ANNUAL REPORT

July 1, 2008 to June 30, 2009

Department of Mechanical and Materials Engineering

Faculty of Engineering

The University of Western Ontario

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MESSAGE FROM THE DEPARTMENT CHAIR

The Department of Mechanical and Materials Engineering offers the Bachelor of Engineering Science Degree in Mechanical Engineering, as well as three options: Mechanical Engineering and Medicine, Mechanical Engineering and Business and Mechanical Engineering and Law. We also offer these Concurrent Degree programmes: Mechanical Engineering and Applied Mathematics; Mechanical Engineering and Medical Biophysics; Mechanical Engineering and Computer Science.

We also offer the M.E.Sc. and M.Eng. degree programmes (in Thermofluids, Materials and Solid Mechanics, Mechanical Engineering and Automation Technologies and Systems) and Ph.D. degree programmes.

The Department currently has a full-time undergraduate enrollment of 239 and a graduate enrollment of 129. In 2008, the Department graduated 79 undergraduate students and 54 graduate students.

The Department currently has one Faculty Scholar from The University of Western Ontario, a newly appointed Fellow of the Engineering Institute of Canada and one Natural Sciences and Engineering Council of Canada Faculty Award.

From July 1, 2008 to June 30, 2009 the Department enjoyed success in research productivity with the publication of 89 journal papers, 1 book chapter, and 85 conference papers published. In addition, 2 patents were issued.

Our faculty members were granted over $5 million in research funding from various agencies including NSERC, CFI, CIHR and from industry.

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

J.M. Floryan, Ph.D., P.Eng. FASME,FCSME,FCASI,FJSPS,FEIC
Chair
Department of Mechanical and Materials Engineering

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 Affairs

A.G. Straatman, Ph.D., P.Eng.
Associate Professor

519-661-2111, Ext: 88249
Office: SEB 2069B
Email: astraatman@eng.uwo.ca

Associate Chair, Undergraduate Affairs

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

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

AWARDS AND RECOGNITION

Altahan, W.

University Students' Council Teaching Honour Roll Award of Excellence, 2008-2009

Buchal, R.O.

Faculty of Engineering R. Mohan Mathur Award for Excellence in Teaching

Dunning, C.E.

Early Researcher Award

Floryan, J.M.

Fellow, Engineering Institute of Canada, 2008

Jiang, L.

NSERC University Faculty Award

Johnson, J.

Faculty Scholar, University of Western Ontario

Straatman, A.G.

University Students Council Teaching Honour Roll Award of Excellence, 2008-09
Terry Base Award for Outstanding Teaching in Mechanical & Materials Engineering, 2008

Yang, J.

Early Researcher Award

FACULTY MEMBERS AND ADMINISTRATIVE STAFF

1. FULL-TIME FACULTY MEMBERS

S. Asokanthan, Ph.D.
Associate Professor
Btech (IIT) 1981
PhD (Waterloo) 1986
GCED (Queensland) 1996

Dynamics and Control of Flexible Rotating Multi-body Systems. Applications cover a range of Mechanical and Aerospace Engineering Applications. Emphasis is placed on Gyroscopic, Stochastic, Hybrid (distributed/ discrete), and Time-varying systems.

519-661-2111, Ext: 88907, Email: sasokanthan@eng.uwo.ca

R.O. Buchal, Ph.D., P.Eng.
Associate Professor

BASc (British Columbia) 1980
MASc (British Columbia) 1984
PhD (British Columbia) 1987

Design methods and tools, design education, instructional technology, manufacturing inspection planning.

519-661-2111, Ext: 88454, Email: rbuchal@eng.uwo.ca

J.R. Dryden, Ph.D., P.Eng.
Associate Professor

BASc (Windsor) 1973
PhD (Windsor) 1977

Conduction of heat in solids, solid mechanics, energy methods.

519-661-2111, Ext: 88307, Email: jdryden@eng.uwo.ca

C.E. Dunning, Ph.D., P.Eng.
Associate Professor

Dipl in Engg (Cape Breton) 1992
BEng (TUNS) 1995
MSc –Medical Biophysics (TUNS) 1997
PhD (Western) 2001

Human biomechanics, joint implant design/ improvement, joint motion and loading, and bomechanical load transfer.

519-661-2111, Ext 88306, Email: cdunning@eng.uwo.ca

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

MSc (Warsaw) 1974
PhD (Virginia Tech) 1990

Flow Control; Flow Manipulation; Hydrodynamic Stability; Boundary Layers; Laminar-Turbulent Transition; Interfacial Fluid Mechanics; Thermocapillary Flows; Convection; Rupture Problems; Moving Boundary Problems; Spectral Methods; Direct Solutions of the Navier-Stokes Equations.

519-661-2111, Ext: 88330, Email: floryan@eng.uwo.ca

T.R. Jenkyn, Ph.D., P.Eng.

Associate Professor

BASc (Toronto) 1994
MASc (Toronto) 1996
PhD (Strathclyde) 1999

'In vivo' biomechanics; Medical imaging; Surgical simulation; Gait & motion analysis; Orthopaedic biomechanics; Trauma & sport injuries; Disabilities resulting from osteoarthritis; Skeletal muscle function; Inverse dynamic modeling.

519-661-2111, Ext: 88339, Email: tjenkyn@eng.uwo.ca

L.Y. Jiang, Ph.D., P.Eng.
Assistant Professor

BSc (USTC) 1994
MSc (Harbin) 1999
PhD (Alberta) 2005

Nanocomposites; Nanomechanics; Carbon Nanotubes; Multi-Scale Modelling; Micromechanics; Composites; Functionally Graded Materials; Fracture Mechanics and Failure Analysis of Materials; Smart Structures; MEMS and NEMS; Health Monitoring of Engineering

519-661-2111, Ext: 80422, Email: lyjiang@eng.uwo.ca

J. Johnson, Ph.D., P.Eng.
Professor

Dipl in Pure and Appl Sci (Sir George Williams) 1973
BSc (Concordia) 1977
BEng (McGill) 1982
PhD (TUNS) 1990

Orthopaedic Bio-engineering, Implant Design, Hand and Upper Limb Biomechanics, Joint Motion and Kinematics, Computer-Assisted Surgery.

519-661-2111, Ext: 88255, Email: jajohnso@eng.uwo.ca

R.E. Khayat, M.Eng., Ph.D.
Professor

BEng (McGill) 1980
MEng (McGill) 1982
PhD (McGill) 1989

Polymer processing; linear and nonlinear hydrodynamic stability; free surface and interfacial flows; computer simulation of Newtonian and non-Newtonian fluid mechanics.

519-661-2111, Ext: 88253, Email: rkhayat@eng.uwo.ca

R. Klassen, Ph.D., P.Eng.
Associate Professor

BSc (Toronto) 1984
MSc (Manitoba) 1986
PhD (Toronto) 1990

Relationships between plastic deformation and microstructure in metallic and non-metallic systems.

519-661-2111, Ext: 88323, Email: rklassen@eng.uwo.ca

G. K. Knopf, Ph.D., P.Eng.
Professor

BA (Saskatchewan) 1984
BEng (Saskatchewan) 1984
MSc (Saskatchewan) 1987
PhD (Saskatchewan) 1991

Intelligent design tools; interactive data visualization; deformable geometric models; 3D shape measurement; optical actuation; bioelectronic detectors and imaging arrays.

519- 661-2111, Ext: 88452, Email: gknopf@eng.uwo.ca

P. Kurowski, Ph.D., P.Eng.
Assistant Professor

MEng (Warsaw) 1978
PhD (Warsaw) 1983

Machine Design, Design Analysis, Finite Element Analysis, Product Design, Kinematics and Dynamics of Machines, Mechanics of Materials, Design Projects.

519- 661-2111, Ext: 80125, Email: pkurowski@eng.uwo.ca

M.D. Naish, Ph.D.
Assistant Professor

BESc (Western) 1996
BSc (Western) 1996
MASc (British Columbia) (1999)
PhD (Toronto) (2004)

Mechatronics, multi-sensor systems, active vision systems, sensor planning, intelligent systems, robotic devices and medical robotics.

519-661-2111, Ext: 88294, Email: naish@eng.uwo.ca

S.P. Salisbury, Ph.D., P.Eng.

Assistant Professor

BASc (Waterloo) 1995
PhD (Toronto) 2007

Development of precision positioning systems and linear motors for biomedical applications. Integration of sensors, modelling and analyzing dynamic systems, development of real-time controllers and control of piezoelectric materials.

519-661-2111, Ext: 80174, Email: ssalisbury@eng.uwo.ca

E. Savory, Ph.D., C.Eng.
Associate Professor

B.Sc (Surry) 1981
PhD (Surry) 1985

Industrial and environmental aerodynamics, Wind effects on buildings and structures, Cavity flows, Jets and plumes, Hemodynamics.

519-661-2111, x 88256, email: esavory@eng.uwo.ca

D.M. Shinozaki, D. Phil., P.Eng.
Professor

B.Eng. (McMaster) 1967
M.Sc. (McMaster) 1968
D.Phil. (Oxford) 1972

Polymer structure and properties, nanostructural engineering, micromechanics

519-661-2111, Ext: 88519, Email: shinozak@eng.uwo.ca

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

B. Eng. (NED) 1989
Ph.D. (Toronto) 2002

Interfacial fluid dynamics and heat transfer, alternative and sustainable energy systems (solar, wind and thermoacoustics); environmental flows; measurement techniques.

(519) 661-211, Ext. 88234, Email: ksiddiqui@eng.uwo.ca

A.V. Singh, Ph.D., P.Eng.
Professor

BSc(Eng) (Ranchi) 1968)
MASc (Ottawa) 1971
PhD (Ottawa) 1975

Solid Mechanics - computational energy methods, vibration & stability of continuous systems, mechanics of composite material plates & shells, mechanics of piezo-electric materials & Micro Electro Mechanical Systems (MEMS).

519-661-2111, Ext: 88321, Email: avsingh@eng.uwo.ca

A.G. Straatman, Ph.D., P.Eng.
Associate Professor
BESc (Western) 1991
MESc (Western) 1992
PhD (Waterloo) 1995

Non-stationary Turbulent Flows, Pulsatile Flows & Hemo-dynamics, Convective Heat Transfer, Enhancement of Convective Heat Transfer using Porous Metals, High-Performance Parallel Computing, Material Property Prediction in Metal Die-casting, Application of CFD.

519-661-2111, Ext: 88249, Email: astraatman@eng.uwo.ca

X. Sun, Ph.D.
Associate Professor

BSc (China) 1985
MSc (China) 1989
PhD (UK) 1999

Nanomaterials, Carbon Nanotubes, Nanowires, Nanoparticles, Nanotechnology, Smart & Functional Materials, Biomaterials, Fuel Cells, Sensors, Micro/Nano Fabrication, Surface Engineering, Corrosion Protection, Microscopy.

519-661-2111, Ext: 87759, Email: xsun@eng.uwo.ca

O.R. Tutunea-Fatan, Ph.D.
Assistant Professor

B.Sc. (Transilvania) 1994
M.Sc. (Transilvania) 1995
Ph.D. (Western) 2004

Accurate numerically-controlled machining of complex surfaces: Optimized configuration of multi-axis CNC machine tools; Computer-Aided Design and Manufacturing (CAD/CAM); Computer-Aided Engineering (CAE) techniques

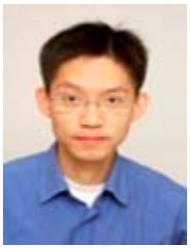
519-661-2111, Ext. 88289; Email: rtutunea@eng.uwo.ca.

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

BASc (Waterloo) 1988
MASc (Waterloo (1991)
PhD (McMaster) 1995

Mechanical characterization of materials, composite materials, deformation processing, materials selection in mechanical design.

519-661-3482, Email: jwood@eng.uwo.ca



Yang, Ph.D.

Assistant Professor

BASc (China) 1998
MASc (China) 2000
PhD (Alberta) 2004

Biofluidics/Microfluidics/ Nanofluidics, Lab-on-a-chip/Biochip, Nanotechnology, MEMS, Biosensor, Cell Adhesion and Signaling, Single Molecule Kinetics, Molecular Self-Assembly, Colloid and Surface Science, Smart Material and Composite, Biomechanics, Solid Mechanics, CAE/CAD.

519-661-2111, Ext: 80158, Email: jyang@eng.uwo.ca

C. Zhang, Ph.D., P.Eng.
Professor

BSc Eng. (Xian) 1982
MSc Eng. (Xian) 1984
PhD (New Brunswick) 1990

Research interests are in the area of numerical simulations of turbulent, multi-phase, and reactive flows. The main field of her research is two-phase flows in condensers, turbulent reactive flows and control in industrial furnaces and automobile engines, and gas-solid flows in fluidized beds, powder spray systems, and pulmonary drug delivery.

519-661-2111, Ext: 88345, Email: czhang@eng.uwo.ca

2. PROFESSOR EMERITI

E.S. Nowak, Professor; Ph.D.

J.D. Tarasuk, Professor; P. Eng.; Ph.D.

3. ADJUNCT ACADEMIC PROFESSORS

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.

3-D forming of hydrogels for medical applications (polyvinyl alcohol cryogel, twin-screw extrusion process); Prosthetic implants (hip, knee, intervertebral disc, heart valve). Tissue-mimicking phantoms (morphology, biophysical properties, medical imaging).

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 Fax: 604-822-2403
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.

P.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.

E. Nowak, Ph.D., P.Eng.
Dept of Mechanical & Materials Eng,
University of Western Ontario
Co-director, Multi-disciplinary Accident Research Team
519-661-2127

Road safety, Canadian Motor Vehicle Safety Standards, Performance of vehicle safety features, Collision reconstruction, Bio-mechanics of injury related to crashes, Causes of collisions.

M.J. Shkrum, M.D., Ph.D.
Email: Mike.Shkrum@LHSC.ON.CA
Department of Pathology, UWO
Staff Pathologist - LHSC (University Hospital), London, Ont.

COPI and medical consultant with the Multi-Disciplinary Accident Research Team. Interest in trauma arising from motor vehicle collisions.

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.).

C. Zemach. Ph.D.
Los Alamos National Laboratory
New Mexico, U.S.A.
Fluid Dynamics

4. VISITING PROFESSORS

A.Inasawa (Japan, 2008, six months; sponsored by Japanese Society for the Promotion of Science)
(hosted by J.M. Floryan)
Karl-Heinz Wehking, Director, Institute of Materials Handling and Logistics, Stuttgart, Germany

5. ADMINISTRATIVE SUPPORT STAFF

Chris Seres
Administrative Assistant
Telephone: 519-661-2136
Fax: 519-661-3020
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Belle Smaill
Graduate Affairs Assistant
Telephone: 519-850-2939
Fax: 519-661-3020
Email: msmaill@eng.uwo.ca

Susan Bock
Undergraduate Affairs Assistant
Telephone: 519-661-4122
Fax: 519-661-3020
Email: sbock@eng.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

Bert Verhagen
Laboratory Supervisor
Spencer Engineering Building, Room 3054B
Telephone: 519-661-2111 Ext: 88346
Email: verhagh@engga.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, 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, MME 3385Y.

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 4419 or 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 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, 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, MME 3385Y.

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
One of: MME 4419 or 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 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, 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, MME 3385Y.

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 4419 (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, 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 4419 or MME 4499, MME 4492A/B, ES 4498F/G
Two 0.5 technical electives
Business Administration 4415Q/R/S/T, 4428A/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 UNDERGRADUATE ENROLLMENT(2008-2009)											
	Year 1		Year 2		Year 3		Year 4		TOTAL		TOTAL
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	
Mechanical	n/a	n/a	58	14	71	16	74	6	203	36	239
PART-TIME UNDERGRADUATE ENROLLMENT (2008-2009)											
	Year 1		Year 2		Year 3		Year 4		TOTAL		TOTAL
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	
Mechanical	n/a	n/a	4	0	18	3	5	1	27	4	31

3. DEGREES GRANTED

Fall 2008	Spring 2009
7	72

4. UNDERGRADUATE AWARDS

Recipients (Fall 2008) – Students registered in the Department of Mechanical and Materials

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

3rd Year MME Awarded annually to a student in his/her third year in the Department of Mechanical and Materials Engineering based on the candidate's mark in Thermodynamics II (MME 334a/b), financial need, continuing educational studies, and career goals in the heating, refrigeration and air conditioning profession. The student must have a minimum YWA of 70% and have taken five full courses during the year. Students repeating MME 334a/b or the former MME 258a/b do not qualify. This award is made possible by the generosity of ASHRAE, London Chapter, Canada.

Awarded to: Mark Furgala

Andrea Bailey Memorial Award (1- $1800.00)
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: Laura Watts

DELCAN Corporation Scholarship in Engineering Science (1-$2000.00)
4th Year ANY Awarded annually to a full-time undergraduate student entering fourth year in the Faculty of Engineering. Applicants must have a minimum 80% average. Preference will be given to students who have demonstrated involvement in extra-curricular activities at the University or in the community. This scholarship is dedicated to William J. Malone, Past President of Delcan Corporation.

Awarded to: Ryan Katchky

Ian Duerden Memorial Award (1-$1000.00)
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: Greg Schuett

Lynda Diane Shaw Memorial Award (1-$900.00)
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: Ryan Herblum

Dr. L. Stuart Lauchland Scholarship (1-$1000.00)
ANY Awarded to a student in any year of Engineering based on academic achievement (minimum 80% average). The recipient will be selected by the Faculty of Engineering. This scholarship was established by a generous donation from Dr. Richard M. Dillon through Foundation Western.

Awarded to: Brian Coulter

Donald P. Morris Engineering Award (1-$1000.00)
Awarded to a full-time undergraduate student in Year 2 or higher of any Engineering Program based on academic achievement and involvement in extracurricular activities that demonstrate leadership skills. This award was established by Donald P. Morris, BESc ’65.

Awarded to**:** Adam Bierylo

EMCO Scholarships (2-$3600.00)
2nd Year ANY Awarded to students entering their second year of Engineering and preferably having a career objective in manufacturing or marketing. These students must have demonstrated leadership ability as well as involvement in outside activities. Scholarships are continuous into third and fourth year based on maintenance of at least an 80% average or standing in the top 25% of the class. Established through the generosity of EMCO Limited.

Awarded to: Ryan Katchky

***Suncor Scholarships* (3-$5000.00)**
Awarded to fourth year students who have successfully completed the Industry Internship Program with Suncor. This award was established by Suncor Energy Foundation

Awarded to: Alex Holt

Entrance Scholarships
All students entering the Faculty of Engineering under the Engineering Excellence Admission Program will be offered a one year Western Academic Scholarship of Excellence ($2,000) if their Grade 12 average is 90% or higher, or a one year Western Scholarship of Distinction ($1,000) if their Grade 12 average is between 85.0 and 89.9%. These scholarships are offered during the admission process and are not conditional on the academic performance during the first year of studies.
Exceptional candidates may qualify for other entrance scholarships such as:

- ***The President's Entrance Scholarships*** -. $6,000 annually for four years, plus first year room and board.
- ***The Faculty Entrance Scholarship*** - $4,000 annually for four years, plus first year residence room costs.
- ***Continuing Admissions Scholarships*** - $2,000 annually for four years.

Faculty Entrance Scholarship
Awarded to: Ryan Katchky

Four Year Continuing Admission Scholarship Program
Awarded to: Brian Robert Logan Coulter, Derek Gateman, Joshua Giles

Recipients (Awards of the Graduating Class June 2009 – Students registered in the Department of Mechanical and Materials

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

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: Brian Coulter

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: Matthew Heffernan

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 Heffernan

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: Joshua Giles

5. DESIGN PROJECTS

Projects at a Glance

Project	Students	Faculty Advisor	Sponsor
Environmental Engineering			
Design of a Recumbent Electric Bicycle	Patrick Buenbrazo, Mike Cancilla and Alex Light	Ralph Buchal	Fit-for-Life
Power Generation Through Human Traffic	Jerome James, Lindsay Bellamy, Ziv Gruber and Tomer Goldenberg	Cynthia Dunning	
Personal Transportation Systems for the 21st Century – Group One	Qi Zhang, Kane Choy and John Staines	Ralph Buchal	
Personal Transportation Systems for the 21st Century – Group Two	Vivian Chung, Tom Loh and Kryzs Osowski	Ralph Buchal	
Personal Transportation Systems for the 21st Century – Group Three	Greg Munro, Alex Holt and Keith Roy	Ralph Buchal	
Improving the Design of Photovoltaic Systems by Optimizing their Thermofluid Effiency	David Greig, Benjamine Lenders and Graham Plater	Eric Savory P. Karava (CEE)	
Waste Heat Recovery Using Thermoacoustic Technology	Adam Bierylo, Mike Piluk and Josimar Dominguez	Kamran Siddiqui	
Condensor Design for Waste Heat Recovery System	Kevin Goss, Thomas Aiello and Nathan Lewcock	Kamran Siddiqui	
Energy Economization	Mark Vandergroot, Hashim Khan and Warda Shaheen	Kamran Siddiqui	Dynaplus Ltd.
Biomedical Engineering			
A Device for Resisted Motion and Static Loading of a Cadaveric Shoulder Joint	Joshua Giles, Brent Biro and Simon Deluce	Jim Johnson	
Design and Optimization of Elbow Testing Apparatus	Ryan Katchky, Ryan Herblum and Laura Watts	Jim Johnson	

Development of a Sensorized Trocar for Minimally-Invasive Surgery	Brendan Bonner and Chantel Smith	Michael D. Naish	
Minimally-Invasive Bone Saw	Matt Heffernan, Tyler Chrusz, Brian Sinclair and Brent Robitaille	Michael D. Naish	
Aerospace Engineering			
Fuselage for a Full-Scale Aerobatic Aircraft	Pat Greer, Mark Janz and Mark Furgala	Bjarni Tryggvason	
RC Model Scale of Glasair II Aircraft	Adam Carreau and Steven Litvack	Bjarni Tryggvason	
Modifying Harvard Model Aircraft for Stable Flight	Brian Coulter, Stephanie Puzio, Nathan Van Ymeren, and Matt Wills	Bjarni Tryggvason	
Silver Dart Wing Testing	Chris Gilpin and Greg Schuett	Bjarni Tryggvason	
Moon Rover Solar Panel and Camera Mechanisms	Shyam Ganesh, Ryan Sirucek, Shaun Welbanks and Steven Latta	Bjarni Tryggvason	
Automotive Engineering			
Diesel-Powered Vehicle Systems Fuel Cleanliness Requirements	Matt Payne, Andrew Perkins and Matt Stoll	Jeff Wood	General Dynamics Land Systems
Manufacturing Engineering			
Design of Large-Capacity Mechanical Locking Machine for the Automotive Exhaust Industry	Sanjay Persaud, Lyla Gharib and Jordan Foster	Paul Kurowski	Upland Technologies
Mechanical or Mechatronics Engineering			
High Resolution Accelerometer	Shaun Salisbury	Mike Tryggvason	
Design of a Vibrations Experiment	Paul Kurowski	Kyle Moscone, Aleks Draca and Chris Fischer	
Inertial Navigation System for 3D Scanning Applications	Brendan Bracken, James Cunningham and Kari McCabe	George Knopf	

6. EXCHANGE PROGRAMS

Student	Institution	Country
Iliyana Asenova	Rhone-Alpes Program	France
Jesus Reynoso	Tecnologico de Monterrey	Mexico
Elena Preciado	Tecnologico de Monterrey	Mexico

7. 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 2008-09.

First	Last	Company
Ryan	Abrams	General Dynamics Land Systems
Ryan	Alexander	General Dynamics Land Systems
Saeed	Alsakka	Suncor Energy Products
Matt	Carroll	Armatec
Stephen	Costella	Trudell Medical
Diane	Davies	Diamond Aircraft
Daniel	Dean	Diamond Aircraft
Amer	Djulbic	Dashwood
Mohamed	El Makdah	ArcelorMittal Dofasco
Matt	Ferguson	Diamond Aircraft
Stephen	Haley	Advanced Precision
Darshanpreet	Khosa	CAMI
Kevin	Nasu	Trudell Medical
Heygaan	Rajakumar	Diamond Aircraft
Ryan	Theakston	Amico Source
David	Tran	INVACARE Continuing Care Group
Thipphathong	Vattaso	Callidus Engineering
Brandon	Vriens	GM
Erik	Williamson	Diamond Aircraft

8. SUMMER ENGINEERING CO-OP PROGRAM

First_Name	Last Name	Program	Placed At
Ryan	Abrams	Mechanical	GDLS
Aiden	Amri	Mechanical	Filter Innovations Inc.
Patrick	Buenbrazo	Mechanical	Electro-Motive
Mike	Bunt	Mechanical	Petroleum Resources Centre
Adam	Day	Mechanical	L3 Wescam
John	Freeman	Mechanical	North America Construction
John	Frydrychowicz	Mechanical	GDLS
Derek	Gateman	Mechanical	Bruce Power
Christopher	Hern	Mechanical	Armatec Survivability
Bryce	Irvine	Mechanical	BJ Process and Pipeline Services
Kyle	Kirby	Mechanical	Electro-Motive
Mario	Morales	Mechanical	Sarnia Research park
Kyle	Moscone	Mechanical	TransAlta
Rachel	Oosterhuis	Mechanical	Anissimoff & Associates
Sarah	Patterson	Mechanical	Cleaver Brooks
Matt	Payne	Mechanical	General Dynamics
Jonathon	Ripley	Mechanical	Union Gas Limited
Michael	Rubinger	Mechanical	SNC Lavalin
Vanessa	Stadnyk	Mechanical	Whittington Engineering/IWS Wood products
Andrea	Sylvester	Mechanical	AECON

9. INTERNATIONAL STUDENTS

In 2008-09, our Department hosted one student from each of India, Lebanon and South Korea.

10. UNDERGRADUATE STORIES

Western student wins prestigious Rhodes Scholarship

Brian Coulter, in his final year at The University of Western Ontario, now has something in common with big names like former U.S. president Bill Clinton and American author and social critic Naomi Wolf – they all hold the title of Rhodes Scholar.

Now completing a concurrent degree in business and mechanical engineering through the Richard Ivey School of Business and Western Engineering, Coulter has received a 2009 Rhodes Scholarship and will be heading to the University of Oxford in England in October to study mathematical and computational finance. The scholarship covers his university fees and includes a $17,000 living stipend.

One of 11 Canadians and two Ontarians to win the international award for study, Coulter was selected from more than 50 applicants. After devoting about 20 hours a week for six weeks preparing his application statement and enduring a 45-minute interview with seven panelists, news that his efforts had paid off came as a shock.

“I couldn’t believe it. Once I met the other candidates, I was simply ecstatic to be included in a group with such amazing people,” says Coulter. “I’m very excited about this. I see it as an opportunity to get an excellent education and I think I’m going to love being there. This will be a big change, but I’m looking forward to it.”

For the interview, Coulter had to tackle questions pertaining to the financial crisis. The interviewers were also interested in Coulter’s work over two summers with the Canada Pension Plan Investment Board, his role as a residence Don and his trek to the Australian outback in 2005 with fellow engineering students to race a solar-powered car he helped build for the World Solar Challenge.

"We are very proud of what Brian has accomplished at Western in two very demanding programs," says Paul Davenport, Western's President. "His academic achievements, along with his extracurricular activities, are truly inspirational to his classmates and peers."

“Ivey strives to produce the next generation of business leaders and Brian, with his pursuit of excellence in every discipline he tackles, has the kind of character that helps us fulfill that mission,” says Carol Stephenson, Dean, Richard Ivey School of Business. “He serves as a great role model for others and we are extremely proud of his accomplishments.”

“I am very impressed to see how Brian has been able to build upon his Western Engineering education, business savvy and personal experiences to develop a true global perspective on industry and finance. The opportunity to study at the University of Oxford, and work alongside future global leaders, will no doubt ignite the successful career of one of Canada's brightest young minds,” says George Knopf, Acting Dean of the Faculty of Engineering.

Coulter is the 12th Western student to receive a Rhodes Scholarship since 1970. Western’s most recent Rhodes Scholar, Joelle Faulkner, was also in the concurrent business and engineering program when she won the award in 2005.

Rhodes Scholarships provide two or three years of study at Oxford and applicants are chosen based on high academic achievement, integrity of character, a spirit of unselfishness, respect for others, potential for leadership and physical vigor.

GRADUATE EDUCATION

1. GRADUATE RESEARCH PROGRAMS

The current graduate program in the Faculty of Engineering is fully accredited by the Ontario Council of Graduate Studies. The Department has restructured the Graduate Research Programs by focusing on the individual areas of strength. The Masters of Engineering Science (MESc) and PhD programs comprise the following fields:

(1) Mechanical Engineering,

(2) Thermofluids,

(3) Materials and Solid Mechanics,

(4) Automation Technologies and Systems.

Mechanical Engineering

The Department has four OCGS approved research areas, including (1) Thermofluids, (2) Materials & Solid Mechanics, (3) Automation Technologies & Systems, and (4) Mechanical Engineering. Specialized flyers are available for the first three areas. This flyer covers all other research areas within the Mechanical Engineering program, including **Biomechanics**, which exposes students 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.

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 Mechancial 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.

Thermofluids

The Thermofluids 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 Thermofluids 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 Thermofluids 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*
- *MME9712 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 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.

2. GRADUATE DEGREE PROGRAMS

Course-based Master's (M.Eng.) Program

This 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. If enrolled full-time a student can complete the degree in one year. 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.

Research-based Master's (M.E.Sc.) Program

This 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 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.

Ph.D. Program

Like the MESc, this 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.

3. GRADUATE ENROLLMENT

	M.Eng	M.E.Sc.	Ph.D.	TOTAL
Summer 2008	14	37	55	106
Fall 2008	25	38	64	127
Winter 2009	30	36	63	129

4. GRADUATE DEGREE GRANTED

OCTOBER 2008 CONVOCATION

Student name	Degree	Completion Date	Thesis Exam Date	Supervisor/ Co-supervisor	THESIS TITLE
Chen, Yu-kuang	MESc	26-Aug-08	11-Aug-08	Asokanthan, S	Instabilities in a class of MEMS-based gyroscopes
Ghabouli Tabar, Mahsa	MEng	14-May-08	n/a		
Jain, Anita	MESc	20-May-08	15-May-08	Naish, MD	Building blocks for adaptive modular sensing systems
Lyle, Andrew	MESc	26-Aug-08	25-Jul-08	Naish, MD	A software architecture for adaptive modular sensing systems
McLachlin, Stewart	MESc	21-Aug-08	11-Aug-08	Dunning, C/Bailey C	Development of tools to assess spinal fization and motion
Mohammadi, Alireza	MESc	22-Aug-08	18-Aug-08	Floryan, JM/Kaloni, P	Spectral method in non-Newtonian fluids
Norouzi Banis, Mohammad	MESc	19-Aug-08	7-Aug-08	Sun, X	Synthesis and characterization of metal oxide nanowires
Saffari, Amir	MESc	25-Aug-08	15-Aug-08	Khayat, R	Flow of viscoelastic jet near channel exit
Tanveer, Muhammad	PhD	16-Jun-08	12-Jun-08	Singh, AV	Linear and nonlinear vibrations of composite plates
Wang, Xiaoning	MEng	22-Jul-08	n/a		
Whitney, Kristin	MESc	19-Aug-08	14-Aug-08	Jenkyn, T	Unloader braces and internal knee loads during gait
Zhu, Xiaoxia	MEng	5-Aug-08	n/a		
Chen, Yu-kuang	MESc	26-Aug-08	11-Aug-08	Asokanthan,S	Instabilities in a class of MEMS-based gyroscopes
Ghabouli Tabar, Mahsa	MEng	14-May-08	n/a		

Jain, Anita	MESc	20-May-08	15-May-08	Naish, MD	Building blocks for adaptive modular sensing systems
Lyle, Andrew	MESc	26-Aug-08	25-Jul-08	Naish, MD	A software architecture for adaptive modular sensing systems
McLachlin, Stewart	MESc	21-Aug-08	11-Aug-08	Dunning, C/ Bailey C	Development of tools to assess spinal fization and motion
Mohammadi, Alireza	MESc	22-Aug-08	18-Aug-08	Floryan, JM/ Kaloni, P	Spectral method in non-Newtonian fluids
Norouzi Banis, Mohammad	MESc	19-Aug-08	7-Aug-08	Sun, X	Synthesis and characterization of metal oxide nanowires
Saffari, Amir	MESc	25-Aug-08	15-Aug-08	Khayat, R	Flow of viscoelastic jet near channel exit
Tanveer, Muhammad	PhD	16-Jun-08	12-Jun-08	Singh, AV	Linear and nonlinear vibrations of composite plates
Wang, Xiaoning	MEng	22-Jul-08	n/a		
Whitney, Kristin	MESc	19-Aug-08	14-Aug-08	Jenkyn, T	Unloader braces and internal knee loads during gait

JUNE 2009 CONVOCATION

Student Name	Degree	Completion Date	Thesis Exam Date	Supervisor/ Co-supervisor	THESIS TITLE
Alam, Nawaz	MEng	31-Dec-08	n/a		
Alba, Kamran	MESc	18-Dec-08	10-Dec-08	Khayat, R	Two-layer thin-film flow
Castillo, Yaritza	MEng	30-Apr-09	n/a		
Cho, Jihyun	PhD	27-Apr-09	21-Apr-09	Asokanthan, S	Nonlinear instabilities in ring-based vibratory gyroscopes
Degroot, Christopher	MESc	30-Apr-09	27-Apr-09	Straatman, A	Thermal dispersion and viscous effects in porous materials
Dhaliwal, Amandeep Singh	MEng	30-Apr-09	n/a		
Dorairaj, Nithyanamdam	MEng	31-Dec-08	n/a		
Escoto, Abelardo	MESc	16-Dec-08	12-Dec-08	Buchal, R	Inspection point accessibility clustering and path planning
Fan, Ying	PhD	2-Dec-08	25-Nov-08	Shinozaki, D	Microstructure and properties of polymer nanocomposites
Farrokhnejad R, Mehdi	MESc	23-Apr-09	20-Apr-09	Straatman, A/Wood, J	Numerical simulation of solidification in binary alloys
Fazel Bakhsheshi, Mohammad	MESc	29-Apr-09	18-Apr-09	Kaloni P/Floryan JM	Spectral method in non-Newtonian fluids
Gani, XXX	MEng	30-Apr-09	n/a		
Gebreyes, Mesfin	Meng	30-Apr-09	n/a		
Grawburg, Nicholas	MESc	19-Dec-08	12-Nov-08	Sun, A/ Sham,TK	Synthesis, Morphology and Spectroscopy of SN02 Nanowires
Grewal, Jashanpratap	MEng	30-Apr-09	n/a		

Student Name	Degree	Completion Date	Thesis Exam Date	Supervisor/ Co-Supervisor	THESIS TITLE
Grewal, Navkaran Singh	MEng	30-Apr-09	n/a		
Hafeez, Pakeeza	MESc	19-Dec-08	10-Dec-08	Asokanthan, S	Modal characterization of micron-scale structural elements
Kandasamy, Selvakumar	PhD	16-Sep-08	11-Sep-08	Singh, AV	Vibration analuses of open shells of revolution
Ma, Jianming Bryan	MEng	30-Apr-09	n/a		
Nzembela, Tshituni	MEng	31-Dec-08	n/a		
van der Zanden, Mark	MEng	31-Dec-08	n/a		
Wang, Tianfu	PhD	27-Apr-09	14-Apr-09	Asokanthan, S	Dynamics of MEMs Sensing and Switching Systems
Wang, Zhao Feng	MEng	30-Apr-09	n/a		
Ward, Christopher	MESc	5-Dec-08	1-Dec-08	Naish, MD	Active vision system for remote target identification
Xing, Jiangang	MEng	30-Apr-09	n/a		
Zhang, Limin	MEng	30-Apr-09	n/a		
Zhang, Yina	MESc	24-Apr-09	14-Apr-09	Zhang, C/ Jiang J	Numerical simulation of fluid flow and heat transfer in SCWR
Alam, Nawaz	MEng	31-Dec-08	n/a		
Alba, Kamran	MESc	18-Dec-08	10-Dec-08	Khayat, R	Two-layer thin-film flow
Castillo, Yaritza	MEng	30-Apr-09	n/a		
Cho, Jihyun	PhD	27-Apr-09	21-Apr-09	Asokanthan, S	Nonlinear instabilities in ring-based vibratory gyroscopes

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

January 1, 2007 to date:	MESc	PhD
Canadian/Perm. Residents	$16,000/yr	$18,000/yr
International	$23,000/yr	$25,000/yr

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. There are three

External Scholarships Recipients: 2008-2009 Competitions

Award	Name	Degree
OGS	HUSAIN, Syed	PhD
OGS	KEDGLEY, Angela	PhD
OGSST	QUENNEVILLE, Cheryl	PhD
OGSST	WHITNEY, Kristin	PhD
NSERC	CEPEK, Jeremy	MESc
NSERC	DeGROOT, Christopher	MESc
NSERC	DEL REY FERNANDEZ, David	MEsc
NSERC	LIN, William	PhD

6. GRADUATE SEMINAR

Fall 2008				
Date	**Student or Guest Lecturer Name**	**Supervisor/Co-Supervisor**	**Presentation Title**	**Seminar Facilitator**
Sep-15	Thomas Bruce	J.T. Wood	Delamination Fracture Mechanics of Continuous Fibre Polymer Composites	Tianfu Wang
	Khaled Al-Aribe	G.K. Knopf/A. Bassi	Photo-responsive Hydrogel Valve for Controlling Flow through Microchannels	
Sep-22	Graham Hunt	E. Savory	The aerodynamic design of automotive cooling fan blades	Hao Liu
	Mei Liu	J.M. Floryan/J. Yang	Label-Free Molecular Interactions Studied by Back-Scattering Interferometry and Hydrodynamic Focusing	
Sept-29	Dr.-Ing. Karl-Heinz Wehking, Inst. of Mechanical Handling & Logistics, Univ. of Stuttgart		Structure and Fields of Activity of the Institute of Mechanical Handling and Logistics of the University of Stuttgart	
Oct-06	Harish Pungotra	G. Knopf/R. Canas	Efficient Algorithm to Detect Collision between Deformable B-spline Surfaces for Virtual Sculpting	
	Cheryl Quenneville	C. Dunning/.J. Johnson	Experimental and Computational Assessments of High-Impact Tibia Loading	Jihyun Cho
Oct-20	Vineet Bhakhri	R.J. Klassen	The Strain-rate dependence of the Nanoindentation Stress of Gold at 300K: A Deformation Kinetics-Based Approach	Graham Hunt
	Mohsen Mohammadi	J.R. Dryden	Stress Concentration around a Circular Hole in Functionally-Graded Solids	
Oct-27	Syed Zahid Husain	J.M. Floryan	Over-Determined Formulation of Computational Fluid Dynamics Problems	William Lin
	Khaled Sultan	A.G. Straatman	Natural convection and nucleate boiling in high porosity porous media	
Nov-03	Dr. D.S. Weaver, (Prof. Emeritus), Dept. of Mechanical Engineering, McMaster University		Flow-Induced Vibrations	
Nov-10	Jonathan Weiler	J.T. Wood	The Development of Comprehensive Material Models of the Structure-Property Relationship for Die-Cast Magnesium Alloy AM60B	Vineet Bhakhri
	Mohammad Hossain	J.M. Floryan	Flow Instability Due to Presence of Distributing Wall Heating	

Nov-17	Angela Kedgley	J. Johnson/C Dunning/ T. Jenkyn	Development of Fluoroscopy-based RSA System and its Preliminary Applications	Khaled Sultan
	German Kalugin	J.M. Floryan	Use of Electromagnetic Effects for Flow Control	
Nov-24	Dr. Franco Berruti, Dept. of Chemical and Biochemical Eng, Univ. of Western Ontario		Biofuels and Bioproducts: Issues and Opportunities	
Dec-01	William Lin	E. Savory	Large-scale physical simulation of a downburst outflow	Syed Zahid Husain
	Rebecca Austman	C. Dunning	Investigation of Bone Strains in the Distal Ulna Using Experimental and Finite Element Methods	
Dec-08	Hao Liu	X.A. Sun	Controlled Synthesis of Aligned Carbon Nanotubes via Chemical Vapor Deposition	Cheryl Quenneville
	Yadav Khanal	R.O. Buchal	Cognitive Factors and Object-Oriented Frameworks in Engineering Design	

Winter 2009

Date	Student's Name	Supervisor/Co-Supervisor	Presentation	Seminar Facilitator
Jan-12	Bipasha Bose	R. Klassen	Local Plastic Deformation of Zr-2.5% Nb CANDU Pressure Tubes	Kuldeep Sareen
	Khaled El-Bannan	S. Salisbury/J.M. Floryan	Development of a novel piezoelectric inchworm actuator for MR-guided surgery	
Jan-19	Taravat Khadivi	E. Savory	Numerical simulation of flow over low aspect ratio elliptical cavities	Rajeev Kumar
	Karman Leung	J. Yang/L. Lau	Exploring bacterial nanowires: functions, properties and applications	
Jan-26	Dr. S.F. Asokanthan, Dept of Mechanical and Materials Engineering		From Spinning Tops to MEMS Gyroscopes	
Feb-02	Dong Wang	C. Zhang	Design and Implementationof Diesel Engine Emissions Control Models through Numerical and Experimental Approaches	Joel Book
	Mihnea Ionescu	X.A. Sun	Carbon Nanotube Synthesis via Spray Pyrolysis CVD Method	

Feb-09	Aidan Kekhaee	J.M. Floryan	Effect of 3-Dimensional Distributed Roughness of the Laminar-Turbulent Transition	Yougui Chen
	Behzad Ghafouri	E. Savory/C. Zhang	In-Situ Performance of Automotive Cooling Fans	
Feb-23	Botao Peng	C. Zhang/J. Zhu	A New Approach to Specify Inlet Boundary Conditions for CFD Modeling on Hydrodyamics in CFB Riser	Taravat Khadivi
	Joel Book	S. Asokanthan	Modal Characterization of Micron-Scale Structures	
Mar-02	Yu Liu	Y. Yang/J.M. Floryan	Friction Force Microscopy at Nanoscale	Bipasha Bose
	Yougui Chen	X. Sun/J.M. Floryan	Synthesis of Nanomaterials and their Applications for Fuel Cells	
Mar-09	Dr. S.P. Simonovic, Department of Civil & Environmental Engineering		Climate Change and Water Management	
Mar-16	Lee Betchen	A.G. Straatman	Optimization of the Pore Structure of High-Conductivity Porous Foams	Karman Leung
	Pun-Pang (Matthew) Shiu	G.K. Knopf	Rapid Fabrication of Micromold Masters for Polymeric Microfluidic Devices	
Mar-23	Kuldeep Sareen	G.K. Knopf	Accurate Surface Reconstruction from Large and Partially-Spurious Point Cloud Data	Yu Liu
	Shadi Keshavarzmanesh	L. Wang	Adaptive Assembly Process Planning & Control	
Mar-30	Rajeev Kumar	C. Zhang/E. Savory	Direct Numerical Simulation of the Flow Past a Surface-Mounted Square Prism of Finite Height	Dong Wang
	Marin Vratonjic	E. Savory	Micro-Traversing Laser Velocimetry of Near-Wall Flow Measurements in the Hemodynamic Flow Rig	
Apr-06	Hadi Babaei	K. Siddiqui	Study and Development of Thermoacoustic Devices	Mihnea Ionescu
	Adam Kirchhefer	R. Gurka/G. Kopp	Aerodynamics of White-Throated Sparrows	
Apr-13	Dr. J. Jiang, NSERC/UNENE Senior Industrial Research Chair		Nuclear Power Plants and their Control Systems	

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

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):

- Rolling mill, wire
- drawing bench
- rotary swager
- 125kN SinTech tensile tester.

Metal Casting and Heat Treating Laboratory (SEB 3049):

- furnaces

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, SEB 3052):

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

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, 3051):

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

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

CAD/CAM/CAI Research Laboratory (SEB 37/37A):

- Fadal VMC 4020 vertical machining center with rotary table (A & B Axes)
- DEA *Swift* direct computer controlled coordinate measuring machine

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)

- 2 Motoman and 1 Fanuc industrial manipulators
- 10 Allen Bradley PLC trainers
- Firewire cameras

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]**
2008	1,904,349	1,987,827	1,201,479	85,195

[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)

PUBLICATIONS

1. REFEREED JOURNAL ARTICLES

1**. Asokanthan S F** and Wang T Instabilities in a MEMS Gyroscope subjected to Angular Rate Fluctuations, *Journal of Vibration and Control*, Vol. 15, No. 2, pp. 299-320, 2009.

2**. Asokanthan S F** and Wang T Nonlinear Instabilities in a Vibratory Gyroscope Subjected to Angular Speed Fluctuations, *Non-linear Dynamics*, Vol. 54, no. 1-2, pp. 69-78, 2008.

3**. Asokanthan S F** and Cho J Dynamic Stability of Beam-type Vibratory Angular Rate Sensors subjected to Rate Fluctuations, *Journal of Intelligent Material Systems and Structures*, Vol. 19, pp.735-743, 2008.

4. OuYang, D., Feng, H.-Y., Van Nest, B. A., **Buchal, R. O**., Effective Gouge-Free Tool Selection for Free-Form Surface Machining, Computer Aided Design and Applications, 6(6), (2009), pp. 839-849.

5. Wang, L., Keshavarzmanesh, S., Feng, H.-Y., **Buchal, R. O**., Assembly process planning and its future trends to collaborative manufacturing: a review, International Journal of Advanced Manufacturing Technology, 46:132-144, DOI 10.1007/s00170-008-1458-9, 2009.

6. Mohammadi, M**., Dryden, J.R.,** "Influence of the Spatial Variation of Poissons Ratio upon the Elastic Field in Nonhomogeneous Axisymmetric Bodies", International Journal of Solids and Structures, Vol. 46, 3-4, pp. 788-795, 2009.

7**. Dryden, J.R.,** "Heat Flow in Functionally Graded Pipes with Isothermal Boundary Conditions", Heat and Mass Transfer, Vol. 45, pp. 1137-1140, 2009.

8. Quenneville CE, Austman RL, King GJW, Johnson JA, **Dunning CE**.The Role of an Anterior Flange on Load Transfer through the Distal Humerus following Total Elbow Arthroplasty, Journal of Hand Surgery, 33(6):927-931, 2008.

9. McLachlin SD, Beaton BJB, Sabo MT, Gurr KR, Bailey SI, Bailey CS, **Dunning CE**. Comparing the Fixation of a Novel Hollow Screw versus a Conventional Solid Screw in Human Sacra under Cyclic Loading, Spine, 33(17):1870-1875. 2008.

10. Austman RL, Milner JS, Holdsworth DW, **Dunning CE**. The Effect of the Density-Modulus Relationship Selected to Apply Material Properties in a Finite Element Model of Long Bone, Journal of Biomechanics, 41(15):3171-3176, 2008.

11. Austman RL, Milner JS, Holdsworth DW, **Dunning CE**. Development of a Customized Density-Modulus Relationship for use in Subject-Specific Finite Element Models of the Ulna, Proc Inst Mech Eng H, 223(6):787-794, 2009.

12. "Gridless Spectral Algorithm for Stokes Flow with Moving Boundaries" by S.Z. Husain and **J.M. Floryan**, Computer Methods in Applied Mechanics and Engineering, v.198, Dec 2008, 245-259.

13. "Analysis of Stability of Channel Flow Subject to Distributed Heating" by M .Zakir Hossain and **J.M. Floryan**. Bul. Amer. Phys. Soc., v.53, No.15, Nov.2008, p.250.

14. "A Spectrally-Accurate Gridless Method for the Navier-Stokes Equations with Moving Boundaries" by S.Z.Husain and **J.M. Floryan**, Bul. Amer. Phys. Soc., v.53, No.15, Nov.2008, p.85.

15. TB Birmingham, JR Giffin, BM Chesworth, DM Bryant, RB Litchfield, K Willits, **TR Jenkyn**, PJ Fowler. 2009. "Medial opening wedge high tibial osteotomy: a prospective cohort study of gait, radiographic, and patient-reported outcomes." Arthritis and Rheumatism. 61(5): 648-657.

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2. REFEREED CONFERENCE PROCEEDINGS

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14. "Immersed Boundary Conditions Method for Analyzing Flow of Ellis Fluid over Corrugated Boundaries" by Mohammad Fazel Bakhsheshi , **J.M. Floryan** and P. N. Kaloni, Proceedings of the 17th Annual Conference of the Computational Fluid Dynamics Society of Canada, May 3-5, 2009, Ottawa, Canada.

15. "The Immersed Boundary Conditions Method As Applied to The Solution of Transient Heat Conduction in a Medium with Moving Boundaries and for Parallel Processing" by D. Del Rey Fernandez, S.Z. Husain and **J.M. Floryan,** Proceedings of the 17th Annual Conference of the CFD Society of Canada, May 3-5, 2009, Ottawa, Ontario, Canada.

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52**. S. Salisbury**, R. Ben Mrad, D. Waechter and E. Prasad, "Development and assessment of a piezoworm stage for use in an XY configuration," Proc. Canada-US CanSmart Workshop on Smart Materials and Structures, Montreal, QC, Oct. 2008.

53. Naqavi I Z, **Savory E** & Martinuzzi R J "Analysis of second moment modeling for a rectangular surface jet using DNS data" Proc 6th Int Symp on Turbulence and Shear Flow Phenomena (TSFP-6), Seoul National University, Seoul, Korea, June, 2009.

54. Bourgeois J, Martinuzzi R J, **Savory E**, Zhang C & Roberts, D A "Experimental and numerical investigation of an aero-engine centrifugal compressor", Paper No GT2009-59808, ASME Turbo Expo 2009: Power for Land, Sea and Air (GT2009) Orlando, Florida, USA, June, 2009.

55. Khadivi T & **Savory E** "Numerical analysis of flow around low aspect ratio cavities with elliptical and rectangular planforms", Proc 17th Ann Conf of the CFD Society of Canada, Ottawa, Ontario, Canada, May 2009.

56. Hunt A G, **Savory E**, Gifford N L & Martinuzzi R J "Downstream blockage corrections of automotive cooling fan module performance", Paper 2009-01-0175, SAE World Congress, Detroit, USA, April, 2009.

57. Abu-Ramadan E, Ghafouri B, **Savory E,** Zhang C & Martinuzzi R J "Prediction of the low-Reynolds number flows around the airfoil and bluff body components of an automotive cooling fan module", Paper 2009-01-1531, SAE World Congress, Detroit, USA, April, 2009.

58. Hobbi, A., and **Siddiqui, K**. "An Experimental Investigation of Thermo-Fluid Characteristics of Flat-Plate Solar Collectors" 3rd Canadian Solar Building Conference, Fredericton, New Brunswick, August 20-22, 2008.

59. Gajusingh, S. T., Shaikh, N. and **Siddiqui, K**., "The impact of a vortex induced by a baffle on the turbulent structure", *ASME Fluids Engineering Division Summer Conference*, Jacksonville, Florida, August 10-14, 2008.

60. Shaikh, N. and **Siddiqui, K.,** "Wave induced effects on the airside velocity field above wind-generated water waves", *ASME Fluids Engineering Division Summer Conference*, Jacksonville, Florida, August 10-14, 2008.

61. Wang, M., and **Siddiqui, K**., "Thermal performance of a solar receiver of dish-type solar concentrator" *4th Canadian Solar Building Conference*, Toronto, New June 25-27, 2009.

62. Sookdeo, S., and **Siddiqui, K**., "PIV technique implementation for velocity measurements inside flat-plate collector tube" *4th Canadian Solar Building Conference*, Toronto, New June 25-27, 2009.

63. Wang, M., and **Siddiqui, K**., "The Impact of Aperture Size on the Thermal Performance of a Parabolic-Dish Concentrated Solar Energy System" *Canadian Congress of Applied Mechanics*, Halifax, June 1-4, 2009.

64. Babaei, H., and Siddiqui, K., "Theoretical Study on Thermoacoustic Couples" *Canadian Congress of Applied Mechanics*, Halifax, June 1-4, 2009.

65. Abderrahmane, H. A., **Siddiqui, K**., and Vatistas, G.H. "Synchronization in Kelvin Equilibria" *Canadian Congress of Applied Mechanics*, Halifax, June 1-4, 2009.

66. Babaei, H., and **Siddiqui, K**., "Theoretical Study on Thermoacoustic Couples" *Canadian Congress of Applied Mechanics*, Halifax, June 1-4, 2009.

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68. Nabavi, M., **Siddiqui, K**., Ng, H. D. "Simulation of the Temperature Distribution in a Directly-Irradiated Solar Chemical Reactor" *Canadian Congress of Applied Mechanics*, Halifax, June 1-4, 2009.

69. Shaikh, N., and **Siddiqui, K**., "An experimental Investigation of the Reynolds stress distribution over wind generated water waves" *Canadian Congress of Applied Mechanics*, Halifax, June 1-4, 2009.

70**. A. V. Singh**, S. Kandasamy, Free Vibration Analysis of open conical and spherical shells supported on parts of the edges, B. H. V. Topping and M. Papadrakakis (editors) Ninth International conference on computational structures technologies, International Continental Hotel, Athens, Greece, August 2008.

71. Tanveer, M., **Singh, A. V.**, On the nonlinear vibration of laminated composite piezoelectric plates, B. H. V. Topping and M. Papadrakakis (editors) Ninth International conference on computational structures technologies, International Continental Hotel, Athens, Greece, August 2008.

72. Shaikh, N. and **Siddiqui, K**., "Wave induced effects on the airside velocity field above wind-generated water waves", *ASME Fluids Engineering Division Summer Conference*, Jacksonville, Florida, August 10-14, 2008.

73. DeGroot, C. T**., Straatman, A. G.,** "Thermal dispersion and viscous effects in spherical void phase porous metals," *The 17th Annual Conference of the CFD Society of Canada*, Ottawa, Canada, May 2009.

74. Farroknehjad, M**., Straatman, A. G.,** Wood, J. T., "A Volume-of-Fluid Based Numerical simulation of Solidification in Mg Die-Casting on fixed non-uniform colocated grids," *The 17th Annual Conference of the CFD Society of Canada*, Ottawa, Canada, May 2009.

75. Sultan, K., **Straatman, A. G.,** "Nucleate boiling in high-porosity high-conductivity porous metals," *The 17th Annual Conference of the CFD Society of Canada*, Ottawa, Canada, May 2009.

76. Cepek, J., **Straatman, A. G.,** "Modelling of turbulent flow and heat transfer in graphitic foams," *DSL 2009*, Rome, Italy, June 2009.

77. DeGroot, C. T**., Straatman, A. G.,** "Modelling thermal dispersion in high-conductivity porous materials," *DSL 2009*, Rome, Italy, June 2009.

78. D. Brown, **C. Zhang** and J. Jiang, "Modern Control of Computationally Modeled Heat Transfer Systems Using the Numerical Method of Lines," Proc. ASME Summer Heat Transfer Conference, San Francisco, CA, July 19-23, 2009.

79. B. Peng, **C. Zhang**, J. Zhu and X. Qi, "CFD Modeling of a CFB Riser Using Improved Inlet Boundary Conditions," Proc. 6th International Symposium on Multiphase Flow, Heat Mass Transfer and Energy Conversion, Xi'an, China, July 11-15, 2009.

80. Y. Zhang, **C. Zhang** and J. Jiang, "Numerical Simulation of Heat Transfer of Supercritical Fluids In Tubes Using Different Turbulence Models," Proc. 20th International Symposium on Transport Phenomena, Victoria, Canada, July 7-10, 2009.

81. D. Brown**, C. Zhang** and J. Jiang, "Modern Control of Computationally Modeled Fluid Flow Systems Using the Numerical Method of Lines," Proc. 20th International Symposium on Transport Phenomena, Victoria, Canada, July 7-10, 2009.

82. J. Bourgeois, E. Savory, R. Martinuzzi, **C. Zhang** and D. Roberts, "Experimental and Numerical Investigation of an Aero-Engine Centrifugal Compressor," Proc. ASME Turbo Expo, Orlando FL, June 8-12, 2009.

83. E. Abu-Ramadan, B. Ghafouri, E. Savory, **C. Zhang** and R. Martinuzzi, "Prediction of the Low-Reynolds Number Flows Around the Airfoil and Bluff Body Components of an Automotive Cooling Fan Module," Proc. SAE World Congress, Detroit, MI, April 20-23, 2009.

84. H. G. Hu and **C. Zhang**, "A New Correlation for Inundation Effect on Heat Transfer in Steam Surface Condensers," Proc. 19th International Symposium on Transport Phenomena, Reykjavik, Iceland, August 17-21, 2008.

85. R. Zhang, **C. Zhang** and J. Jiang, "Validation of Dynamic Models for an Air-Cooled CPU Chip Cooling Device," Proc. ASME Summer Heat Transfer Conference, Jacksonville, FL, August 10-14, 2008.

3. ORAL AND POSTER PRESENTATIONS

1**. Asokanthan S F** and Wang X H (2008) Almost-sure Stability of a Gyropendulum subjected to Vertical Support Random Excitation via a Higher-Order Numerical Scheme, *proceedings of Dynamic Days Europe 2008,* Delft, Netherlands, August 2008. **(Poster)**

2. **Buchal, R. O**., Rogers, D., Krishen, P., Evaluation of Design Collaboration Tools for the SunStang Electric Car Project, Proceedings of the Canadian Design Engineering Network (CDEN) 2008 Conference, Halifax, Nova Scotia, July 27-29, 2008.

3. **Buchal, R. O**., Reflections on Engineering Design Education, Proceedings of the Canadian Design Engineering Network (CDEN) 2008 Conference, Halifax, Nova Scotia, July 27-29, 2008.

4. A.L. Trejos, J. Jayender, M.T. Perri, **M.D. Naish**, R.V. Patel, and R.A. Malthaner, "Robot-Assisted Palpation Improves Minimally Invasive Tumour Localization," *Canadian Surgery Forum 2008*, Halifax, Nova Scotia, September 11–14, 2008.

5. M.T. Perri, A.L. Trejos, **M.D. Naish**, R.V. Patel, and R.A. Malthaner, "New Tactile Sensing System to Locate Tumours During Minimally Invasive Robotic Surgery," *4th International Minimally Invasive Robotic Association Congress*, Québec City, Québec, January 28–31, 2009.

6. M.T. Perri, A.L. Trejos, **M.D. Naish**, R.V. Patel and R.A. Malthaner, "New Tactile Sensing System for Intra-operative Minimally Invasive Tumour Localization," Poster Presentation, *Lawson Health Research Institute Research Day*, London, ON, March 24, 2009.

7. C. Kong, A.L. Trejos, **M.D. Naish**, R.V. Patel and K.A. Leitch, "Measuring Temperature and Force Outcomes with Three Different Bone-Cutting Saws," Poster Presentation, *Lawson Health Research Institute Research Day*, London, ON, March 24, 2009.

8. A.L. Trejos, R.V. Patel, **M.D. Naish** and C.M. Schlachta, "A Sensorized Instrument for Skills Assessment and Training in Minimally Invasive Surgery," Poster Presentation, *Lawson Health Research Institute Research Day*, London, ON, March 24, 2009.

9. **Straatman, A. G.** "Modelling of turbulent flow and heat transfer in graphitic foams," DSL 2009, Rome, Italy, June 2009; invited talk.

10. Straatman, A. G. "Convective heat transfer in porous graphitic foams," DSL 2008, Barcelona, Spain, July 2008; invited talk.

11. Sun, X. "Nanotubes and Nanowires for Fuel Cells", University of Toronto, August 15, 2008.

12. Sun, X. "Development of Novel Nanomaterials for Space Applications, Canadian Space Agency, July 7, 2008, Montreal.

13. Sun, X. "Carbon Nanotubes as Pt-Ni and Pt-Co Support for PEM Fuel Cells", INCO, Mississauga, ON, October 6, 2008.

14. J. Li, **J.T. Wood**, J. Auld, G. Wang, "Thermodynamic modeling of porosity formation during non-equilibrium solidification in magnesium alloy castings", TMS Annual Meeting, New Orleans, LA, 105-112, 2008.

15. Mei Liu, **Jun Yang**, "Controlled Multi-batch Self-Assembly of Micro-Parts onto Flexible Substrates by Patterning Solders of Different Melting Points", Ottawa, CSME, June 2008.

16. Yu Liu, Qiuquan Guo, Xueyin Wu, **Jun Yang**, "Modeling and Optimal Design of an In-vivo Low-voltage DC Electrokinetic Pump", Ottawa, CSME, June 2008.

17. T. Wu, T. Yago, **J. Yang**, J. Miner, L. Coburn, J. A. López, M. A. Cruz, L. V. McIntire, R. P. McEver, C. Zhu, "Catch Bonds of Glycoprotein Ibα-von Willebrand Factor Interaction and Their Elimination by VWD Mutants", Edmonton, CSC2008.

18. **C. Zhang**, "Modern Control of Computationally Modeled Heat Transfer Systems Using the Numerical Method of Lines," Proc. ASME Summer Heat Transfer Conference, San Francisco, CA, July 19-23, 2009.

19. **C. Zhang**, "CFD Modeling of a CFB Riser Using Improved Inlet Boundary Conditions," Proc. 6th International Symposium on Multiphase Flow, Heat Mass Transfer and Energy Conversion, Xi'an, China, July 11-15, 2009.

20. **C. Zhang**, "Comparison of Different Approaches to Specify Inlet Boundary Conditions for CFD Modeling in a CFB Riser", Proc. Joint ASCE-ASME-SES Conference on Mechanics and Materials, Blacksburg, Virginia, June 24-27, 2009.

21. **C. Zhang**, "Numerical and Mathematical Study of Core-Annulus Structure Formation Mechanisms for Gas-Solids Two Phase Flow in a CFB Riser," 5th M.I.T. Conference on Computational Fluid and Solid Mechanics, Cambridge, MA, June 17–19, 2009.

22. **C. Zhang**, "A New Correlation for Inundation Effect on Heat Transfer in Steam Surface Condensers," Proc. 19th International Symposium on Transport Phenomena, Reykjavik, Iceland, August 17-21, 2008.

23**. C. Zhang**, "Validation of Dynamic Models for an Air-Cooled CPU Chip Cooling Device," Proc. ASME Summer Heat Transfer Conference, Jacksonville, FL, August 10-14, 2008.

4. PATENTS

C.M. Schlachta, R.V. Patel, A.L. Trejos and **M.D. Naish**, "Hands-Free Pointer System," United States Provisional Patent, Number 61/116,675, filed November 2008.

R.V. Patel, A.L. Trejos, M. Tavakoli and **M.D. Naish**, "Sensorized Medical Instrument," PCT patent pending, Number PCT/CA2009/00021, filed January 2009.

PROFESSIONAL SERVICES

1. REVIEW OF REFEREED JOURNALS AND BOOK CHAPTERS

S.F. Asokanthan

ASME Journal of Applied Mechanics
Journal of Sound and Vibration
Journal of Vibration and Control
ASME Design Engineering Technical Conferences

R.O. Buchal

Journal of Mechanical Engineering Science
Journal of Engineering Design
Experimental Techniques

C.E. Dunning

Clinical Biomechanics
Journal of Biomechanics
Institution of Mechanical Engineers, Part H, Journal of Engineering in Medicine

J.M. Floryan

Chemical Engineering Communications
Journal of Heat Transfer
Phys. Fluids
Chemical Engineering Communications
Journal of Applied Mathematics
Computers and Fluids
Journal of Fluid Mechanics
ASCE Journal of Aerospace Engineering
Canadian CFD Society Conference
International Journal of Energy Research
European Journal of. Mechanics
International Journal Numerical Methods Fluids
Fluid Dynamics Research
International Journal of Energy Research
National Science Foundation
Archives of Mechanics
Heat and Mass Transfer
Theoretical and Computational Fluid Mechanics\

T.R. Jenkyn

Journal of Biomechanics
Medical Physics
Clinical Biomechanics

L.Y. Jiang

Journal of Physics D
Applied Physics
Proceedings of the Royal Society of London
Acta Mechanica
ASME Journal of Applied Mechanics
Archives of Mechanics

J.A. 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

R.E. Khayat

Journal of Fluid Mechanics
Physics of Fluids
International Journal Numerical Methods Fluids

G.K. Knopf

Biosensors and Bioelectronics
Optical Engineering
International Journal of Optomechatronics (Associate Editor)
Journal of Intelligent Material Systems and Structures
Journal of Intelligent Manufacturing
International Journal of Advanced Manufacturing Technology
Control and Intelligent Systems (Associate Editor)
Microsystem Technologies
Computer-Aided Design
Engineering Computations
Neurocomputing
Taylor & Francis (Book Proposal)
Wiley: Encyclopedia of Industrial Biotechnology (Book Chapter)

M.D. Naish

International Journal of Medical Robotics and Computer Assisted Surgery
IEEE International Conference on Automation Science and Engineering
A. Kuttan K.K., *Introduction to Mechatronics*, Oxford (book)

E. Savory

Journal of Wind Engineering and Industrial Aerodynamics
Proc Inst. Mechanical Engineers, Part D, J Automobile Engineering
CSME Journal
Abstracts for Int Workshop on Physical Modelling of Flow and Dispersion Phenomena (PHYSMOD 2009)

K. Siddiqui

Experiments in Fluids; Measurement Science and Technology
Journal of Wind Engineering and Industrial Aerodynamics
Ocean Dynamics
Heat Transfer Engineering
Experimental Thermal Fluid Science.

A.G. Straatman

ASME Journal of Heat Transfer
International Journal of Heat and Mass Transfer
Carbon

O.R. Tutunea-Fatan

International Journal for Manufacturing Research

J. Yang

Lab on a Chip
Applied Physics Letter
Journal of Micromechanics and Microengineering
Microsystem Technologies
Journal of Materials Processing Technology
The Journal of Physical Chemistry
Journal of Applied Physics
Sensors & Actuators: B. Chemical.

C. Zhang

International Journal of Computational Fluid Dynamics
International Journal of Computational Methods in Engineering Science and Mechanics
International Journal of Environment Studies
International Journal of Heat and Mass Transfer
Journal of Powder Technology
Standards Council of Canada
E-Books, Bentham Science Publishers

2. REVIEW OF GRANT APPLICATIONS

S.F. Asokanthan

Natural Sciences and Engineering Research Council (Discovery)

R.O. Buchal

Natural Sciences and Engineering Research Council
Ontario Centres of Excellence
Technology Foundation STW (Netherlands)

C.E. Dunning

Natural Sciences and Engineering Research Council (Discovery)
Kentucky Science and Engineering Foundation
Bone & Joint Injury Prevention & Rehab Center – University of Michigan
Canadian Foundation of Innovation (Leaders Opportunity Fund)

J.M. Floryan

Natural Sciences and Engineering Research Council (Discovery) (Strategic)
National Science Foundation of U.S.A.
SharcNet

T.R. Jenkyn

Nova Scotia Health Research Foundation
Canadian Institutes of Health Research
Natural Science and Engineering Research Council (Discovery)

L.Y. Jiang

Natural Sciences and Engineering Research Council (Discovery)

R.E. Khayat

Natural Sciences and Engineering Research Council
CNRS (National Research Council of France)

R.J. Klassen

Natural Sciences and Engineering Research Council (Discovery)

G.K. Knopf

Natural Sciences and Engineering Research Council (Discovery Grant)
A*STAR Biomedical Research Council (BMRC) – Singapore

K. Siddiqui

Natural Sciences and Engineering Research Council (Discovery)

A.G. Straatman

CFI Tier I

J. Yang

Natural Sciences and Engineering Research Council (Discovery and Strategic)

C. Zhang

Natural Sciences and Engineering Research Council
Ontario Centres of Excellence
MITACS