جامعة قطر
QATAR UNIVERSITY

Sunday, 16 February, 2020

Qatar University, Ibn Al Bitar Building (I06)

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- **Mrs Amal AlAraj**

Free Wifi, connect to **QMD2020**

Keynotes Speaker Bibliography

Prof. Deborah Hughes Hallett is Adjunct Professor of Public Policy and Professor of Mathematics at the University of Arizona. She graduated from Cambridge University in England and has taught at Middle East Technical University in Ankara, Turkey, and Universiti Brunei Darussalam. Her work is on strategies to improve the teaching of mathematics, and she is interested in promoting international cooperation between mathematicians. With Andrew Gleason at Harvard, she organized the Calculus Consortium for Higher Education and started a foundation to promote innovative curriculum and pedagogy. She has served on committees for the National Academy of Sciences and organized three international conferences on the teaching of mathematics. She is a fellow of the American Advancement of Science and the author or coauthor of seven books, which have been translated into several languages. Her work has been recognized by prizes from Harvard University, the University of Arizona, the Association for Women in Mathematics, and the Mathematical Association of America.

Prof. Rym M'Hallah is currently a full professor at the Department of Statistics and Operations Research at Kuwait University. She was a professor of Quantitative Methods and Information System at the University of Sousse, Tunisia, which she joined after industrial experience in Tunis, Tunisia. Dr. M'Hallah has degrees in industrial engineering and operations research, all from Pennsylvania State University. Dr. M'Hallah has authored a sizeable number of peer-reviewed journal publications in international prominent journals of her field and held editorial positions in Operations Research journals. Her research focused on modeling and optimizing large-scale systems using operations research techniques including but not limited to mathematical, constraint, and dynamic programming, meta-heuristics, simulation, scheduling, and quality control. Applications include health care, manufacturing and transportation, scheduling, and cutting and packing. Her research has been funded by different organization (including the National Science Foundation of the USA, the European Community International Cooperation program, the French National Scientific Research Center, and Kuwait University). Her current interest is enhancing health care systems and service industries using operations research and industrial engineering techniques.

Prof. Zead Mustafa, received his Bachelor degree of Mathematics from Mu'tah University –Jordan in 1997 and Master degree of Mathematics from Al al-Bayet University-Jordan in 2000. He obtained my PhD of Mathematics from Newcastle University – Australia in 2005, He awarded the outstanding postgraduate (research) student achievement in 2004 from Newcastle University. In 2006, Dr. Zaed joined the department of Mathematics at The Hashemite University as Assistant Professor and in 2011, he was promoted to Associate Professor. In 2012, he joined Department of Mathematics, Statistics and Physics at Qatar University as Associate Visiting professor, and from 2013 continued as faculty member. Currently he is a professor at Department of Mathematics, Statistics and Physics at Qatar University. His main research interest in the area of Metric space, Generalized metric spaces and fixed point theorems with their applications, he has more than 76 published papers in this area. In 2016, he has been selected as a Web of Science Highly Cited Researcher for the year of 2016.

Time	Events	Location
8:00am – 8:30am	Registration	Auditorium G. A6.01
8:30am – 8:50am	Qatar Math Day 2020 Opening	
8:50am – 9:05am	*4ᵗʰ Qatar University Math Competition Award Ceremony*	
9:05am – 9:55am	Keynote: Skill and Understanding in Mathematics: Rivals or Partners? Speaker: *Prof. Deborah Hughes Hallett, University of Arizona and Harvard Kennedy School*	
9:55am – 10:45am	Keynote: Integer and Constraint Programming for the two-dimensional bin packing problem with due dates Speaker: *Prof. Rym M'Hallah, University of Kuwait*	
	10:45am – 11:00am - Coffee Break	

Concurrent Sessions 1

Time	Event	Room	Time	Events/Room			
11:00am – 11:30am	Seminar 1: A simple SI-type model for HIV/AIDS with media and self-imposed psychological fear Speaker: *Dr. Nasser Al-Salti, Sultan Qaboos University, Oman*	G.A6.01	11.00am – 12:00pm	ورشة عمل 1: البرهان الهندسي في الرياضيات المتحدث: أيمن عبدالله الصحري، وزارة التعليم العالي **قاعة F.CL.01:**	ورشة عمل 3: استخدام المخططات التقنية و البرمجة باستخدام PYTHON في تدريس الرياضيات المتحدث: يامن فرج، وزارة التعليم العالي **قاعة F.CL.03:**	ورشة عمل 5: التحضير الإلكتروني المتحدث: سامر عبيد الخطيب، وزارة التعليم العالي **قاعة F.CL.07:**	Room: F.CL.09 **Workshop 7**: Essential Tools for Problem Solving Speaker: Abdelouahed Hamdi, Qatar University
	Seminar 2: Understanding and Promoting the Needs of Gifted and High Ability Students in a School Context Speaker: *Cynthia Bolton, Head of Gifted Education, Qatar Foundation, Qatar*	G.CL.03					
11:30am – 12:00pm	Seminar 3: Hepatitis C Virus Treatment in High Burden Country in the Middle East and North Africa: Mathematical Modeling Speaker: *Dr. Houssein, AYOUB, Qatar University*	G.A6.01					
	Seminar 4: Discovering students' weakness in Math at early stage is the first step to develop their academic performance *Speaker*: *Mahmoud* Syam, Qatar University	G.CL.03					

Time	Title	Room	Time	Events/Room			
12:00pm – 12:30pm	**Seminar 5**: Representations of Low Dimensional Lie Algebras and Applications **Speaker**: *Dr. Ryad Ghanam, Virginia Commonwealth University School of Arts, Qatar*	G.A6.01	12:00pm - 1:00pm	ورشة عمل 2: تطوير مهارات ما وراء المعرفة من خلال التعلم القائم على حل المشكلات المتحدث: ساري بطحي ، وزارة التعليم العالي **قاعة: F.CL.01**	Workshop 4: Desmos <mark>Attendee is required to bring own laptop.</mark> Room F.CL.03	ورشة عمل 6: مفاتيح التفكير العشرين لترى دبان القائم على حل المشكلات المتحدث: رحمة كامل جلال، وزارة التعليم العالي **قاعة: F.CL.07**	Workshop 8: Establishing connections in mathematics education Speaker: Iman El Nabrawy, Qatar University Room: F.CL.09
	Seminar 6: QU-Placer Math Test: Improved Placement and Pedagogical Diagnostic Decisions **Speaker**: *Dr. Walid Massoud, Qatar University Testing Center*	G.CL.03					
12:00pm – 1:00pm	**Seminar 7**: On Parametric Marcinkiewicz Integral Operators **Speaker**: *Dr. Ahmad Salman, Sultan Qaboos University*	G.A6.01					
	Seminar 8: An Overview of Mathematical Committees in Oman **Speaker**: *Dr. Magda Al-Hinai, President of Omani Mathematical Community*	G.CL.03					

1:00pm – 2:15pm - Lunch & Prayer

2:15pm – 3:05pm	**Keynote**: On Recent Generalizations of Metric Spaces and Fixed Point Theory **Speaker**: *Prof. Zead Mustafa, Qatar University*

Concurrent Sessions 2

Time	Title	Room	Time	Events/Room			
3: 05pm – 3:35pm	**Seminar 9**: The numerical solution of a wind-driven current Oceanography Model using the Sinc-Derivative interpolation method. **Speaker**: *Dr. Kenzu Abdella, Qatar University*	G.A6.01	3:05pm – 4:00pm	Workshop 9: Desmos-2 <mark>Attendee is required to bring own laptop. Room: F. CL.03</mark>	ورشة عمل : البرهان الهندسي في الرياضيات، وزارة التعليم العالي المتحدث: أيمن عبدالله المصري، وزارة التعليم العالي **قاعة: F.CL.04**	ورشة عمل : تطوير مهارات ما وراء المعرفة من خلال التعلم القائم على حل المشكلات المتحدث: ساري بطحي ، وزارة التعليم العالي **قاعة: F.CL.05**	ورشة عمل: مفاتيح التفكير العشرين لترى دبان القائم على حل المشكلات المتحدث: رحمة كامل جلال، وزارة التعليم العالي **قاعة: F.CL.07**
	Seminar 10: Pi Day Mathematics Competition **Speaker**: Dr. *Hasan Demirkoparan, Carnegie Mellon University, Qatar*	F.CL.01					
	Seminar 11: Additive Splitting Methods for Advection-Diffusion-Reaction Equations **Speaker**: *Raed Marabeh, Qatar University*	G.CL.03					
3:35pm – 4:05pm	End						

Keynotes Speakers

Skill and Understanding in Mathematics: Rivals or Partners?

Prof. Deborah Hughes Hallett, University of Arizona, Adjunct Professor if Public Policy: Harvard Kennedy School

An effective mathematics course develops both computational skill and conceptual understanding. The appropriate balance between them depends on the particular students you have. This talk will center on how to create such a balance and its benefits— how understanding and skill reinforce each other, generating increased confidence and better retention of material. We will discuss some of the tools available—including engaging applications, probing problems, ConcepTests, on-line homework, and projects.

Integer and Constraint Programming for the two-dimensional bin packing problem with due dates

Prof. Rym M'Hallah, University of Kuwait

This talk addresses a combination of two practical yet computationally difficult optimisation problems: bin packing and scheduling. It deals with packing a set of rectangular items, which may be rotated by 90°, into identical rectangular bins. Each item is characterized by its width, height, and due date. Its lateness is the difference between its completion time and its due date, where its completion time is that of its assigned bin. All bins' processing times are equal regardless of their assigned items. The problem distributes all items among the bins and packs them without overlap as to minimise the maximum lateness of the items.

This problem prevails in make-to-order low-volume production systems such as steel, wood and furniture manufacturing. It occurs in fleet planning and logistics as well as during rescue and defence operations. In these contexts, packing efficiency might be increased by mixing up several orders; however, the increased efficiency cannot be at the cost of customer service. The problem is computationally challenging due to a large number of ways that items can be positioned in the bins. Thus, finding efficient solution techniques is highly important from practical perspectives. Problems like this often require new approaches combining different algorithmic techniques to handle multiple aspects of the problem with maximal efficiency.

As for all difficult optimisation problems, finding an optimal solution, in a reasonable time, for large-sized instances is hard. The paper proposes an approximate approach for the problem and, unlike the existing techniques, explores the complementary strengths of constraint programming and mixed integer programming techniques. In this sense, it bridges the gap between artificial intelligence and operations research constructing an algorithm where methods traditional to these fields find synergy in their combination. The approach combines heuristic search with mixed integer programming, which is in turn guided by feasibility constraints. In addition, it applies an innovative lookahead strategy that (i) forbids searching in directions that will eventually lead to incorrect solutions and (ii) directs the search towards improving solutions only. This approach improves existing solutions by 27.4% on average, and achieves optimum for 33.9% of the test instances. Consequently, it is a viable alternative to the constructive heuristics traditionally applied to bin packing.

The work is of a great significance for an academic community, especially for a large group of researchers working on cutting and packing problems. The proposed approach is easily adaptable to similar real-world problems ranging from organising on-time delivery of electrical goods from a store to production planning of make-to-order built-in furniture to managing the load of air fleet with respect to time requirements. Most importantly, this talk highlights the fundamental role of simple mathematical tools in solving highly complex but commonly occurring problems.

On Recent Generalizations of Metric Spaces and Fixed Point Theory

Prof. Zead Mustafa, Qatar University

Now-a-days, the study of metric spaces is considered fascinating and highly useful because of its increasing role in mathematics and the applied sciences. It has been increasingly realized that this branch of mathematics provides a convenient and very powerful way of examining the behavior of various mathematical models, and it clarifies and unifies the underlying concepts in mathematics, engineering, theoretical physics, applied mathematics, economics and other applied fields.

In the past two decades, metric spaces have gained much attention through advances in Metric fixed point theory. Special classes of metric spaces have been intensively investigated; geodesic metric spaces, hyperbolic metric spaces and hyperconvex spaces to name a few. There have also been a number of attempts to extend the theory to spaces that are more general than the ordinary metric spaces.

The purpose of this Talk is to highlights the recent generalizations of Metric Spaces with a comparison between them. Moreover, I will present the recent development of fixed-point theory of b-metric endowed with graph.

Concurrent Session 1

Seminar 1

A simple SI-type model for HIV/AIDS with media and self-imposed psychological fear

Dr. Nasser Al-Salti, Sultan Qaboos University, Oman

Seminar 2

Understanding and Promoting the Needs of Gifted and High Ability Students in a School Context

Cynthia Lynn Bolton, Gifted Education of Qatar Foundation, Qatar

Gifted and high ability students have strengths and difficulties that shape the way they view the world, solve problems and relate to others. They have the ability to perform at higher academic levels if supported properly but may not demonstrate their ability in the school setting due to social pressures, boredom or teachers who may not understand how to best engage them. They may experience difficulties when trying to make friends, understanding and regulating their emotions and exploring who they are and who they want to be.

According to Dabrowski's Theory of Positive Disintegration ((Dabrowski 1964, 1967, 1970, 1972) gifted students experience the world at a heightened level of sensitivity which should be considered when developing programs that best support them. Dr. Jane Piirto in the book Understanding Creativity explores the social and emotional commonalities of successfully gifted individuals throughout history making a strong argument for the need of identification of gifted students at a young age and strategically planned targeted support for positive social and emotional development (Piirto 2000).

This presentation focuses on identifying gifted students, understanding their giftedness while raising awareness of their social and emotional needs and exploring ways to promote their development in the school context.

Seminar 3

Hepatitis C Virus Treatment in High Burden Country in the Middle East and North Africa: Mathematical Modeling Analyses

Dr. Houssein Ayoub, Qatar University

In this talk, I will present some numerical results of a research project related to the Mathematical Biology field. As background, breakthroughs in the pipeline and accessibility to direct-acting antivirals (DAAs) have opened ambitious opportunities for controlling hepatitis C virus (HCV) infection and reducing its burden and cost. Much policy and scientific attention have focused on the recently stipulated global target of HCV elimination by 2030. This has contributed to the launch of ambitious DAA treatment programs, such as that of Egypt, the nation most affected by this infection. In this project, we aimed to assess whether DAA treatment programs could be designed to serve as treatment as prevention programs for HCV infection, leading to HCV elimination by 2030 as per the World Health Organization plan. A nonlinear age-structured mathematical model was developed and analyzed to describe HCV transmission in a population. The mathematical model was fitted to epidemiological data using a non-linear least-square fitting method. Five optimal treatment program scenarios were considered from 2014 up to 2030 including different targets for HCV control and elimination. The results showed that DAA scale-up will have immense and immediate impact on the number of new HCV infections. Elimination by 2030 is feasible if sufficient resources are committed to program scale-up and sustainability.

Seminar 4

The numerical solution of a wind-driven current Oceanography Model using the Sinc-Derivative interpolation method.

Dr. Abdullah Kenzu, Qatar University

In this paper, the Sinc-Derivative Collocation method is used to solve an oceanography model. The model describes a wind-driven current with depth-dependent eddy viscosity. The model is developed in both complex velocity and coupled system formulations. In general, the Sinc-based methods excel over traditional numerical methods due to their exponentially decaying errors, rapid convergence and handling problems in the presence of system singularities. Together with these advantages, the Sinc-Derivative interpolation approach utilizes first derivative interpolation, minimizing the numerical errors associated with numerical differentiation. The approximate solutions determined by the Sinc-Derivative technique is shown to be more accurate and efficient than other methods in the literature.

Seminar 5

Representations of Low Dimensional Lie Algebras and Applications

Dr. Ryad Ghanam, Virginia Commonwealth University in Qatar

In this talk I will report on the progress of the problem of finding linear representations for low-dimensional real Lie algebras. For each Lie algebra of dimension less than or equal to 6, I will give a matrix Lie group whose Lie algebra is the given algebra in the list. As an application, I will show how to use these representations to solve the inverse problem of Lagrangian mechanics for the canonical connection on Lie groups.

Seminar 6

QU-Placer Math Test: Improved Placement and Pedagogical Diagnostic Decisions

Dr. Walid Massoud, Qatar University Testing Center

The Foundation Program Department of Math (FPDM) made consistent observations over time that the previously used math placement test was not adequately assigning students with pre-requisite skills to their courses. Since December 2016, FPDM and the Qatar University Testing Center (QUTC) have been working closely to develop a standardized math test (QU-Placer) aligned with the content of both Foundation-level courses. The QU-Placer has been constructed with recent and the most widely used standards for test development. 3,325 students participated in field tests associated with the QU mathematics placement test between early Spring 2018 and early Spring 2019 to develop an item bank. QU's decision to use the QU-Placer test was taken in March 2019. The new test has much better validity for QU use and improved fairness for QU students. Relevant test-related analyses are improving the quality of instruction students receive.

Seminar 7

On parametric Marcinkiewicz Integral Operators

Dr. Ahmad Salman, Sultan Qaboss University

Seminar 8

An Overview of Mathematical Committees in Oman

Dr. Magda Al-Hinai, President of Omani Mathematical Community

Workshops

Workshop 1

البرهان الهندسي في الرياضيات

أيمن عبدالله المصري

عرض استراتيجيات التعامل مع البرهان الهندسي في مصدر التعلم ، وتوظيف المحسوسات و التكنولوجيا لمراعاة الفروق الفردية وانماط المتعلمين.

Workshop 3

استخدام المخططات التدفقية والبرمجة باستخدام PYTHON في تدريس الرياضيات (درس مصغر لاستخدام التكنولوجيا الفعالة)

يامن فرح

درس مصغر يتم من خلاله العمل على:
- تقديم استراتيجيات لتدريس حل المعادلة التربيعية باستخدام فعال للتكنولوجيا وبوسائل تكنولوجية مختلفة تراعي الفروق الفردية لدى الطلاب وتحقق الكفايات التعليمية وتنمي مهاراتهم في دمج التكنولوجيا في التعليم من خلال (مخططات تدفقية ـ برمجة ــ حاسبة بيانية ــ حاسبة عملية) مع تقديم أوراق عمل تحاكي حل المشكلات ومشاريع STEM.
- استخدام لعبة أحجار الدومينو بشكل الكتروني في التقييم مع Microsoft Teams .

Workshop 5

التحضير الالكتروني

سامر عياد الخطيب

برنامج للتحضير اليومي لمادة الرياضيات حيث يتم من خلال البرنامج اعداد التحضير و العرض التقديمي ، ويكون العرض متسقا مع الأنشطة و زمن كل نشاط و نوع الإستراتيجية المستخدمة كما يقوم البرنامج بإعداد محضر للتحضير و الرسالة الأسبوعية.

Workshop 7

Essential Tools for Problem Solving

Dr. Abdelouahed Hamdi, Qatar University

We will review, discuss and share some useful results that could be taught to high school students and university students, which allow them to tackle some "neither direct nor easy" problems in mathematics. For instance, we will see the strength of "AM-GM and Cauchy-Schwartz Inequalities", the "Mean-Value Theorem", the tangent lines and the variations of functions in solving problems. The workshop will provide an enriching experience in mathematics for intellectually curious learners. Through such interactive discussions, we wish to re-activate a community that values critical thinking, creativity, passionate problem solving, and lifetime mathematical learning.

Workshop 2

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تطوير مهارات ما وراء المعرفة من خلال التعلم القائم على حل المشكلات

ساري بعثي

تهدف هذه المشاركة بشكل مباشر الى تسليط الضوء على الجزء الثالث من أجزاء مصدر الرياضيات الجديد بجانب معايير المحتوى ومعايير الممارسات (MPS)، حيث تقدم مهارات ما وراء المعرفة بقالب جديد، وتسهم هذه المشاركة بتقديم نموذج من الواقع على تنمية مهارات ما وراء المعرفة عند الطلاب من خلال خطوة التعلم القائم على حل المشكلات التي تعد هي الخطوة الأولى في تصميم دروس المصدر الحديث.

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Workshop 4

Desmos Workshop – Part 1

Workshop 6

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مفاتيح التفكير العشرين لتوني رايان

رحمة كامل جلال

مفاتيح التفكير العشرين لتوني رايان هو برنامج وصفه توني ريان يتكون من عشرين مفتاح للتفكير   يرتكز على الموازنة بين التفكير الإبداعي و التفكير الناقد ، فهي مجموعة من عشرين نشاط مختلف مصمم لإشراك وتحفيز المتعلمين في مجموعة من المهام لتوسيع وتعميق تفكيرهم.

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Workshop 8

Establishing connections in mathematics education

Dr. Iman El Nabrawy, Qatar University

No one can argue that mathematics teaching becomes more interesting and more meaningful to students, when taught in a way where connections within a topic, between topics and to real life problems are established.

A culture that develops students' ability of mathematical connection will inevitably grow problem-solving learners and will instill deeper understanding of important knowledge. This workshop will address different aspects of establishing connections in mathematics education and will introduce the participants to various interactive tools and examples to teaching mathematics as an interwoven pieces of knowledge connected to real life rather than isolated islands of memorized rules and formulas.

Concurrent Session 2

Seminar 9

Discovering students' weakness in Math at early stage is the first step to develop their academic performance

Mahmoud Syam, Qatar University

Weakness of students in mathematics is a very old problem, discovering the source of this weakness is not an easy mission and needs to check the curriculum, teaching methods, learning process, assessment methods and using the technology in teaching mathematics. In addition, Mathematics is a vertically structured field; university stage depends on secondary stage, which depends on preparatory stage, which depends also on primary stage. Determining the source of weakness depends on the outcomes of each stage by using international tests to be fair with all stages including the first year University students. In this presentation, I will share the audience our experience in Foundation Program, Department of Mathematics; what we did, what we are doing and what will we do in the short term to help our students. Then I will open a discussion to share the audience their opinions about this issue.

Seminar 10

Pi Day Mathematics Competition

Dr. Hasan Demirkoparan, Carniegie Mellon University, Qatar

Pi Day is embraced by mathematicians and educators worldwide as an opportunity to celebrate and encourage learning in mathematics. Pi is written in symbol form as the Greek letter π, which represents the ratio of the circumference of a circle to its diameter, an infinite number rounded to 3.14. Pi Day falls on March 14 each year, or 3/14.

CMU-Q introduced the Pi Day Mathematics Competition in 2016 to encourage high school students to explore the fun side of math. In this talk, the outcomes of the four previous competitions will be shared along with its structure, rules and preliminary statistics of the results.

Seminar 11

Additive Splitting Methods for Advection-Diffusion-Reaction Equations

Raed Marabeh, Qatar University

In mathematics, partial differential equations (PDEs) are widely used in modeling of many natural and physical processes. The right hand side of PDEs can be often split into two parts. The split can be based on mathematical properties, such as linearization, or based on physical properties, such as advection, diffusion, or reaction. Most PDEs in practice need to be solved using numerical methods. One of the efficient numerical approaches in solving these equations is to treat each term with a separate method, i.e., 2-additive methods.

In this study, a comparison between the performance of the mathematical and physical splitting will be performed by applying a set of linear multistep methods to an advection-diffusion-reaction (ADR) problem. An introduction to a newly developed additive splitting method, which is convenient to the ADR equations, will be presented. Specifically, treating advection, diffusion and reaction with three distinct methods, i.e., 3-additive methods.