Assistant Professor of Mathematics
Department of Applied Mathematics and Sciences
Khalifa University of Science, Technology and Research
PO Box 127788, Abu Dhabi, UAE
+971 2 401 8154
tufail.malik@kustar.ac.ae
http://www.kustar.ac.ae/pages/dr-tufail-malik

Tufail Malik

Personal Data

Citizenship	Canadian
Home Address	5 Wellington Street, Sackville, NB E4L 4N8, Canada
Mobile Phone	+971 50 335 6038

Education

PhD (2007)	Mathematics (Arizona State University, USA) *Supervisor: Hal Smith*
M.S. (2002)	Mathematics with computer science option (Ohio University, USA)
M.Sc. (1994)	Mathematics (Quaid-e-Azam University, Islamabad, Pakistan)

Research Interests

Mathematical Biology
My main research interest is in Epidemiology. I design and rigorously analyze robust mathematical models based on nonlinear ordinary, partial, and stochastic differential equations to study the transmission dynamics and control mechanisms (such as vaccination and quarantine) of diseases of public health significance. Microbial quiescence, syndromic surveillance systems, and photoacclimation in phytoplankton are my other areas of research interest.

Environmental-Economic Models
I am interested in the interactions between population dynamics, public health, technological change, energy management, environmental quality and economic growth. In addition to dynamic optimal-control models, I use multi-criteria decision analysis models (including polynomial and fuzzy goal-programming models) in order to assist decision makers for strategic planning and investment allocations towards sustainable development.

Employment History

9/2012–present	Assistant Professor of Mathematics, Khalifa University of Science, Technology and Research, Abu Dhabi.
1/2010–4/2012	Postdoctoral Fellow and Sessional Instructor, University of Manitoba, Winnipeg, Manitoba, Canada.
1/2010–8/2012	Instructor, International College of Manitoba, Winnipeg, Manitoba, Canada.
Summer 2010	Intern researcher, Canadian Institutes of Health Research (CIHR) Pandemic Outbreak Team Leader Grant: PTL-97126.
7/2007–6/2009	McCain Research Associate and Instructor, Mount Allison University, Sackville, New Brunswick, Canada.
2002–2007	Graduate Teaching Associate and Honors Disciplinary Faculty, Arizona State University.
1998–2002	Graduate Teaching Associate, Ohio University.

Refereed Journal Publications

19. T. Malik, M. Imran, R. Jayaraman (2016). Optimal Control with Multiple Human Papillomavirus Vaccines. Journal of Theoretical Biology, 393:179-193. (SCI indexed)
18. M. Imran, T. Malik, A. Khan, A. Ansari (2016). Mathematical Analysis of Swine Influenza Epidemic Model with Optimal Control. Japan Journal of Industrial and Applied Mathematics, 33(1):269-296. (SCI indexed)
17. T. Malik (2016). Discrete Time Markov Chain of a Dynamical System with a Rest Phase. International Journal of Applied Nonlinear Science, 2(3): 137-152.
16. R. Jayaraman, C. Colapinto, D. LaTorre, T. Malik (2016). A Weighted Goal Programming Model for Planning Sustainable Development Policies Applied to Gulf Cooperation Council Countries. Journal of Applied Energy. *http://dx.doi.org/10.1016/j.apenergy.2016.04.065*. (SCI indexed)
15. T. Malik, A. Alsaleh, A. Gumel, M. Safi (2015). Optimal Strategies for Controlling the MERS Coronavirus During a Mass Gathering. Global Journal of Pure and Applied Mathematics, 11(6):4831-4865. (Scopus and MathSciNet indexed)
14. D. LaTorre, D. Liuzzi, T. Malik, O. Sharomi, R. Zaki (2015). Dynamics and Optimal Control for a Spatially-Structured Environmental-Economic Model. Electronic Journal of Differential Equations, 2015(277): 1-15. (SCI indexed)
13. R. Jayaraman, C. Colapinto, D. La Torre, T. Malik (2015). Multi-criteria model for sustainable development using goal programming applied to the United Arab Emirates. Energy Policy, 87, 447-454. (SCI indexed)
12. R. Jayaraman, D. LaTorre, T. Malik, Y. Pearson (2015). Optimal labour allocation for energy, economic and environmental sustainability in the United Arab Emirates: A goal programming approach. Energy Procedia, 75:2999-3006. (Scopus Indexed)
11. O. Sharomi, T. Malik (2015). Optimal Control in Epidemiology. Annals of Operations Research, DOI: 10.1007/s10479-015-1834-4. (SCI indexed)
10. R. Jayaraman, D. Liuzzi, C. Colapinto, T. Malik (2015). A Fuzzy Goal Programming Model to Analyze Energy, Environmental and Sustainability Goals of the United Arab Emirates. Annals of Operations Research, DOI: 10.1007/s10479-015-1825-5. (SCI indexed)
9. L. Thompson, T. Malik, A. Gumel, T. Strome, and S. Mahmud (2014). Emergency Department and "Google Flu Trends" Data as Syndromic Surveillance Indicators for Seasonal Influenza. Epidemiology and Infection, 142(11):2397-405. (SCI indexed)
8. M. Imran, H. Rafique, A. Khan, T. Malik (2014). A model of bi-mode transmission dynamics of hepatitis C with optimal control. Theory in Biosciences, 133(2):91-109. (SCI indexed)
7. T. Malik, A. Gumel and E. Elbasha (2013). Qualitative Analysis of an Age- and Sex-structured Vaccination Model for Human Papillomavirus. Discrete and Continuous Dynamical Systems - Series B, 18(8):2151-2174. (SCI indexed)
6. T. Malik, J. Reimer A. Gumel, E. Elbasha, S. Mahmud (2013). The Impact of an Imperfect Vaccine and Pap Cytology Screening on the Transmission of Human Papillomavirus and Occurrence of Associated Cervical Dysplasia. Mathematical Biosciences and Engineering, 10(4):1173-1205. (SCI indexed)
5. T. Malik, P. Salceanu, A. Mubayi, A. Tridane, M. Imran (2012). West Nile Dynamics: Virus Transmission Between Domestic and Wild Bird Populations Through Vectors. Canadian Applied Mathematics Quarterly, 20(4):535-556. (Indexed in ERA 2012 Journal List)
4. T. Malik, A. Gumel, L. Thompson, T. Strome, S. Mahmud (2011). "Google Flu Trends" and Emergency Department Triage Data Predicted the 2009 Pandemic H1N1 Waves in Manitoba. Canadian Journal of Public Health, 102(4):294. (SCI indexed)
3. M. Imran, T. Malik, S. M. Garba (2011). Deterministic model for the role of antivirals in controlling the spread of the H1N1 influenza pandemic. Electronic Journal of Differential Equations, 2011(155):1-21. (SCI indexed)
2. T. Malik, H. Smith (2008). Does Dormancy Increase Fitness of Bacterial Populations in Time-Varying Environments? Bulletin of Mathematical Biology, 70(4):1140-1162. (SCI indexed)

1. T. Malik, H. Smith (2006). A Resource-Based Model of Microbial Quiescence, Journal of Mathematical Biology 53(2):231-252. (SCI indexed)

Other Publications

- R. Jayaraman, D. LaTorre, T. Malik, Y. Pearson (2015). A Polynomial Goal Programming Model with Application to Energy Consumption and Emissions in United Arab Emirates. Proceedings of the 2015 International Conference on Industrial Engineering and Operations Management, Dubai, UAE. Best track paper: Sustainability and Green Systems (IEEE explore, SCI Indexed)
- Davide La Torre, Herb Kunze, Manuel Ruiz-Galan, Tufail Malik, and Simone Marsiglio (2015). Optimal Control: Theory and Application to Science, Engineering, and Social Sciences (editorial). Abstract and Applied Analysis, 10.1155/2015/890527. (SCI indexed)
- T. Malik (2011). Microbial Quiescence: A Fitness Strategy in Environmental Stress. LAP LAMBERT Academic Publishing ISBN: 978-3-8465-1937-0.

Papers Under Review

- M. Al-Arydah and T. Malik. An age-structured model of the Human Papillomavirus dynamics and optimal vaccine control.
- O. Sharomi and T. Malik. A model to assess the effect of vaccine compliance on Human Papillomavirus infection and cervical cancer.
- O. Sharomi, D. LaTorre, D. Liuzzi, T. Malik, R. Zaki. MATOPTDE: A MATLAB toolbox for solving optimal control problems with differential equations.
- M. Imran, M. Dur-e-Ahmad, T. Malik, M. Usman. A Model for Transmission Dynamics of Zika fever with Horizontal and Vertical Transmission.
- D. LaTorre, D. Liuzzi, T. Malik, O. Sharomi, R. Zaki. An Economic Growth Model with Pollution Dynamics and Enviromental Taxation: Dynamics Analysis and Control.

Funding History

2013 Khalifa University Internal Research Fund Level 2 Grant on "Population dynamics, sustainable economic growth, energy and the environment. Mathematical models and optimal policies". Total amount granted: US$ 531,000 for a period of 28 months (Sep. 2013 – Dec. 2015. Role: PI)

2015 "Optimal Decisions, Policies and Strategies for Sustainable Economic Growth". *Three anonymous external referees unanimously recommended funding of the proposal but grant was not awarded (due to lack of funds).* Total amount requested: US$ 489,000 for a period of 24 months (Jan. 2016 – Dec. 2017. Role: PI)

Research Supervision

Current Graduate Students

- Hend Al Tair (PhD student, Khalifa University; *Co-Supervising*)
- Usman A Danbaba (PhD student, University of Pretoria; *Co-Supervising*). *Mathematical models for the transmission dynamics of Zika fever and its control using sterile insect technique*

Research Associates

- Dr. Oluwaseun Sharomi (postdoctoral fellow), April 2014 – Dec. 2015
- Danilo Liuzzi, MSc. (research associate), Feb. 2014 – Dec. 2015
- Abdelaziz Saeed Alzaabi (undergraduate research associate), Nov. 2014 – Dec. 2015
- Mohammad Ather Rana (undergraduate research associate), Oct. 2014 – Dec. 2015

Thesis Examination Committees

- Kaltham Al Romaithi (M.Sc. thesis, Department of Electrical and Computer Engineering, Khalifa University; Internal Examiner, May 2016.)
- Fatima AlAwadhi (M.Sc. thesis, Department of Mathematical Sciences, United Arab Emirates University; External Examiner, April 2015.)

Invited Talks

Optimal Control with Multiple Human Papillomavirus Vaccines.
The 11th AIMS Conference on Dyn. Systems, Diff. Eq. and Applications, Orlando, USA, July 2016

Optimal labour allocation for energy, economic and environmental sustainability in the United Arab Emirates: A goal programming approach.
The 7th International Conference on Applied Energy – ICAE2015, Abu Dhabi, UAE, March 2015

Middle East Respiratory Syndrome (MERS): Optimal Quarantine and Vaccination Strategies.
10th AIMS Conference on Dyn. Systems, Diff. Eq. and Applications, Madrid, Spain, July 2014
Society for Mathematical Biology Meeting, Osaka, Japan, July-August 2014

The Impact of an Imperfect Vaccine and Pap Cytology Screening on the Transmission Dynamics of Human Papillomavirus.
Canadian Mathematical Society's Summer Meeting, Halifax, Canada, June 2013
Joint Mathematics Meetings, Boston, Jan. 2012
9th AIMS Conference on Dyn. Systems, Diff. Eq. and Applications, Orlando, July 2012

Fitness of Dormancy Capable Microbes in Time-Varying Environments
Prairie Network for Research in the Mathematical Sciences Meeting, Winnipeg, April-May, 2010
Florida Gulf Coast University, Feb. 2010
Institute of Industrial Mathematical Sciences, Manitoba, Feb. 2010

Photoacclimation in Phytoplankton with Resource Optimization
Canadian Mathematical Society Annual Meeting, St. John's, Canada, June 2009

Microbial Quiescence: A Survival Strategy in Environmental Stress
CMS-MITACS Joint Conference Winnipeg, Manitoba, May 31 - June 3, 2007
American Mathematical Society Spring Western Section Meeting, Tucson, AZ, 2007

Microbial Quiescence in Periodic and Random Resource Environments
Joint SIAM-SMB Conference on Life Sciences, Raleigh, NC, July 31-Aug. 4, 2006
SIAM Annual Meeting, Boston, MA, July 10-14 2006
Mathematical Biology Seminar, McMaster University, Hamilton, Canada, March 2006
Institute of Industrial Mathematical Sciences Seminar, University of Manitoba, 2006

Fitness of Quiescence Capable and Incapable Microbial Populations
Workshop on MathematicaL Models in Biology and Medicine, Arizona State Univ, 2006

Microbial Quiescence in a Constant Resource Supply Environment
Arizona Days Conference, Los Alamos NM, Jan. 2006
Canadian Mathematical Society's Annual Meeting, Victoria BC, Dec. 2005
Mathematical Biology Seminar, Arizona State University, Oct.14,2005

Teaching Experience

(a) Khalifa University of Science, Technology and Research, Abu Dhabi.

Fall 2016	Numerical Methods in Engineering (MATH 602).
Spring 2016	Differential Equations and Linear Algebra† (MATH 211).
Fall 2015	Numerical Methods in Engineering† (MATH 602).
Summer 2015	Complex Variables with Applications† (MATH 312).

Spring 2015 Numerical Methods in Engineering† (MATH 602), Calculus III (MATH 212).
Spring/Fall 2014 Numerical Methods in Engineering† (MATH 602).
2013 Linear Algebra and Differential Equations† (MATH 211), Calculus III (MATH 201).
Fall 2012 Differential Equations and Applications (MATH 206).

†: *I was also the Course-Coordinator*

(b) International College of Manitoba, Winnipeg, Manitoba, Canada

Winter 2010 – Winter 2012 Introduction to Calculus (MATH 1500).
Calculus II (MATH 1700), Vector Geometry and Linear Algebra (MATH 1300).

(c) University of Manitoba, Winnipeg, Manitoba, Canada

Summer 2011 Vector Geometry and Linear Algebra (MATH 1300).
Winter 2011 Numerical Mathematics (MATH 2600).
Winter 2010 Introduction to Calculus (MATH 1500; class of 140 students).

(d) Mount Allison University, Sackville, New Brunswick, Canada

Winter 2009 Calculus I (MATH 1111; class of 130 students).
Fall 2008 Multivariable Calculus (MATH 2111).
Winter 2008 Differential Equations I (MATH 2121). (*Designed the course, with focus on modeling.*)
Fall 2007 Multivariable Calculus (MATH 2111).

(e) Arizona State University, Tempe, Arizona, USA

Winter 2007 Calculus with Analytic Geometry III (MAT 272).
Fall 2006 Calculus with Analytic Geometry III (MAT 272).
Fall 2005 Calculus with Analytic Geometry I (MAT 270).
Winter 2005 Brief Calculus (MAT 210).
2002–2004 Brief Calculus (MAT 210), Precalculus (MAT 170), College Algebra (MAT 117).

(f) Ohio University, Athens, Ohio, USA

Spring 2002 Introduction to Probability and Statistics (MATH 250).
Spring 2002 Calculus and Analytic Geometry (MATH 263).
Fall 2001 Pre-Calculus (MATH 115).
Spring 2001 Calculus and Analytic Geometry (MATH 263).
Winter 2001 Introduction to Calculus (MATH 163).
Spring 2000 Introduction to Calculus (MATH 163).
1999–Fall 2000 Pre-Calculus (MATH 115).
Fall 1998 Algebra (MATH 113).

Pedagogical Training

Fall 2005 Preparing Future Faculty, Arizona State University.
Fall 2003 Teaching training seminar, Arizona State University.
Summer 2002 TA training workshop, Arizona State University.
Fall 1998 Graduate teaching seminar, Ohio University.

Integration of Technology in Teaching

- Graphing Calculator: Used extensively in teaching at Ohio University and Arizona State University.
- MAPLE: Used for in-class demonstrations (Ohio University, Arizona State University) and hands-on labs and maple-based homework (Arizona State University).
- MATLAB: Used for projects/homeworks in the graduate course Numerical Methods in Engineering, Khalifa University, in-class demonstrations (Khalifa University, Ohio University, Mount Allison University, University of Manitoba) and matlab-based homework (University of Manitoba).
- DETools: Used for in-class demonstrations during the Differential Equations course (Khalifa University & Mount Allison University). Prepared a lab by installing the software for hands-on learning.
- WeBWorK: Used extensively at Arizona State University.

Course Management Platforms

Moodle, Wikimedia, MS Excel, HTML.

Mentorship

2012 - Academic Advisor to approximately seven undergraduate students each semester.

2005, 2006 TA Training Leader, Math TA training workshop, Arizona State University.

2003, 2004 Tutor, Mathematics Tutor Center, Arizona State University.

Community Activities and Service

Conference/Seminar Organization

2013 – Organizer, Weekly AMS Research Seminar, Applied Mathematics and Sciences, Khalifa University. In this capacity I organize talks by the Mathematics, Physics and Chemistry faculty of the University, as well as invite, host, and schedule talks by the external speakers from the region.

3/2015 Chair, special session "Operations Research and Management Science", in the UAE Graduate Students Research Conference (Abu Dhabi, UAE, March 22-24, 2015).

12/2014 Lead organizer and chair, international workshop on "Optimal Decision-Making in Economics, Healthcare and Sustainable Ecosystems" (Khalifa University, Abu Dhabi, Dec. 10 - 11, 2014).

7/2014 Organizer and chair, special session "Modeling the Spread and Control of Infectious Diseases", in the 10th AIMS Conference on Dynamical Systems, Differential Equations and Applications (Madrid, Spain, July 7 - 11, 2014). Co-organizer: Prof. Abba Gumel.

7/2012 Co-organizer and co-chair, special session "Modeling and Dynamics of Infectious Diseases", in the 9th AIMS Conference on Dynamical Systems, Differential Equations and Applications (Orlando, Florida, USA, July 1 - 5, 2012). I co-organized with Prof. Abba Gumel.

Committees

2015 Member, Educational Excellence Working Group, Khalifa University Strategic Plan 2012-17.

2015 Member, Technical Program Committee, UAE Graduate Students Research Conference 2015.

2015 Mathematics Syllabus Revision Committee, AMS department, Khalifa University.

2014 Member, Proposal Preparation Committee for the Accreditation for a B.Sc. degree program in Applied Mathematics and Statistics. I was involved in preparing the proposal documents and writing syllabi for some of new courses to be offered in the new program.

2012 – Member, Mathematics Hiring Committee, Khalifa University

2005–2006 Member, Mathematics Department's Webpage Committee, Arizona State University.

2/2006 Member, Poster Session Judge Committee, Workshop on Mathematical Models in Biology and Medicine, Arizona State University.

Research Article Reviewing

SIAM Journal on Applied Dynamical Systems; Discrete and Continuous Dynamical Systems-Series B; Journal of Infection and Public Health; BMC (BioMed Central) Infectious Diseases; Journal of Population Studies; Mathematical Biosciences; Mathematical Modeling and Analysis; Abstract and Applied Analysis, International Journal of Biomathematics; Journal of Applied Mathematics and Physics; UAE Graduate Students Research Conference 2015; 5^{th} International Conference on Industrial Engineering and Operations Management, Dubai, 2015

Web Administration

2013 – present Departmental webpage administration and editing, Applied Mathematics and Sciences, Khalifa University

Outreach Activities

2/2016 Khalifa University Open Day 2016; Represented at the AMS department booth

2/2016 Exploring Majors Day; Participated in the presentation to introduce the new Applied Mathematics and Statistics degree program to the University students

10/2015 Najah Exhibition 2015; Volunteered for Khalifa University Recruitment Stand

2015 Khalifa University Open Day 2015; Represented at the AMS department booth

Awards and Honors

2015 Best Track Paper, 5^{th} Int'l Conf. on Industrial Engineering & Operations Management (IEOM), Dubai

2006 Graduate Student Research Award, Arizona State University.

2007 Teaching Excellence Award, Graduate and Professional Students Association, Arizona State University.

2007 Certificate of Appreciation, The Honors College, Arizona State University.

2005 Outstanding Teaching Assistant Award, Dept. of Mathematics and Statistics, Arizona State University.

2004 Wexler Teaching Award Nomination, Arizona State University.

2002 Outstanding Teaching Assistant Award, Ohio University.

References

Research

Abba Gumel Professor of Mathematics (Postdoc Advisor 2010-2012), Arizona State University, Tempe, Arizona, USA (agumel@asu.edu, +1-480-727-2690)

Davide LaTorre Associate Professor of Mathematics and Associate Chair, Khalifa University, Abu Dhabi (davide.latorre@kustar.ac.ae, +971-02-401-8170)

Elamin H. Elbasha, PhD Merck Research Laboratories, UG1C-60, PO Box 1000, North Wales, PA19454-1099, USA (elamin_elbasha@merck.com, +1-267-305-7991)

Yang Kuang Professor of Mathematics, Arizona State University, Tempe, Arizona 85287, USA (kuang@asu.edu, +1-480-965-6915)

Teaching

Robert Bennell Interim Chair, Applied Mathematics and Sciences Department, Khalifa University of Science, Technology and Research (robert.bennell@kustar.ac.ae, +971-2-401-8172)

Donald Trim Professor of Mathematics, University of Manitoba, Winnipeg, Manitoba, R3T 2N2, Canada
(dtrim@cc.umanitoba.ca, +1-204-474-8760)