassen, (2012), "Investigation of strain-hardening rate on splined mandrel flow forming of 5052 and 6061 aluminum alloys", Materials Science and Engineering A-Structural Materials Properties Microstructure and Processing, Volume 532, pages: 287-294.

131. **J.T. Wood**, J.P. Weiler, and I. Basu , (2012), "Effect of Process Variables on Microstructural Features During Solidification of AM60B Magnesium Alloy", Materials Science Forum.

132. J.P. Weiler, **J.T. Wood**, and I. Basu , (2011) "Process-structure-property relationships for Magnesium alloys", Materials Science Forum.

133. M. Haghshenas, M. Jhaver, R. J. Klassen, **J.T. Wood**, et al. (2011), "Plastic strain distribution during splined-mandrel flow forming", Materials and Design, Volume 32, issue 6, Pages, 3629-3636.

134. M. N. Khan, M. Aljarrah, **J. T. Wood**, et al., (2011), "The effect of cooling rate on thermophysical properties of magnesium alloys", Journal of Materials Research, Volume 26, pages 974-982.

135. Jie He, Binyu Yu, Matt J. Hourwitz, Yijing Liu, Maria Teresa Perez, **Jun Yang**, Zhihong Nie, "Wet-chemical synthesis of amphiphilic rodlike silica particles and their molecular-mimetic assembly in selective solvents", Angew. Chem. Int. Ed. , Vol. 51, 3628-3633, 2012

136. Solmaz Karamdoust, Binyu Yu, Colin V. Bonduelle, Yu Liu, Greg Davidson, Goran Stojcevic, **Jun Yang**, Woon M. Lau and Elizabeth R. Gillies "Preparation of Antibacterial Surfaces by Hyperthermal Hydrogen Induced Cross-linking of Polymer Thin Films", Journal of Materials Chemistry, Vol. 22, 4881-4889 2012.

137. Qiuquan Guo, Ying Xia, Martin Sandig and **Jun Yang**, "Characterization of cell elasticity correlated with cell morphology by atomic force microscope", Journal of Biomechanics, Vol. 45(2), 304-309, 2012.

138. Hamid Reza Aghayan, Evgueni Bordatchev and **Jun Yang**, "Two methodologies for optical analysis of contaminated engine lubricants", Measurement Science and Technology, Vol. 23 015202, 2012.

139. Nour W. Ghonaim, W. M. Lau, Daniel Goldman, Christopher G. Ellis and **Jun Yang**, "A Micro-delivery Approach for Studying Microvascular Responses to Localized Oxygen Delivery", Microcirculation, Vol. 18, 646-654, 2011.

140. Qiuquan Guo, Mei Liu and **Jun Yang**, "Evaluation of Intermolecular Forces in a Circulating System", BioSystems, Vol. 106, 130-135, 2011.

141. Mei Liu, Ying Chen, Qiuquan Guo, Ruying Li, Xueliang Sun, **Jun Yang**, "An Economic Method for Large-Scale Patterning and Electric Measurement of Nanowires", Journal of Nanoelectronics and Optoelectronics, Vol. 6, 144-151, 2011.

142. K. M. Leung, G. Wanger, Q. Q. Guo, Y. Gorby, G. Southam, W. M. Lau and **J. Yang**, "Bacterial nanowires: conductive as silicon, soft as polymer", Soft Matter, Vol.7, 6617-6621, 2011. (highlighted paper).

143. B. Peng, **C. Zhang** and J. Zhu, "Numerical Study on the Use of Circumferential Jets to Improve the Uniformity of Radial Solids Concentration Profile in CFB Risers," Chemical Engineering & Technology (accepted 01/13/2012).

144. B. Peng, J. Zhu and **C. Zhang**, 2012, "A New Approach To Specify the Inlet Boundary Conditions for Computational Fluid Dynamics (CFD) Modeling of Hydrodynamic Behavior of a Circulating Fluidized Bed (CFB) Riser," Industrial & Engineering Chemistry Research, Vol. 51, No. 4, pp 2152–2165.

145. B. Peng, J. Xu, J. Zhu and **C. Zhang**, 2011, "Numerical and Experimental Studies on the Flow Multiplicity Phenomenon for Gas-Solids Two-Phase Flows in CFB Risers," Powder Technology, Vol. 214, No.2, pp. 177-187.

146. B. Peng, **C. Zhang** and J. Zhu, 2011, "Numerical Study of the Effect of the Gas and Solids Distributors on the Uniformity of the Radial Solids Concentration Distribution in CFB Risers," Powder Technology, Vol. 212, No. 1, pp.89-102.

147. Y. Zhang, **C. Zhang** and J. Jiang, "Numerical Study on the Turbulent Mixing Coefficient for Supercritical Fluids in Subchannels," Nuclear Technology (accepted 03/24/2011).

148. B. Peng, **C. Zhang** and J. Zhu, 2011, "Theoretical and Numerical Studies on the Flow Multiplicity Phenomenon for Gas-Solids Two-Phase Flows in CFB Risers," International Journal of Multiphase Flow, Vol. 37, pp. 660–670.

149. Y. Zhang, **C. Zhang** and J. Jiang, 2011, "Numerical Simulation of Fluid Flow and Heat Transfer of Supercritical Fluids in Fuel Bundles," Journal of Nuclear Science and Technology, Vol. 48, No. 6, pp. 929-935.

150. R. Zhang, **C. Zhang** and J. Jiang, 2011, "A New Approach to Design a Control System for a FGR Furnace Using the Combination of the CFD and Linear System Identification Techniques," Combustion Theory and Modelling, Vol. 15, No. 2, pp. 183–204.

151. Y. Zhang, **C. Zhang** and J. Jiang, 2011, "Numerical Simulation of Heat Transfer of Supercritical Fluids in Circular Tubes Using Different Turbulence Models," Journal of Nuclear Science and Technology, Vol. 48, No. 3, pp. 366–373.

152. J. A. Bourgeois, R. J. Martinuzzi, E. Savory, **C. Zhang** and D. A. Roberts, 2011, "Assessment of Turbulence Model Predictions for an Aero-Engine Centrifugal Compressor," ASME Trans. Journal of Turbomachinery, Vol. 133.

153. R. Zhang, **C. Zhang** and J. Jiang, 2011, "Determination of Applicable Input Range for Approximating a Nonlinear FGR Furnace around the Design Point," Combustion Theory and Modelling, Vol. 15, pp. 89-106.

2. REFEREED CONFERENCE PROCEEDINGS

1. Book J M and **Asokanthan S F** (2011) Modal Characterization of MEMS Switches via Output-only and Input/Output Identification Methods, Proceedings of ASME International Design Engineering Technical Conferences (IDETC), Washington, DC, August 2011, Paper # IDETC-48888
2. Cho J and **Asokanthan S F** (2011) Nonlinear Dynamic Response of Harmonically Driven Rotating Thin Circular Rings, Proceedings of 7th European Nonlinear Dynamics Conference, Rome, Italy, July 2011
3. Wang T and **Asokanthan S F** (2011) Bouncing Dynamics in MEMS-based Switching Structures, Proceedings of 7th European Nonlinear Dynamics Conference, Rome, Italy, July 2011
4. **Buchal, R.O.,** A Holistic, Interdisciplinary Approach to the Design of a Sustainable Personal Mobility System, Proceedings of the 2012 Canadian Engineering Education Association (CEEA) Conference, Winnipeg MB, June 17-20, 2012.
5. **Dryden J.R.,** "Effective Properties of Functionally Graded Cylinders", ACEX-11, July 3-6, Portugal, 2011.
6. McLachlin SD, Rasoulinejad P, Bailey SI, Gurr KR, Bailey CS, **Dunning CE**: Anterior versus Posterior Fixation for an Isolated Posterior Facet Complex Injury in the Sub-axial Cervical Spine, Annual Meeting of the Canadian Orthopaedic Research Society, St. John's, NL, July 7-9, 2011. (poster)
7. Nadeau M, McLachlin SD, Bailey SI, Gurr KR, Bailey CS, **Dunning CE**: Qualitative and Quantitative Assessment of Soft Tissue Damage in the Cervical Spine following a Unilateral Facet Injury, Annual Meeting of the Canadian Orthopaedic Research Society, St. John's, NL, July 7-9, 2011. (poster)
8. Burkhart TA, **Dunning CE**, Andrews DM: Failure Characteristics of the Distal Upper Extremity in Response to Dynamic Impact Loading, Annual Meeting of the Canadian Orthopaedic Research Society, St. John's, NL, July 7-9, 2011. (podium)
9. Nadeau M, McLachlin SD, Bailey SI, Gurr KR, **Dunning CE**, Bailey CS: Qualitative and Quantitative Assessment of Soft Tissue Damage in the Cervical Spine following a Unilateral Facet Injury, 26th Annual Meeting of the North American Spine Society, Chicago, IL, November 2-5, 2011. (podium)
10. McLachlin SD, Rasoulinejad P, Bailey SI, Gurr KR, **Dunning CE**, Bailey CS: Anterior versus Posterior Fixation for an Isolated Posterior Facet Complex Injury in the Sub-axial Cervical Spine, 39th Annual meeting of the Cervical Spine Research Society, Scottsdale, AZ, December 8-10, 2011. (podium)
11. McCabe CMJ, McLachlin SD, Bailey SI, Gurr KR, Bailey CS, **Dunning CE**: The Role of Soft Tissue Restraints Following Type II Odontoid Fractures in the Elderly – A Biomechanical Study, 39th Annual meeting of the Cervical Spine Research Society, Scottsdale, AZ, December 8-10, 2011. (podium)
12. Rasoulinejad P, McLachlin SD, Bailey SI, Gurr KR, **Dunning CE**, Bailey CS: The Importance of the Posterior Osteoligamentous Complex to Sub-axial Cervical Spine Stability in Relation to a Unilateral Facet Injury, 39th Annual meeting of the Cervical Spine Research Society, Scottsdale, AZ, December 8-10, 2011. (poster)
13. Burkhart RA, Quenneville CE, **Dunning CE**, Andrews DM: Development and Validation of a Distal Radius Finite Element Model to Simulate Dynamic Impact Loading, 20th Annual Symposium on Computational Methods in Orthopaedic Biomechanics, San Francisco, CA, February 3, 2012. (podium & poster)
14. Neuert MAC, **Dunning CE**: Development of Strain Adaptive Finite Element Model for the Ulna, 20th Annual Symposium on Computational Methods in Orthopaedic Biomechanics, San Francisco, CA, February 3, 2012. (podium & poster)

15. McCabe CMJ, McLachlin SD, Bailey SI, Gurr KR, Bailey CS, **Dunning CE**: The Role of Soft Tissue Restraints Following Type II Odontoid Fractures in the Elderly – A Biomechanical Study, 58th Annual Meeting of the Orthopaedic Research Society, San Francisco, California, February 4-7, 2012. (poster)

16. Neuert MAC, **Dunning CE**: Application of a Strain-Adaptive Model to Assess the Influence of Stem Material on Bone Density Distribution in the Distal Ulna, 58th Annual Meeting of the Orthopaedic Research Society, San Francisco, California, February 4-7, 2012. (poster)

17. McCabe CMJ, McLachlin SD, Bailey SI, Gurr KR, Bailey CS, **Dunning CE**: The Role of Soft Tissue Restraints Following Type II Odontoid Fractures in the Elderly – A Biomechanical Study, 12th Annual Scientific Conference of the Canadian Spine Society, Sun Peaks, BC, Feb, 29 – Mar. 3, 2012. (poster)

18. Nadeau M, McLachlin SD, Bailey SI, Gurr KR, **Dunning CE**, Bailey CS: Evaluation of Instrumentation Techniques for a Unilateral Facet Fracture Dislocation Using a Validated Soft Tissue Injury Model, 12th Annual Scientific Conference of the Canadian Spine Society, Sun Peaks, BC, Feb, 29 – Mar. 3, 2012. (poster)

19. Leitch KL, Birmingham TB, Reeves J, Giffin JR, **Dunning CE**: Development of a Materials-testing Fixture to Enable Asymmetric Loading of the Lower Limb: An application of in-vivo gait data, OARSI, Barcelona, Spain, April 26-29, 2012. (poster)

20. Burkhart TA, **Dunning CE**, Andrews DM: Multivariate Injury Risk Criteria for Fractures to the Distal Radius. 8th annual Injury Biomechanics Symposium, The Ohio State University, Columbus, OH, May 13-15, 2012. (podium & poster)

21. Burkhart TA, Andrews DM, **Dunning CE**: Multivariate Injury Risk Criteria for Fractures to the Distal Radius, 17th Bi-annual Canadian Society for Biomechanics Conference, Simon Fraser University, Burnaby, BC, June 6-9, 2012. (podium)

22. Burkhart TA, Quenneville CE, **Dunning CE**, Andrews DM: Validation and Mesh Quality Assessment of a Distal Radius Finite Element Model to Simulate Forward Fall Impact Loading, 17th Bi-annual Canadian Society for Biomechanics Conference, Simon Fraser University, Burnaby, BC, June 6-9, 2012. (podium)

23. Hosein YK, King GJW, **Dunning CE**: The Effect of Intramedullary Stem Surface Finish on the Torsional Stability of a Generalized Cemented Joint Replacement System, Annual Meeting of the Canadian Orthopaedic Research Society, Ottawa, ON, June 8-10, 2012. (poster)

24. Leitch KL, Birmingham TB, Reeves J, Giffin JR, **Dunning CE**: Development of a Materials-testing Fixture to Enable Asymmetric Loading of the Lower Limb: An application of in-vivo gait data, Annual Meeting of the Canadian Orthopaedic Research Society, Ottawa, ON, June 8-10, 2012. (podium)

25. McCabe CMJ, McLachlin SD, Bailey SI, Gurr KR, Bailey CS, **Dunning CE**: The Role of Soft Tissue Restraints Following Type II Odontoid Fractures in the Elderly – A Biomechanical Study, Annual Meeting of the Canadian Orthopaedic Research Society, Ottawa, ON, June 8-10, 2012. (podium)

26. McLachlin SD, Nadeau M, Bailey SI, Gurr KR, **Dunning CE**, Bailey CS: Evaluation of Instrumentation Techniques for a Unilateral Facet Fracture Using a Validated Soft Tissue Injury Model, Annual Meeting of the Canadian Orthopaedic Research Society, Ottawa, ON, June 8-10, 2012. (podium)

27. McLachlin SD, Nadeau M, Bailey SI, Gurr KR, **Dunning CE**, Bailey CS: Development of a Soft Tissue Injury Model for a Unilateral Facet Perch in the Cervical Spine, Annual Meeting of the Canadian Orthopaedic Research Society, Ottawa, ON, June 8-10, 2012. (poster)

28. Neuert MAC, **Dunning CE**: Development of Strain Adaptive Finite Element Model for the Ulna, Annual Meeting of the Canadian Orthopaedic Research Society, Ottawa, ON, June 8-10, 2012. (poster)

29. Direct Determination of Control Actuation" by **J.M.Floryan**, Annual Meeting of the Canadian Applied and Industrial Mathematics, Society(CAIMS), Toronto, June 24-28, 2012.

30. "Flows in Grooved Channels" by A. Mohammadi and **J.M.Floryan**, Proceedings of TIM 2011, April 27-29, 2012, Gananoque, Ontario, Canada.

31. "The Super-ThermoHydrophobic Effect" by **J.M.Floryan**. Bul. Amer. Phys. Soc., v.57, #1, 2012.

32. "Flows in Channels with Grooves of an Arbitrary Form " by A.Mohammadi and **J.M.Floryan**, Bul. Amer. Phys. Soc., v. 56, No. 15, Nov.2011, p.117.

33. "Natural Convection Due to a Long Wavelength Heating" by A.Asgarian and **J.M.Floryan**, Bul. Amer. Phys. Soc., v. 56, No. 15, Nov.2011, p.120.

34. "Natural Convection in a Fluid Layer Subject to a Periodic Heating" by M.Hossain and **J.M.Floryan**, Bul. Amer. Phys. Soc., v. 56, No. 15, Nov.2011, p.119.

35. "Flow through Ribbed Annuli" by H.Moradi and **J.M.Floryan**, Bul. Amer. Phys. Soc., v. 56, No. 15, Nov.2011, p.122.

36. Yan, Z., and **Jiang, L. Y.**, Static and dynamic analysis of piezoelectric nanowires with surface effects, The 2nd International Conference on Nanotechnology: Fundamentals and Applications, Ottawa, Canada, July 27-29, 2011.

37. Sabo MT, Shannon H, Ng J, Ferreira LM, **Johnson JA**, King GJW. Capitellar Hemiarthroplasty Significantly Alters Radiocapitellar Contact Mechanics. Canadian Orthopaedic Research Society 45th Annual Meeting. St. John's Newfoundland, July 2011.

38. Deluce SR, Shannon H, Ferriera LM, King GJ, **Johnson JA**.The Development and Validation of a Laser Point Digitization System for Computer Assisted Orthopaedic Surgery. Canadian Orthopaedic Research Society 45th Annual Meeting. St. John's Newfoundland, July 2011.

39. Gray A, Alolabi B, Ferreira LM, Athwal GS, King GJW, **Johnson JA**. An Anatomically Shaped Coronoid Prosthesis Restores the Stability of the Coronoid Deficient Elbow: An in-vitro Biomechanical Study. Canadian Orthopaedic Association 66th Annual Meeting. St. John's Newfoundland, July 2011.

40. Alolabi B, Gray A, Ferreira LM, **Johnson JA**, Athwal GS, King GJW. An Extended Tip Coronoid Prosthesis Improves the Stability of the Coronoid and Ligament Deficient Elbow. Canadian Orthopaedic Association 66th Annual Meeting. St. John's Newfoundland, July 2011.

41. Rafehi S, Athwal GS, Lalone EA, **Johnson JA,** King GJW. An Anatomic Study of Coronoid Cartilage Thickness with Special Reference to Fractures. Canadian Orthopaedic Association 66th Annual Meeting. St. John's Newfoundland, July 2011.

42. Lanting BA, Ferreira LM, **Johnson JA**, King GJW, Athwal GS. Radial Head Prosthesis Sizing Alters the Forces in the Interosseous Membranne and Forearm Load Transfer. Canadian Orthopaedic Association 66th Annual Meeting. St. John's Newfoundland, July 2011.

43. Sabo MT, McDonald CP, Ng J, **Johnson JA**, King GJW. Morphologic Analysis of the Humeral Capitellum with and Interest in Implant Design. Canadian Orthopaedic Association 66th Annual Meeting. St. John's Newfoundland, July 2011.

44. Katchky RN, **Johnson JA**, King GJW, Athwal GS. Anatomic Radial Head Arthroplasty: A Lack of Reliable landmarks for Alignment. Canadian Orthopaedic Association 66th Annual Meeting. St. John's Newfoundland, July 2011.

45. Gray A, Alolabi B, Deluce S, Ferreira LM, Athwal GS, King GJW, **Johnson JA**. Determining the Optimal Fixation Method for a Coronoid Prosthesis. Canadian Orthopaedic Association 66th Annual Meeting. St. John's Newfoundland, July 2011.

46. Willing R, King GJW, **Johnson JA**. The Development of a Parametric Finite Element Model for Simulating the Ulnotrochlear Joint of Total Elbow Replacements. Canadian Orthopaedic Association 66th Annual Meeting. St. John's Newfoundland, July 2011.

47. Lalone EA, Giles JW, Deluce S, Ferreira LM, King GJW, **Johnson JA**. The Effect of Collateral Ligament Repair on Ulnohumeral Joint Congruency. Canadian Orthopaedic Association 66th Annual Meeting. St. John's Newfoundland, July 2011.

48. Giles J, Elkinson I, Ferreira L, Faber KJ, **Johnson J**, Athwal GS. Moderate to Large Hill-Sachs Defects: An in-vitro Biomechanical Comparison of Remplissage, Allograft and Partial Resurfacing Arthroplasty. Canadian Orthopaedic Association 66th Annual Meeting. St. John's Newfoundland, July 2011.

49. Glennie A, Giles J, Athwal GS, **Johnson J**, Faber KJ. The Effect of Cement Technique on Load Transfer and Fixation of the Glenoid Component in Total Shoulder Arthroplasty. Canadian Orthopaedic Association 66th Annual Meeting. St. John's Newfoundland, July 2011.

50. Elkinson I, Giles J, Ferreira L, Faber KJ, **Johnson J**, Athwal GS. The Effect of the Remplissage Procedure on Shoulder Stability and Range of Motion: An in vitro Biomechanical Assessment. Canadian Orthopaedic Association 66th Annual Meeting. St. John's Newfoundland, July 2011.

51. Elkinson I, Giles J, Ferreira L, Faber KJ, **Johnson J**, Athwal GS. The Shoulder Remplissage Procedure for Hill-Sachs Lesions: Does Technique Matter? Canadian Orthopaedic Association 66th Annual Meeting. St. John's Newfoundland, July 2011.

52. Elkinson I, Giles J, Ferreira L, Faber KJ, **Johnson J**, Athwal GS. The Effect of the Remplissage Procedure on Shoulder Stability and Range of Motion: An in vitro Biomechanical Assessment. American Shoulder and Elbow Society Annual Closed Meeting. The Greenbrier, White Sulphur Springs, West Virginia, USA. October 12-15, 2011.

53. Sabo M, Athwal GS, King GJW, **Johnson, J**.. Landmarks for Rotational Alignment of the Humeral Component During Elbow Arthroplasty. American Academy of Orthopaedic Surgeons 79th Annual Meeting. San Francisco, California, February 2012.

54. Gray A, Alolabi B, Deluce SR, Ferreira L, Althwal GS, King GJW, **Johnson JA.** Determining the Optimal Fixation Method for a Coronoid Prosthesis. American Academy of Orthopaedic Surgeons 79th Annual Meeting. San Francisco, California, February 2012.

55. Willing R, Lalone E, King G, **Johnson J**. Comparing Two Constitutive Material Models of Cartilage for Hemiarthroplasty Articular Contact Mechanics using Computational Analyses. Orthopaedic Research Society 58th Annual Meeting. San Francisco, California, February 2012.

56. Willing R, **Johnson J**, King G. The Effect of Implant Design of Linked Total Elbow Replacements on Stability and Stress: A Finite Element Analysis. Orthopaedic Research Society 58th Annual Meeting. San Francisco, California, February 2012.

57. Ng, J, Lalone E, McDonald C, Ferreira L, King G, **Johnson J.** Capitellum Surface Digitizations: Effects of Locating the Spherical Centre for Minimally Invasive Surgery. Orthopaedic Research Society 58th Annual Meeting. San Francisco, California, February 2012.

58. LM Ferreira, KE Fay, EA Lalone, **JA Johnson**, GJW King. The Effect of Radial Head Excision and Arthroplasty on Medial Collateral Ligament Tension. Canadian Orthopaedic Research Society 46th Annual Meeting. Ottawa, Ontario, June 2012.

59. GDG Langohr, R Willing, JB Medley, GJW King, **JA Johnson**. A Finite Element Contact Analysis of Axisymmetric and Anatomical Radial Head Hemiarthroplasty. Canadian Orthopaedic Research Society 46th Annual Meeting. Ottawa, Ontario, June 2012.

60. M Nishiwaki, G Greeley, E Lalone, L Ferreira, JA Johnson, GJW King. Load Transfer at the Distal Ulna Following Simulated Colles' Malalignment. Canadian Orthopaedic Research Society 46th Annual Meeting. Ottawa, Ontario, June 2012.

61. J Giles, HW Boons, K Faber, I Elkinson, L Ferreira, **J Johnson**, GS Athwal. A Biomechanical Evaluation of the Dynamic Sling Effect of the Latarjet Procedure: Does It Improve Shoulder Stability? Canadian Orthopaedic Association 67th Annual Meeting. Ottawa, Ontario, June 2012.

62. J Giles, HW Boons, I Elkinson, K Faber, L Ferreira, **J Johnson**, GS Athwal. An In Vitro Biomechanical Comparison of the Classic and Congruent Arc Latarjet Procedures. Canadian Orthopaedic Association 67th Annual Meeting. Ottawa, Ontario, June 2012

63. J Giles, G Puskas, M Welsh, GS Athwal, **JA Johnson**. The Biomechanical Strength of Classic and Congruent Arc Latarjet Constructs. Canadian Orthopaedic Association 67th Annual Meeting. Ottawa, Ontario, June 2012.

64. I Pereira, B Alolabi, A Gray, GS Athwal, **JA Johnson**, GJW King. A Novel Process for Anatomic Measurement of the Proximal Ulna to Guide Prosthesis Design. Canadian Orthopaedic Association 67th Annual Meeting. Ottawa, Ontario, June 2012.

65. SJ Desai, GS Athwal, LM Ferreira, **JA Johnson**, M Welsh, E Lalone, GJW King. Distal Humerus Hemiarthroplasty: The Effect of Implant Sizing on Elbow Joint Kinematics. Canadian Orthopaedic Association 67th Annual Meeting. Ottawa, Ontario, June 2012.

66. B Alolabi, A Gray, LM Ferreira, **JA Johnson**, GS Athwal, GJW King. Recontruction of the Coronoid Process using the Tip of the Ipsilateral Olecranon. Canadian Orthopaedic Association 67th Annual Meeting. Ottawa, Ontario, June 2012.

67. B Alolabi, A Gray, LM Ferreira, **JA Johnson**, GS Athwal, GJW King. Rehabilitation of the Medial and Lateral Collateral Ligament Deficient Elbow : An in vitro Biomechanical Study. Canadian Orthopaedic Association 67th Annual Meeting. Ottawa, Ontario, June 2012.

68. RT Willing, EA Lalone, GJW King, **JA Johnson**. Comparing Two Constitutive Material Models of Cartilage for Hemiarthroplasty Articular Contact Mechanics using Computational Analyses. Canadian Orthopaedic Research Society 46th Annual Meeting. Ottawa, Ontario, June 2012.

69. RT Willing, GJW King, **JA Johnson**. The Effect of Implant Design on Stability and Stress of Linked Total Elbow Replacements: A Finite Element Analysis. Canadian Orthopaedic Research Society 46th Annual Meeting. Ottawa, Ontario, June 2012.

70. HL Shannon, LM Ferreira, GJW King, **JA Johnson**. The Effect of Radial Head Implant Position on the Kinematics of Forearm Rotation. Canadian Orthopaedic Research Society 46th Annual Meeting. Ottawa, Ontario, June 2012.

71. E Lalone, RT Willing, T Peters, GJW King, **JA Johnson**. Accuracy Assessment of 3D Bone Model Reconstructions. Canadian Orthopaedic Research Society 46th Annual Meeting. Ottawa, Ontario, June 2012.

72. MT Sabo, H Shannon, E Lalone, S Deluce, LM Ferreira, **JA Johnson**, GJW King. Capitellar Hemiarthroplasty Can Restore Normal Elbow Kinematics Compared with Capitellar Excision. Canadian Orthopaedic Research Society 46th Annual Meeting. Ottawa, Ontario, June 2012.

73. MT Sabo, H Shannon, E Lalone, S Deluce, LM Ferreira, **JA Johnson**, GJW King. Radiocapitellar Arthroplasty and Elbow Kinematic. Canadian Orthopaedic Research Society 46th Annual Meeting. Ottawa, Ontario, June 2012.

74. Mohammad Niknami, **Khayat, R.E.** 2011, Natural convection of a Non-Fourier fluid flow in a vertical slot and application to Nanofluids, 61stCanadian Chemical Engineering Conference , London, Ontario, Canada (October 2011)

75. MD Mahmudur Rahman Faisal, **Khayat, R.E**, Yanful, K.E. 2011,Analytical bottom stress determination in shallow mine tailings pond,61st Canadian Chemical Engineering Conference,London,Ontario,Canada(October 2011).

76. K. Alba, **R. E. Khayat** and P. Laure. Transient Two-Layer Channel Flow. Submitted to Canadian Congress of Applied Mechanics (CANCAM) July, 2011, Vancouver, BC, Canada.

77. Mohammad Niknami, Kamran Siddiqui, **Khayat, R.E.** 2011, Economic and environmental analyses of Nanofluid based solar water heaters, 4th Annual Symposium of the Particle Technology Research Center, London, Ontario, Canada (October 2011)

78. Rahim M. Khorasany, Daniel F. Stranges, **Khayat, R. E**. 2011, Thermal Convection of Non-Fourier Fluids. Part I. Linear and Weakly Nonlinear Analyses, 61stCanadian Chemical Engineering Conference (CSChE 2011), London, Ontario, Canada (October 2011)

79. Daniel Stranges, Khorasany, R.H., **Khayat, R.E.** 2011, Rayleigh-Benard Convection of Nanofluids, Part II - Non-Linear Analysis, Proceedings of the 61st Annual Canadian Chemical Engineering Conference, London, Ontario, Canada (October 2011)

80. M. Haghshenas, L. Wang, **R.J. Klassen**; Strain rate dependence of the indentation stress of heat-treated AA 6061 alloy over the indentation depth range from 50 nm to 10.0 nm. Symposium of Hardness across the multi-scales of structure and loading rate, Materials Science and Technology Conference, Editors: R. Armstrong, D. Bahr, N. Thadani, S. Walley, Cleveland Ohio, October 2011.

81. Shiu, P.P., **Knopf, G.K.**, and Nikumb, S. (2012) "Polymer micromolds with near optical quality surface finishes", Microfluidics, BioMEMS, and Medical Microsystems X. Edited by Becker, H. and Gray, B.L. Proceedings of the SPIE, Volume 8251, pp. 82510H-82510H-10. [DOI: 10.1117/12.908098]

82. Chow, M., Bordatchev, E.V., and **Knopf, G.K.** (2012) "Impact of initial surface parameters on the final quality of laser micro-polished surfaces", Micromachining and Microfabrication Process Technology XVII. Edited by Maher, M.A. and Resnick, P.J. Proceedings of the SPIE, Volume 8248, pp. 824809-824809-10. [DOI: 10.1117/12.908137]

83. Ronny, R.A., **Knopf, G.K.**, Bordatchev, E., Tauhiduzzaman, M. and Nikumb, S. (2012) "Micromachined edge illuminated optically transparent automotive light guide panels", Micromachining and Microfabrication Process Technology XVII. Edited by Maher, M.A. and Resnick, P.J. Proceedings of the SPIE, Volume 8248, pp. 824806-824806-11. [DOI: 10.1117/12.908202]

84. Pungotra, H., **Knopf, G.K.** and Canas, R. (2012) "B-spline surface based concept design module for applications in virtual reality environment", CAD'12, June 11-14, 2012, Niagara Falls Ontario (paper #50).

85. Pungotra, H., **Knopf, G.K.** and Canas, R. (2012) "An alternative methodology to represent B-spline surface for applications in virtual reality environment", CAD'12, June 11-14, 2012, Niagara Falls Ontario (paper #92).

86. H. Azimian, R.V. Patel and **M.D. Naish**, "A Chance-Constrained Approach to Preoperative Planning of Robotics-Assisted Interventions," 33rd Annual International Conference of the IEEE Engineering in Medicine and Biology Society, Boston, MA, pp. 2127–2130, Aug. 30–Sept. 3, 2011.

87. A.Escoto, A.L. Trejos, **M.D. Naish**, R.V. Patel, M.-E. LeBel, "Force Sensing-Based Simulator for Arthroscopic Skills Assessment in Orthopaedic Knee Surgery," Medicine Meets Virtual Reality (MMVR), Newport Beach, CA, Feb. 9–11, 2012.

88. C.D.W. Ward, A.L. Trejos, **M.D. Naish**, R.V. Patel, K. Siroen and C.M. Schlachta, "Development of a Hands-Free Pointer for Instruction during Minimally Invasive Surgery," IEEE/RAS-EMBS International Conference on Biomedical Robotics and Biomechatronics, Rome, Italy, pp. 1211–1216, June 24–28, 2012.

89. I.Khalaji, R.V. Patel and **M.D. Naish,** "Systematic Design of an Ultrasonic Horn Profile for High Displacement Amplification," IEEE/RAS-EMBS International Conference on Biomedical Robotics and Biomechatronics, Rome, Italy, pp. 913–918, June 24–28, 2012.

90. T.P. Kurowski, A.L. Trejos, **M.D. Naish**, R.V. Patel and R.A. Malthaner, "Design of a Minimally Invasive Lung Tumor Localization Device," accepted for publication at the ASME Dynamic Systems and Control Conference, Ft. Lauderdale, FL, Oct. 17–19, 2012.

91. K. El Bannan and **S. Salisbury**, "Design of a two degree-of-freedom, MRI-compatible actuator," 34th Annual International Conference of the IEEE Engineering in Medicine and Biology Society, San Diego , CA, accepted 2012.

92. Elliott K, **Savory E,** Zhang C, Martinuzzi R & Lin W (2012) "Analysis of curvature corrected turbulence models using a 90 degree curved geometry modelled after a centrifugal compressor", Proc CFD Society of Canada Conference, Alberta, Canada, May.

93. **Savory E**, Perret L & Rivet C (2011) "Modelling the flow regime in a simple urban-type street canyon", Proc PHYSMOD2011 – International Workshop on Physical Modeling of Flow and Dispersion Phenomena, KlimaCampus, University of Hamburg, Germany, August, 2011, pp 15-22.

94. Karava P, Chowdhury M J, & **Savory E** (2011) "Effect of terrain on the forced convective heat transfer from the inclined windward roof of a low-rise building", Proc 13th Int Conf on Wind Engineering, (ICWE13), Amsterdam, Netherlands, July.

95. Lin W E, **Savory E**, McIntyre R P, Vandelaar C & King J P C (2011) "A single-span aero-elastic model of an overhead electrical power transmission line with guyed lattice towers", Proc 13th Int Conf on Wind Engineering, (ICWE13), Amsterdam, Netherlands, July.

96. Orf L F & **Savory E** (2011) "Modeling of downburst-producing thunderstorms", Proc 13th Int Conf on Wind Engineering, (ICWE13), Amsterdam, Netherlands, July.

97. **Savory E**, Perret L & Rivet C (2011) "Modelling considerations for examining the mean and unsteady flow in a simple urban-type street canyon", Proc 13th Int Conf on Wind Engineering, (ICWE13), Amsterdam, Netherlands, July.

98. Perret L & **Savory E** (2011) "Dynamics of the large-scale structures over a street canyon in an urban-type boundary layer", Proc 7th Int Symp on Turbulence and Shear Flow Phenomena (TSFP-7), Ottawa, Canada, July.

99. Elatar, A. and **Siddiqui, K.** "Wall heating effects in low Reynolds number channel flows" CSME International Congress, Winnipeg, June 4-6, 2012.

100. Khan, F. A., and **Siddiqui, K.** "Simulation of hydrogen production by using concentrated solar energy through thermo-chemical water splitting process. Part I: Simulation of zinc oxide reduction reaction" ASME-JSME-KSME Joint Fluids Engineering Conference, Hamamatsu, Japan, July 24-29, 2011.

101. Khan, F. A., and **Siddiqui, K.** "Simulation of hydrogen production by using concentrated solar energy through thermo-chemical water splitting process. Part II: Simulation of zinc hydrolysis reaction to generate hydrogen" ASME-JSME-KSME Joint Fluids Engineering Conference, Hamamatsu, Japan, July 24-29, 2011.

102. **Siddiqui, K.** and Chishty, W.A., "The influence of gas and liquid flow rates on the transient bubble characteristics in a liquid cross-flow" ASME-JSME-KSME Joint Fluids Engineering Conference, Hamamatsu, Japan, July 24-29, 2011.

103. DeGroot, C. T.**, Straatman, A. G.,** "Towards a porous media model of the human lung," 4th Int. Conference on Porous Media and its Application in Science and Industry, Pottsdam, Germany, June 2012.

104. DeGroot, C. T.**, Straatman, A. G.,** "Simulation of flow in an alveolated duct within the human lung with application to porous media," The 20th Conference of the CFD Society of Canada, Canmore, Canada, May 2012.

105. Mostafavi, K., **Tutunea-Fatan, O.R.**, Lalone, E., King, G.J.W, and Johnson, J.A., 2012, "Determination of Elbow Flexion-Extension Axis Based on Planar and Closed B-Splines," Paper No. 79, USB Proceedings of the CAD'12 Conference held between Jun. 11-14, 2012 in Niagara Falls, Canada, 12 pages.

106. Hafiz, A.K., Bordatchev, E., and **Tutunea-Fatan, R.**, "The Effect of Overlap Percentage on Surface Quality in Laser Polishing of AISI H13 Tool Steel," Technical Paper No. 7766, Transactions of 40th North American Manufacturing Research Conference (NAMRC40) held between Jun. 4-8, 2012 in Notre Dame, USA, 10 pages.

107. J. P. Weiler and **J.T. Wood**, (2012), "Predicting mechanical performance from process parameters in cast Magnesium alloys: A review of the UWO research programme", Submitted to Magnesium Alloys and their Applications Conference.

108. J. P. Weiler and **J. T. Wood** (2012), "Strain-rate effects of sand-cast and die-cast Magnesium alloys under compressive loading", Accepted to Magnesium Technology.

109. I.Basu, J.P. Weiler, **J.T. Wood** (2011), "Process-structure relationships for cast magnesium alloys", Thermec' 2011", Quebec City.

110. I. Basu, J.P. Weiler, **J.T. Wood** (2011), Study of Solidification of magnesium alloys during high-pressure die-casting", Thermec' 2011", Quebec City.

111. Xiaobing Cai, Qiuquan Guo, Gengkai Hu and **Jun Yang**, "Particle trapping and focusing in liquid based on acoustic metamaterials", Proceeding of SPIE Smart Structures/NDE 2012.

112. Tingjie Li, Qiuquan Guo, Limin Zhang and **Jun Yang**, "A Centrifugal Lab-in-a-tubing Platform Enabling Automatic Point-of-care Blood Diagnostics", Proceeding of IEEE ICMA 2011.

3. OTHER (Editor Reviewed Article)

1. **Knopf, G.K.**, Sareen, K. and Canas, R. (2011) " Reconstructing complex scenes for virtual reality" SPIE Newsroom, October 20, 2011, (3 pages) [DOI: 10.1117/2.1201110.003920]

4. OTHER (Research Laboratory Reports)

1. "Mixed Convection in a Periodically Heated Channel " by M.Z. Hossain and **J.M. Floryan**, Expert Systems in Fluid Dynamics Research Laboratory Report ESFD-8/2012, Department of Mechanical and Materials Engineering, The University of Western Ontario, London, Ontario, N6A 5B9, Canada, 2012.

2. "Drag Reduction due to Thermal Modulation" by M.Z. Hossain and **J.M.Floryan**, Expert Systems in Fluid Dynamics Research Laboratory Report ESFD-7/2012, Department of Mechanical and Materials Engineering, The University of Western Ontario, London, Ontario, N6A 5B9, Canada, 2012.

3. "Flow healing behind a surface protuberance of small-height" by A. Inasawa, **J.M.Floryan** and M.Asai. Expert Systems in Fluid Dynamics Research Laboratory Report ESFD-6/2012, Department of Mechanical and Materials Engineering, The University of Western Ontario, London, Ontario, N6A 5B9, Canada, 2012.

4. "Groove Optimization for Drag Reduction" by A.Mohammadi and **J.M.Floryan**, Expert Systems in Fluid Dynamics Research Laboratory Report ESFD-5/2012, Department of Mechanical and Materials Engineering, The University of Western Ontario, London, Ontario, N6A 5B9, Canada, 2012.

5. "Flows in Annuli with Longitudinal Grooves" by H.Moradi and **J.M.Floryan**, Expert Systems in Fluid Dynamics Research Laboratory Report ESFD-4/2012, Department of Mechanical and Materials Engineering, The University of Western Ontario, London, Ontario, N6A 5B9, Canada, 2012.

6. "Instabilities of Natural Convection in a Periodically Heated Layer" by M.Z. Hossain and **J.M.Floryan**, Expert Systems in Fluid Dynamics Research Laboratory Report ESFD-3/2012, Department of Mechanical and Materials Engineering, The University of Western Ontario, London, Ontario, N6A 5B9, Canada, 2012.

7. "Groove optimization for drag reduction" by A. Mohammadi and **J.M. Floryan**, Expert Systems in Fluid Dynamics Research Laboratory Report ESFD-2/2012, Department of Mechanical and Materials Engineering, The University of Western Ontario, London, Ontario, N6A 5B9, Canada, 2012

8. "Vortex Instability in a Meandering Channel" by **J.M.Floryan**. Expert Systems in Fluid Dynamics Research Laboratory Report ESFD-1/2012, Department of Mechanical and Materials Engineering, The University of Western Ontario, London, Ontario, N6A 5B9, Canada, 2012.

9. "Heat Transfer due to Natural Convection in a Periodically Heated Slot" by M.Z.Hossain and **J.M.Floryan**, Expert Systems in Fluid Dynamics Research Laboratory Report ESFD-5/2011, Department of Mechanical and Materials Engineering, The University of Western Ontario, London, Ontario, N6A 5B9, Canada, 2011.

10. "Pressure Losses in Grooved Channels" by A.Mohammadi and **J.M.Floryan**, Expert Systems in Fluid Dynamics Research Laboratory Report ESFD-4/2011, Department of Mechanical and Materials Engineering, The University of Western Ontario, London, Ontario, N6A 5B9, Canada, 2011.

11. "Natural Convection due to a Long Wavelength Heating" by M.Z.Hossain and **J.M.Floryan**, Expert Systems in Fluid Dynamics Research Laboratory Report ESFD-3/2011, Department of Mechanical and Materials Engineering, The University of Western Ontario, London, Ontario, N6A 5B9, Canada, 2011.

5. ORAL AND POSTER PRESENTATIONS

1. Kamalizonouzi B and **Asokanthan S F** (2012) Numerical Simulation of MDOF Human Body Dynamics Simulation via Motion Genesis, presented at the 17th Biennial Meeting of the Canadian Society of Biomechanics, Burnaby, BC, June 2012

2. Book J M and **Asokanthan S F** (2011) Modal Characterization of MEMS Switches via Output-only and Input/Output Identification Methods, Proceedings of ASME International Design Engineering Technical Conferences (IDETC), Washington, DC, August 2011, Paper # IDETC-48888

3. Cho J and **Asokanthan S F** (2011) Nonlinear Dynamic Response of Harmonically Driven Rotating Thin Circular Rings, Proceedings of 7th European Nonlinear Dynamics Conference, Rome, Italy, July 2011

4. Wang T and **Asokanthan S F** (2011) Bouncing Dynamics in MEMS-based Switching Structures, Proceedings of 7th European Nonlinear Dynamics Conference, Rome, Italy, July 2011

5. **Buchal, R.O.,** A Holistic, Interdisciplinary Approach to the Design of a Sustainable Personal Mobility System, Proceedings of the 2012 Canadian Engineering Education Association (CEEA) Conference, Winnipeg MB, June 17-20, 2012.

6. McCabe CMJ, McLachlin SD, Bailey SI, Gurr KR, Bailey CS, **Dunning CE**: The Role of Soft Tissue Restraints Following Type II Odontoid Fractures in the Elderly – A Biomechanical Study, 39th Clinical Seminar in Orthopaedic Surgery, London, Ontario, September 27, 2011. (podium)

7. Nadeau M, McLachlin SD, Bailey SI, Gurr KR, **Dunning CE**, Bailey CS: Evaluation of Instrumentation Techniques for a Unilateral Facet Fracture Dislocation Using a Validated Soft Tissue Injury Model, 39th Clinical Seminar in Orthopaedic Surgery, London, Ontario, September 27, 2011. (podium)

8. Leitch KL, Birmingham TB, Reeves J, Giffin JR, **Dunning CE**: Development of a Materials-testing Fixture to Enable Asymmetric Loading of the Lower Limb: An application of in-vivo gait data, Ontario Biomechanics Conference, Barrie, Ontario, March 16-18, 2012. (poster)

9. Hosein YK, King GJW, **Dunning CE**: The effect of intramedullary stem surface finish on the torsional stability of cemented joint replacement systems, Ontario Biomechanics Conference, Barrie, Ontario, March 16-18, 2012. (podium)

10. McLachlin SD, Nadeau M, Bailey SI, Gurr KR, **Dunning CE**, Bailey CS: Evaluation of instrumentation techniques for a unilateral facet fracture dislocation using a validated soft tissue injury model, Ontario Biomechanics Conference, Barrie, Ontario, March 16-18, 2012. (podium)

11. Neuert MC, **Dunning CE**: Validation of a strain adaptive model of the ulna, Ontario Biomechanics Conference, Barrie, Ontario, March 16-18, 2012. (poster)

12. Fetterly S, King GJW, **Dunning, CE**: Development of an experimental technique to quantify cement mantle strains in the distal ulna, Ontario Biomechanics Conference, Barrie, Ontario, March 16-18, 2012. (poster)

13. **Ferreira, L**. The Effect of Radial Head Excision and Arthroplasty on Medial Collateral Ligament Tension. Canadian Orthopaedics Association, Ottawa, ON, June 8, 2012.

14. **Ferreira, L**. The Effect of Radial Head Excision and Arthroplasty on Medial Collateral Ligament Tension. CIHR Young Investigators Meeting, King City, ON June 12, 2012.

15. "Flows in Grooved Channels" by A. Mohammadi and **J.M.Floryan**. Presented during TIM 2011, April 27-29, 2012, Gananoque, Ontario, Canada. Speaker: J.M.Floryan.

16. "The Super-Hydrophobic Effect in Single Phase Fluids" by A.Mohammadi and **J.M.Floryan**. Presented during the 7th Symposium on Flow Manipulation and Active Control, 2012 ASME Fluids Engineering Summer Meeting, July 8-12, 2012, Puerto Rico. Speaker: J.M.Floryan.

17. "The Super-ThermoHydrophobic Effect" by **J.M.Floryan**. Presented during the March Meeting of the American Physical Society, Boston, Feb.27-March2, 2012. Speaker: J.M.Floryan.

18. "Super-Hydrophobic-Like Effect Created by Surface Corrugations" by **J.M.Floryan**, presented during the Winter Meeting of the Canadian Mathematical Society, Dec.10-12, 2011, Toronto, Canada. Speaker: J.M.Floryan.

19. "Flows in Channels with Grooves of an Arbitrary Form " by A.Mohammadi and **J.M.Floryan**, presented during the 64th Annual Meeting of the American Physical Society, Nov.21-23, 2011, Baltimore. Speaker: A.Mohammadi.

20. "Natural Convection Due to a Long Wavelength Heating" by A.Asgarian and **J.M.Floryan**, , presented during the 64th Annual Meeting of the American Physical Society, Nov.21-23, 2011, Baltimore. Speaker: A.Asgarian..

21. "Natural Convection in a Fluid Layer Subject to a Periodic Heating" by M.Hossain and **J.M.Floryan**, , presented during the 64th Annual Meeting of the American Physical Society, Nov.21-23, 2011, Baltimore. Speaker: M.Hossain.

22. "Flow through Ribbed Annuli" by H.Moradi and **J.M.Floryan**, presented during the 64th Annual Meeting of the American Physical Society, Nov.21-23, 2011, Baltimore. Speaker: H.Moradi..

23. "Efficient Methods for Analysis of Flows in Grooved Annuli" by H.Moradi and **J.M.Floryan**, to be presented the International Conference on Applied Mathematics, Modeling & Computational Science (AMMCS-2011), July 25-29, 2011, Waterloo, Ontario, Canada.

24. "Numerical Bifurcation Study of Natural Convection in a Layer of Fluid Subject to Spatially Distributed Heating", Asgarian, A., Hossain, M.Z. and **Floryan, J.M.**, presented at the International Conference on Applied Mathematics, Modeling & Computational Science (AMMCS-2011), July 25-29, 2011, Waterloo, Ontario, Canada.

25. "Flow in Grooved Micro-channels" by A.Mohammadi and **J.M.Floryan**, presented at the 7th International Symposium on Turbulence and Shear Flow Phenomena, July 28-31, 2011, Ottawa, Canada.

26. Yan, Z., and **Jiang, L.Y.**, Size-dependent properties of piezoelectric nanostructures with surface effects, CMSC 2012, London, Ontario, Canada, June 6-8, 2012.

27. Zhou, J. Y., Khayat, R.E., and **Jiang, L.Y.**, Failure modes of a dielectric elastomer plate actuator with various boundary constraints, CMSC 2012, London, Ontario, Canada, June 6-8, 2012.

28. Yan, Z., and **Jiang, L.Y.**, Modeling and analysis of piezoelectric nanostructures with surface effects, 2012 EMN Meeting, Orlando, Florida, April 16-20, 2012.

29. Yan, Z., and **Jiang, L.Y.**, Electromechanical coupling behavior and mechanical properties of piezoelectric nanostructures with surface effects, 48th Annual Technical Meeting, Society of Engineering Sciences, Northwestern university, October 12-14, 2011.

30. R.O. Oviasuyi and **R.J. Klassen**; "Anisotropic Deformation of Zr Ion Irradiated Zr-2.5%Nb Micro-Pillars", presented at the 24th Canadian Materials Science Conference, London ON, June 5-8, 2012.

31. B. Bose, B.J. Diak, and **R.J. Klassen**; "Characterization of the Deformation Kinetics of Zr-2.5%Nb CANDU Pressure Tube Material using Displacement Rate Change Micro-Indentation", presented at the 24th Canadian Materials Science Conference, London ON, June 5-8, 2012.

32. A.Islam and **R.J. Klassen**; "Length Scale Dependence of the Constant-Load Creep of Au Micro-Pillars at Room Temperature", presented as a poster at the 24th Canadian Materials Science Conference, London ON, June 5-8, 2012.

33. M. Haghshenas, J.T. Wood, and **R.J. Klassen**; "Work Hardening Rate in Splined Mandrel Flow Forming of FCC Alloys", presented as a poster at the 24th Canadian Materials Science Conference, London ON, June 5-8, 2012.

34. A.Vriens, and **R.J. Klassen**; "Investigation of the Effect of Roller Inclination Angle on the Forming Forces During Splined Mandrel Flow Forming of a Steel Work Piece", presented at the 24th Canadian Materials Science Conference, London ON, June 5-8, 2012.

35. M.-E. LeBel, A. Escoto, A.L. Trejos, **M.D. Naish**, R.V. Patel, "Force Sensing Simulator for Arthroscopic Skill Testing in Orthopaedic Knee Surgery," Oral Presentation, Association for Medical Education in Europe (AMEE) 2011 Annual Conference, Vienna, Austria, August 27–31, 2011.

36. D.A. Bottoni, M.T. Perri, A.L. Trejos, **M.D. Naish**, R.V. Patel, R.A. Malthaner, "New VATS Palpator Sensing System Safely Locates Occult Tumours in vivo," Oral presentation, Canadian Surgery Forum 2011, London, ON, September 15–18, 2011, available in Canadian Journal of Surgery, vol. 54, suppl. 1, p. S83, August 2011.

37. A.L. Trejos, R.V. Patel, **M.D. Naish,** R.A. Malthaner and C.M. Schlachta, "Force-based Assessment of Skill in Minimally Invasive Surgery," Oral presentation, 2012 London Health Research Day, London, ON, March 20, 2012.

38. I.Khalaji, R.V. Patel and **M.D. Naish**, “Towards Miniaturization of Ultrasonically Activated Scalpels,” Poster presentation, 2012 London Health Research Day, London, ON, March 20, 2012.

39. A.L. Trejos, R.V. Patel, **M.D. Naish**, R.A. Malthaner and C.M. Schlachta, “Force-based Assessment of Skill in Minimally Invasive Surgery,” accepted for oral presentation at the 7th Minimally Invasive Robotic Association International Congress, Boston, MA, September 5–8, 2012.

40. Jian Liu, Xifei Li, Xiangbo Meng, Dongsheng Geng, Mohammad N. Banis, Yuhai Hu, Ruying Li, **Xueliang Sun**. "Atomic-layer-deposition synthesis of energy nanomaterials and their applications in lithium-ion batteries". 12th International Conference on Atomic Layer Deposition, Dresden, Germany, June 17-20, 2012 (oral).

41. Yuhai Hu, Dongsheng Geng, Xifei Li, Kathy Li, **Andy Sun**. “Chemical Functionalization of Graphene for Lithium Ion Batteries”. 61st Canadian Chemical Engineering Conference, London ON, Canada, Oct. 23-26, 2011. (Oral)

42. Yang J.L., Wang J.J., Wang D.N., Li X.F., Liang G., Gauthier M., Li R.Y., **Sun X**. “3D Porous LiFePO4 and its Composites with Nanostructured Carbon as Cathode Materials for Lithium Ion Batteries Used in Electric Vehicles”. 24th Canadian Materials Science Conference, London, Canada, 2012, June, 6-9 (Oral)

43. Wang D.N., Yang J.L., Li X.F., Wang J.J., Li R.Y., Cai M., Sham T.K., **Sun X.** “SnO2/Graphene Nanocomposites with Enhanced Performance as Anodes for Lithium Ion Batteries”. 24th Canadian Materials Science Conference, London, Canada, 2012, June, 6-9 (Oral).

44. Jian Liu, **Xueliang Sun**. "Crystallinity-controlled coating of ZrO2 and Co3O4 on carbon nanotubes by atomic layer deposition". Canadian Society for Chemistry Engineering (CMChE), London, ON, Canada, Oct 23-26, 2011 (oral).

45. Jian Liu, Xifei Li, Xiangbo Meng, Dongsheng Geng, Mohammad N. Banis, Yuhai Hu, Ruying Li, **Xueliang Sun**. "Atomic-layer-deposition synthesis of energy nanomaterials and their applications in lithium-ion batteries". Canadian Materials Science Conference, London, ON, Canada June 5-8, 2012 (oral).

46. Jian Liu, Xifei Li, Liang Li, Ruying Li, Mei Cai, **Xueliang Sun**. Novel nanostructured Li4Ti5O12 as anode materials for lithium-ion battery applications. 16th International Meeting on Lithium Batteries, Repubic of Korean, June 17-22, 2012 (poster).

47. A.Geng, S. **Sun, X**. Hu, R. Li, X. Sun, S. Ye, S. Knights. Synthesis and application of doped graphene as non-noble metal electrocatalysts for fuel cells. 61st Canadian Chemical Engineering Conference, London, Ontario, Canada. 2011, October 24 (oral).

48. Xifei Li, Xiangbo Meng, Ruying Li, **Xueliang Sun**, Mei Cai and Mark W. Verbrugge “Atomic Layer Deposition Derived Metal Oxides with Controlled Morphology and Crystallinity onto Graphene Nanosheets For Lithium Storage”. 16th International Meeting on Lithium Batteries, Repubic of Korean, June 17-22, 2012 (poster).

49. Yongliang Li, Jiajun Wang, Xifei Li, Dongsheng Geng, Mohammad N. Banis, Ruying Li and **Xueliang Sun** “Graphene and N-doped Graphene as Cathodes for Li-Air Batteries”. 16th International Meeting on Lithium Batteries, Repubic of Korean, June 17-22, 2012 (poster).

50. Yongliang Li, Jiajun Wang, Xifei Li, Dongsheng Geng, Mohammad N. Banis, Ruying Li and **Andy Xueliang Sun** “Graphene and N-doped graphene as cathodes for Li-Air Batteries”. Canadian Materials Science Conference, London, ON, Canada June 5-8, 2012 (oral).

51. M Norouzi Banis, X Meng, Y Zhang, R Li, **X Sun**. “Development of Mmetal Ssilicide Nnetworked Nnanostructures: Nanowires, Nanoribbons, Nanosheets and Nanobat”. Canadian Materials Science Conference, London, ON, Canada June 5-8, 2012 (oral).

52. Hafiz, A.M.K., Bordatchev, E.V., and **Tutunea-Fatan, R.O.,** "Analysis of Microhardness and Surface Integrity in Laser Polishing of AISI H13 Tool Steel," Abstract No. 52, presented at the 24th Canadian Materials Science Conference (24th CMSC) held between Jun. 5-8, 2012 in London, Canada.

53. Heroux, A., Salisbury, S., Barari, A., and **Tutunea-Fatan, O.R.**, 2012, "Minimization of the Interference between Implant and Distal humerus for Total Elbow Arthroplasty," Poster No. 152, presented at the London Health Research Day held on Mar. 20, 2012 in London, Canada.

54. Peipei Jia, Hao Jiang, J. Sabarinathan, **Jun Yang**, "Fabrication of Nanohole Array Sensors by Nanotransfer Printing", 24th Canadian Materials Science Conference, June 4-8, 2012, London, Ontario, Canada.

55. Tingjie Li, FalongJia, Yaxi Fan, ZhifengDing and **Jun Yang**, "Nanofabrication of an Electrochemical System and its Application in Lab-on-a-CD", 24th Canadian Materials Science Conference, June 4-8, 2012, London, Ontario, Canada.

56. Yaxi Fan, Tingjie Li, Leo Lau and **Jun Yang**, "Fast Prototyping and Small Volume Production of Polymer Devices by Hybrid Molds using Hot Embossing Lithography", 24th Canadian Materials Science Conference, June 4-8, 2012, London, Ontario, Canada.

57. Yang Chen, **Jun Yang**, "Amperometric Detection of Cardiac Troponin I with Nanomaterials Modified Golden Electrode", 24th Canadian Materials Science Conference, June 4-8, 2012, London, Ontario, Canada.

58. Xiaobing Cai, Qiuquan Guo, Gengkai Hu and **Jun Yang**, "Particle trapping and focusing in liquid based on acoustic metamaterials", SPIE Smart Structures/NDE 2012, March 11-15, 2012, San Diego, California, USA.

6. INVITED LECTURES

C. Dunning

September 2011 — Investigations in Orthopaedic Biomechanics from Western's Jack McBain Biomechanical Testing Lab, Dr. Sandy Kirkley Musculoskeletal Research Symposium, Western University

L. Ferreira

June 2012 — The roles Mechatronics can play in orthopaedic procedures and surgical training. Schulich Department of Surgery Research Day. St. Joseph's Health Care,

Surgical Mechatronics Laboratory: A Bench To Bedside Approach. CIBC St. Joseph's Foundation Luncheon. London, ON,

J.M. Floryan

September 2011 — Certain Aspects of Flows over Rough Surfaces. National Institute of Aerospace, Hampton, VA,USA

M.D. Naish

September 2011 — Devices to Enhance the Practice of Minimally Invasive Surgery," 5th Seminario International Ingenería Electrónica, Bucaramanga, Columbia.

A.V. Singh

July 2011 — Extensional and flexural modes of vibration of single layer graphene sheets by lattice structure and continuum plate theories, The 8th International Symposium on Vibrations of Continuous Systems, Whisler BC

X. Sun

May 2012	Graphene-based Electrodes for Energy Storage and Conversion, 95th Canadian Chemistry Society conference, Calgary, (invited)
	Atomic Layer Deposition: Synthesis and Energy Applications of Nanostructured Materials. 95th Canadian Chemistry Society conference, Calgary, (invited)
April 2012	Graphene-based Electrodes for Fuel Cells and Li Batteries, Electrochemical Society Canadian Conference (ECS Canadian), Montreal. (invited)
February 2012	Development of Nanostructured Materials for Fuel Cells and Li Batteries, University of International Florida, Miami, USA
June 2012	Advanced Nanomaterials for Fuel Cells and Batteries", University of Tsinghua University, Bejing, China
	Energy Materials for Fuel Cells and Batteries, University of Soochow, Soochow, China,
	Energy Materials for Fuel Cells and Batteries. Institute of Physics, Academy of Sciences, China
October 2011	Nano-based Electrodes for Fuel Cells and Li Batteries, 7th IUPAC International Conference on Novel materials and their Synthesis (NMS-VII) & 21st International Symposium on Fine Chemistry and Functional Polymers (FCFP-XXI). Shanghai, China. (Keynote)
	Pt Nanwire-based Electrodes for Fuel Cells, Low Carbon EarthSummit-2011, Dalian, China
	Nanomaterials for Fuel Cells and Batteries", University of Zhongshan, Guangzhou, China
	Nanomaterials and Clean Energy, Dalian Institute of Chemical Physics Chinese, Academy of Sciences, China
August 2011	Fuel Cells and Batteries: Role of Nanomaterials, University of Waterloo, Ontario
July 2011	Li Ion Batteries and Li-Air Batteries: Role of Nanomaterials, University of Shenzhen
	Development of Li Ion Batteries and Li-Air Batteries", Wuhan University of Technology

J. Yang

April 2012	Nanotechnology: from nanofabrication to nanomanipulation to application, Shanghai Jiaotong University
January 2012	A Method for Fabrication of Well-defined Microfiltration Membranes with Uniform Pore Size and Distribution, Trojan Technologies
December 2011	When Nanotechnology Meets Biology: from Fundamentals to Applications, Shanghai University

7. TECHNICAL REPORTS

S. Salisbury

M. Heydari Araghi and **S. Salisbury**, "SMA Actuator Design," prepared for Curtiss-Wright Controls Inc., Western University, April 2012.

E. Savory

Savory E, El Dalmatty A, Hangan H, Miller C & Galsworthy J (2012) "Modeling and prediction of failure of transmission lines due to high intensity winds (HIW) - Phase 2 (Validation and Implementation)" CEATI WISMIG Project 3323, Final Report.

X. Sun

8 reports for GM, Ballard, Phostech Lithium

8. BOOKS AND BOOK CHAPTERS

Engineering Analysis with SolidWorks Simulation 2012. **P.Kurowski**, SDC Publications.
ISBN 978-1-58503-710-0.

DeGroot, C. T**., Straatman, A. G.,** "Thermal dispersion in high conductivity porous media," in Numerical analysis of Heat and Mass Transfer in Porous Media, Edited by Joao Delgado, Springer, 2012.

"Advanced Electrochemical Technologies for Energy Storage and Conversion". Wiley-VCH, Edited by Rushi Liu, **Andy Xueliang Sun**, Lei Zhang, Hansan Liu, Jiujun Zhang (2012).

J. Hou, J. Wang, **X. Sun,** M. W. Ellis, "Advanced Carbon Materials for Electrochemical Energy Conversion and Storage" in the "Handbook of Carbon Nano Materials". World Scientific Publishing Co. (2012). (book chapter)

9. PATENTS

Kofman, J. and **Knopf, G.K.** entitled "Method and apparatus for three-dimensional shape measurement with unconstrained object and sensor motion" [US 6542249; CA 2278108] sold to Align Technology Inc., San Jose California, in June 2012. Align Technology Inc. is a global medical device company that develops 3D scanning solutions for orthodontics and dentistry.

H. Hassan and **K. Siddiqui**, "Dual-axis Solar Tracker" US provisional patent application number 61/537,517, 1018P007US01, 2011.

Polihronov, J., **Straatman, A. G.**, "Method and Apparatus for Producing the Vortex Tube Effect on a Large Scale," Patent protection filed May 2012.

X. Sun, R. Li, M. Saha, R. Li, and M. Cai. "Nanowire Support Catalysts for Fuel Cell Electrodes", US patent, Patent Number: 20090004552 (2009).

X. Sun, R. Li, Y. Zhou, H. Liu, and M. Cai. "One-dimensional Metal Nanostructures", US patent, Patent Number: 20100316873 (2010).

Sun, X. Zhong, Y., Li, R. Cai, M. "Synthesis of Rare Earth Element-containing Alumina Nanowires". US patent, Patent application number: 20100130351(2010).

Sun, X., Zhang, G., Sun, S., Li, R. Cai, M. "A General Strategy for the Kilogram-Scale Production of Various Metal and Bimetallic-Composite Nanostructures", US patent,

Publication Number: 20110197710. (2011)

Sun, X., Yang, H., Li, X., Geng, G. "Secondary Lithium Batteries Having Novel Anodes Field of The Invention", US patent, Patent Number: 20120177995. (2012)

Sun, X., Zhang, G., Sun, S., Li R., Cai, M., "Porous Dendritic Platinum Nanotubes as Electrocatalysts for Fuel Cell Applications". US patent, Publication Number 20120003563.(2012)

X. Sun, H. Abou-Rachid, M. Ionescu. "Controlled Synthesis Novel Class Carbon Nanostructures". US patent, filed, 2012.

PROFESSIONAL SERVICES

1. REVIEW OF REFEREED JOURNALS AND BOOK CHAPTERS

S. Asokanthan

Journal of Sound and Vibration
ASME Journal of Applied Mechanics

R.O. Buchal

Journal of Mechanical Engineering Science
Journal of Computing and Information Science in Engineering (JCISE)

J.R. Dryden

Journal of Materials Science

C. Dunning

Clinical Biomechanics
International Journal for Numerical Methods in Biomedical Engineering
Proceedings of the Institution of Mechanical Engineers, Part H, Journal of Engineering in Medicine
Journal of Orthopaedic Trauma
Journal of Biomechanics

L. Ferreira

ASME Journal of Biomechanical Engineering (1 review)
Medical Engineering & Physics (1 review)
Journal of Biomechanics (two reviews)

J.M.Floryan

Reviewing for 32 journal titles
Member of Editorial Board of the Canadian Society for Mechanical Engineering (CSME) Transactions
Archives of Mechanics
The Archive of Mechanical Engineering
Journal of Flow Control, Measurement and Visualization.

T. Jenkyn

Journal of Biomechanics
Journal of Orthopaedic and Related Research
Physics in Medicine and Biology

L. Jiang

Mathematics and Mechanics of Solids
Physica E: Low-dimensional Systems and Nanostructures
Smart Materials and Structures
Mechanics of Materials
Mechanics Research Communications
Proceedings of the Royal Society A
Theoretical & Applied Mechanics Letters
Journal of Physics D: Applied Physics
Journal of Engineering Materials and Technology
International Journal of Applied Mechanics
Journal of Applied Physics
Journal of Physics: Condensed Matter.

J. Johnson

The Journal of Shoulder and Elbow Surgery (Assistant Editor)
The Journal of Biomechanical Engineering
The Journal of Hand Surgery
The Journal of Orthopaedic Research
Clinical Orthopaedics and Related Research
Journal of Engineering in Medicine
Clinical Biomechanics
Journal of Biomechanics
Applied Physiology
Nutrition & Metabolism

R. Klassen

The Journal of Mechanical Engineering Science
Journal of Nuclear Medicine

G. Knopf

International Standards Organization (ISO) - Member of the Standards Council of Canada advisory committee (CAC) on *Robots for Manufacturing Environment* (TC184/SC2)

Associate Editor of Refereed Journals:
International Journal of Control and Intelligent Systems (Editor: C. de Silva, UBC),
International Journal of Optomechatronics (Editor: H.-S. Cho, KIAST)

Reviewer of Refereed Journals
Applied Optics
Biosensors and Bioelectronics
Computer-Aided Civil and Infrastructure Engineering
Computer Aided Design
Control and Intelligent Systems (Associate Editor)
Optical Engineering
International Journal of Advanced Manufacturing Technology
International Journal of Optomechatronics (Associate Editor)

Journal of Intelligent Manufacturing
Journal of Optics
Measurement Science and Technology
Precision Engineering
Robotics and Computer Integrated Manufacturing
Sensors and Actuators: B Chemical

M.D. Naish

IEEE Transactions on Haptics
IEEE Transactions on Medical Imaging
IEEE Transactions on Biomedical Engineering
International Journal of Medical Robotics and Computer Assisted Surgery

E. Savory

J Wind Engineering and Industrial Aerodynamics
Wind and Structures
Experimental Thermal Fluid Sciences
J Automobile Engineering

Other
Organizing Committee for PHYSMOD 2011, "International Workshop on Physical Modelling of Flow and Dispersion Phenomena" held 22nd – 25th August 2011, Meteorological Institute of Hamburg University, Germany.

K. Siddiqui

Journal of Fluids Engineering
Solar Energy

Other
Elected as the Chair of Fluid Mechanical Technical Committee of the American Society of Mechanical Engineers (ASME) for a two-year term
Technical Editor, CSME Bulletin
Symposium organizer, ASME Fluid Engineering Summer Conferences

A.G. Straatman

International J. Computer Mathematics (2)
Journal of Thermal Sciences (1)
International J. Heat and Mass Transfer (1)
Carbon (1)
International Conference on Heat Exchanger Fouling and Cleaning (3).

X. Sun

Nature Nanotechnology
Nature Communications
Nature Materials
Journal of American Chemical Society
Adv. Materials
ACS Nano, *"Angewandte Chemie International Edition*
Nanotechnology
Materials of Chemistry
J. Phys. Chem.
Electrochemistry Communication

Electrochemical Solid-State Letter
Appl. Phys. Lett.
Carbon
Langumir, etc.

O.R. Tutunea-Fatan

Computer-Aided Design
Journal of Engineering Manufacture
International Journal of Advanced Manufacturing Technology
Journal of Mechanical Engineering Science
Journal of Machining Science and Technology
International Journal of Machine Tools and Manufacture

J. Wood

Canadian Metallurgical Quarterly

J. Yang

Lab on a Chip, Applied Physics Letter, Nanotechnology, Journal of Micromechanics and Microengineering
IEEE Transactions on Industrial Electronics
IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency
IEEE Transactions on Nanotechnology, Langmuir
The Journal of Physical Chemistry
Journal of Applied Physics
Sensors & Actuators: B. Chemical
Biomedical Materials
Biomacromolecules; Microsystem Technologies
Biotechnology Journal
Journal of Materials Processing Technologies

C. Zhang

Chemical Engineering Science
International Journal of Heat and Mass Transfer
Proceedings of the Institution of Mechanical Engineers, Part A, Journal of Power and Energy

2. REVIEW OF GRANT APPLICATIONS

S. Asokanthan

NSERC Discovery Grants
NSERC CREATE Grant

R.O. Buchal

NSERC Strategic Grants
NSERC Collaborative Research and Development Grant

C. Dunning

NSERC – Discovery Grants (three applications)

J.M.Floryan

NSERC, NSF

L. Ferreira

Internal Grant Competition (Lawson Health Research Institute) (one application)

T. Jenkyn

NSERC Discovery
CFI Leading Edge Funds
CIHR Operating Grants

L. Jiang

American Chemistry Society – Petroleum Research Fund (Proposal Review)

J. Johnson

Canadian Institute of Health Research (CIHR)
Catalyst Grant- Bone Health Committee (Scientific Chair, attendee, 2012)
2012 Canadian Institute of Health Research (CIHR)
Biomedical Engineering Committee (Scientific officer, attendee, 2012)

R. Klassen

NSERC – CRD Grants (two applications)
NSERC – Discovery Grants (two applications)

G. Knopf

Member of NSERC's Discovery Grant Evaluation Committee (1512)
Natural Sciences and Engineering Research Council (Discovery Grant)
Austrian Science Fund (FWF) - Translational Research Program (TRP)
Romanian National Council for Scientific Research - Exploratory Research Projects

M.D. Naish

NSERC Strategic Grants
NSERC Discovery Grants

E. Savory

Czech Academy of Sciences

K. Siddiqui

NSERC Discovery Grants

A.G. Straatman

NSERC – CRD Grants (two applications)
NSERC – Discovery Grant (one application)
Nazarbeyez University Review (one application)

Elected President of CFD Society of Canada 2012-2014

X. Sun

NSERC Discovery Committee Member (2011-2013)
NSERC – Strategic

NSERC - Discovery
CRD
121
CFI
OCE
ORF
NSF

J. Yang

NSERC – Discovery Grant
NSERC – Strategic Grant
NSERC – 121

C. Zhang

NSERC
MITACS