

Conference Program

Lero, University of Limerick, Ireland

20th-24th June 2011

www.fm2011.lero.ie



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CONFERENCE WELCOME

FM 2011 is the seventeenth in a series of symposia organized by Formal Methods Europe, an independent association whose aim is to stimulate the use of, and research on, formal methods for software development. The symposia have been notably successful in bringing together innovators and practitioners in precise mathematical methods for software and systems development, industrial users as well as researchers. Submissions are welcomed in the form of original papers on research and industrial experience, proposals for workshops and tutorials, entries for the exhibition of software tools and projects, and reports on ongoing doctoral work.

The FM 2011 Symposium will be based around the theme
Formal Methods Come of Age
It will have the goal of highlighting and celebrating advances and maturity in formal methods research, education, and deployment via tool support and industrial best practice, and their role in a variety of industries, domains, and in certification and assurance. FM 2011 particularly welcomes papers on experience with practical applications of formal methods in industrial and research settings, experimental validation of tools and methods as well as construction and evolution of formal methods tools.

The broad topics of interest for FM 2011 are:

- **Formal methods in practice:** industrial applications of formal methods, experience with introducing formal methods in industry, tool usage reports, experiments with challenge problems. Authors are encouraged to explain how the use of formal methods has overcome problems, lead to improvements in design or provided new insights.
- **Tools for formal methods:** advances in automated verification and model-checking, integration of tools, environments for formal methods, experimental validation of tools. Authors are encouraged to demonstrate empirically that the new tool or environment advances the state of the art.
- **Role of formal methods in software and systems engineering**: development processes with formal methods, usage guidelines for formal methods, method integration. Authors are encouraged to

demonstrate that process innovations lead to qualitative or quantitative improvements.

- **Theoretical foundations:** all aspects of theory related to specification, verification, refinement, and static analysis. Authors are encouraged to explain how their results contribute to the solution of practical problems with methods or tools.
- **Teaching formal methods:** original contributions that provide insight, evaluations and suggestions for courses of action regarding the teaching of formal methods, including teaching experiences, educational resources, the integration of formal methods into the curriculum, the definition of a formal methods body of knowledge, etc. Authors are encouraged to provide some form of evaluation and assessment of the content and approach in the teaching being reported.

We thank all members of the various FM2011 committees for their dedication and effort and a special thanks to our corporate sponsors for supporting us during such a financially difficult time.

Finally we hope you will enjoy FM2011, and take home new insights, valuable connections and fond memories of our Irish hospitality.



Mike Hinchey
FM2011 General Chair



Michael Butler
FM2011 Programme Chair



Wolfram Schulte
FM2011 Programme Chair

ORGANIZING COMMITTEE

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DOCTORAL SYMPOSIUM

Norah Power, Lero, University of Limerick, Ireland

INVITED SPEAKERS

Janos Szitpanovits, Vanderbilt University, Nashville, Tenessee, USA
Jasmin Fisher, Microsoft Research Cambridge, UK
David Harel, Weizman Institute of Science, Rehovot, Israel

PROGRAMME COMMITTEE

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Huibiao	Zhu	East China Normal University	China

KEYNOTE SPEAKERS

MODEL INTEGRATION AND CYBER PHYSICAL SYSTEMS: A SEMANTICS PERSPECTIVE *JANOS SZTIPANOSVITS*

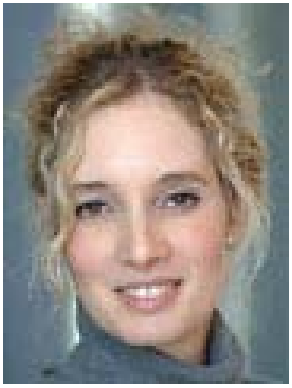
Recent attention to Cyber Physical Systems (CPS) is driven by the need for deeper integration of design disciplines that dominate physical and computational domains. Consequently, heterogeneity is the norm as well as the main challenge in CPS design: components and systems are modeled using multiple physical, logical, functional and non-functional modeling aspects. The scope of relevant design domains includes (1) physical domains, such as structure, mechanical dynamics, thermal, propulsion, fluid, electrical, acoustics/vibration and (2) computational/networking domains, such as system control, sensors, health management, mission management, communication. However, the practice of multi-modeling – using established domain-specific modeling languages and tools independently in the design process – is insufficient. Modeling and analyzing cross-domain interactions among physical and computational/networking domains and understanding the effects of heterogeneous abstraction layers in the design flow are fundamental part of CPS design theories. I will cast this challenge as a model integration problem and discuss solutions for capturing interdependencies across the modeling domains using constructs for meta-model composition and integration.



Short Biography

Dr. Janos Sztipanovits is the E. Bronson Ingram Distinguished Professor of Engineering at Vanderbilt University. He is founding director of the Institute for Software Integrated Systems (ISIS). His research areas are at the intersection of systems and computer science and engineering. His current research interest includes the foundation and applications of model-based methods for the design of Cyber Physical Systems

EXECUTABLE BIOLOGY: TOWARDS COMPUTER PROGRAMMES THAT MIMIC LIFE *JASMIN FISHER*



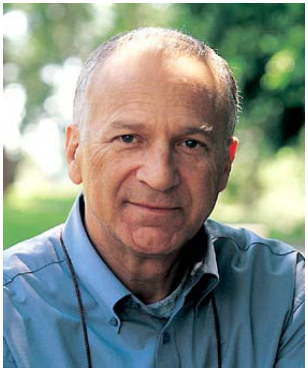
As time goes by, it becomes more and more apparent that the puzzles of life involve more and more molecular pieces that fit together in increasingly complex ways. Biology is not an exact science. It is messy and noisy, and most often vague and ambiguous. We cannot assign clear rules to the way cells behave and interact with one another. And we often cannot quantify the exact amounts of molecules, such as genes and proteins, in the resolution of a single cell. To make matters worse (so to speak), the combinatorial complexity observed in biological networks (e.g., metabolic and signalling pathways) is staggering, which renders the comprehension and analysis of such systems a major challenge. Recent efforts to create executable models of complex biological phenomena – an approach called Executable Biology – entail great promise for new scientific discoveries, shading new light on the puzzle of life. At the same time, this 'new wave of the future' forces Computer Science to stretch far and beyond, and in ways never considered before, in order to deal with the enormous complexity observed in biology. In this talk, I will summarize some of the success stories in using formal methods to model biology, as well as some of the major milestones on the way to conquer biological complexity.

Short biography

Dr. Jasmin Fisher received her PhD in Neuroimmunology from the Weizmann Institute of Science in Israel and is currently a Researcher at Microsoft Research Cambridge and an associated Lecturer at Cambridge University. She started her work on the application of formal methods to biology as a postdoctoral fellow in the department of Computer Science at the Weizmann Institute (2003-2004), where she worked with Prof. David Harel, and then continued to work also on the development of novel formalisms and tools that are specifically-tailored for modelling biological processes as a postdoctoral researcher in the School of Computer Science at the EPFL in Switzerland (2004-2007), together with Prof. Tom Henzinger. Her research focuses on the construction and analysis of executable models that mimic aspects of biological phenomena in order to better understand complex biological

systems. She is mainly interested in processes of cell fate determination and signalling networks operating during normal development and cancer. Her e-mail address is jasmin.fisher@microsoft.com and her webpage is http://research.microsoft.com/en-us/people/jfisher/

SOME THOUGHTS ON BEHAVIORAL PROGRAMMING *DAVID HAREL*



The talk starts from a dream/vision paper I published in 2008, whose title is a play on that of John Backus' famous Turing Award Lecture (and paper). I will propose that --- or rather ask whether --- programming can be made a lot closer to the way we humans think about dynamics, and the way we somehow manage to get others (e.g., our children, our employees, etc.) to do what we have in mind. Technically, the question is whether we can liberate programming from its three main straightjackets: (1) having to directly produce a precise artifact in some language; (2) having actually to produce two separate artifacts (the program and the requirements) and having then to pit one against the other; (3) having to program each piece/part/object of the system separately. The talk will then get a little more technical, providing some evidence of feasibility of the dream, via LSCs and the play-in/play-out approach to scenario-based programming, and its more recent Java variant. The entire body of work around these ideas can be framed as a paradigm, which we call behavioral programming.

Short biography

David Harel is the William Sussman Professor at the Weizmann Institute of Science. His research interests are in several areas of computer science. In the past these included computability (especially levels of undecidability), logics of programs (especially dynamic logic), database theory (especially query languages and their power), and automata theory. In recent years, has activity is focused on software and systems engineering, object-oriented analysis and design, visual languages, layout of diagrams, modeling and analysis of biological systems, and the synthesis and communication of smell.

SUNDAY 19TH JUNE 2011

SEW'34 /CPA2011 WELCOME RECEPTION & REGISTRATION

19.00-21.00

Scholars Club is located at the heart of the University of Limerick's Student Centre. The Club has an intimate atmosphere and friendly staff serving food, hot drinks and an extensive range of beers. It is a great venue for a welcome reception. You can register here for any of the FM2011 events, from 19.00 until 21.00 and pick up your conference bags.

There will be a tasty selection of finger food and drinks served to welcome everyone to the University and kick off CPA and SEW. We hope to see you there!

MONDAY 20TH JUNE 201

FM2011 DOCTORAL SYMPOSIUM LRG-03

Room LRG-032. Old Lero Building

The Doctoral Symposium will be held on June 20th in conjunction with the FME Symposium FM2011. This aims to provide a helpful environment in which selected doctoral students can present and discuss their ongoing work, meet other students working on similar topics and receive helpful advice and feedback from a panel of researchers and academics

FM2011 MONDAY WORKSHOPS

TIME		VENUE
09.00	Refinement 2011 (Workshop 2)	KBG13
09.00	Overture/VDM Workshop 2011 (Workshop 3)	KBG14

09.00	UML&FM'2011	(Workshop 4)	KBG15

Tea/coffee will be served at 10.30 and 15.30 in the KBS foyer
Lunch will be served at 13.00 - 14.00 in the main restaurant

FM2011 MONDAY TUTORIALS

TIME		VENUE
14.00	Elena Troubitsyna et al.: "Correct-by-Construction Development of Fault Tolerant Systems" (Tutorial 3)	KBG10
14.00	Jun Sun and Jin Song Dong.: "Build Your Own Model Checker in One Month" (Tutorial 4)	KBG11

Tea/coffee will be served at 10.30 and 15.30 in the KBS foyer
Lunch will be served at 13.00 - 14.00 in the main restaurant

KNAPPOGUE CASTLE MEDIEVAL BANQUET





You will be captivated from the moment you arrive when you get your first taste of honey rich mead. Here the ladies of the Castle welcome guests with a programme of music, song and dance, taking you on a musical journey from medieval times to the present day.
Sean Lord of Clancullen's reputation for lavish parties and truly royal entertainment surpassed that of his father. We are delighted to honour this tradition of entertainment and hospitality to the present day at Knappogue Castle.We invite you to come and enjoy the experience.

The banquet will begin at 19.30. Buses will leav Cappavilla Village in UL at 18.30 and collect from Knappogue at 22.00.

TUESDAY 21ST JUNE 2011

FM2011 TUESDAY WORKSHOPS

Time		Room
09.00	Workshop on Formal Methods & Cryptography (CryptoForma2011) (Workshop 5)	KBG13
09.00	Formal Methods for Interactive Systems (FMIS2011) (W6)	KBG14
09.00	B 2011 (Workshop 7)	KBG15

Tea/coffee will be served at 10.30 and 15.30
Lunch will be served at 13.00 - 14.00 in the main restaurant

FM2011 TUESDAY TUTORIALS

Time		Room
09.00	Viktor Vafeiadis and Cliff Jones: "Rely/Guarantee-thinking and Separation Logic" (Tutorial 5)	KBG10
09.00	Peter Gorm Larsen and Marcel Verhoef: "Design of Real-time Embedded Control Systems using VDM++ and Bond graphs (Tutorial 6)	KBG11
14.00	Peter Gorm Larsen and Marcel Verhoef: "Design of Real-time Embedded Control Systems using VDM++ and Bond graphs" (continued) (Tutorial 6)	KBG11

Tea/coffee will be served at 10.30 and 15.30
Lunch will be served at 13.00 - 14.00 in the main restaurant

FM2011 WELCOME RECEPTION

The Lero Centre 19.00 – 21.00



The FM2011 Welcome Reception will take place in Lero's new home. This will the first reception in Lero's new headquarters! The building has been under construction for the past year.
There will be a selection of canapés and Prosecco available to welcome everyone to FM2011 and Lero's new building. A harpist and violinist will provide music. There will be a registration desk there so you can register and pick up your conference badges and bags. It would be great to see you all there!

WEDNESDAY 22ND JUNE 2011

MAIN CONFERENCE WEDNESDAY KEMMY BUSINESS SCHOOL KGB12

Time	
09.00	Opening Address
09.30	**Invited Talk** Janos Sztipanovits. *Model Integration and Cyber Physical Systems: A Semantics Perspective*
10.30	Coffee
11.00	**Cyber Physical Systems** *Does it Pay to Extend the Perimeter of a World Model?* Damm, Finkbeiner. *System Verification Through Program Verification*. Dietsch, Westphal, Podelski.

Adaptive Cruise Control: Hybrid, Distributed, and Now Formally Verified. Loos, Platzer, Nistor

12.45 Lunch

14.00 **Runtime Analysis**

TraceContract: A Scala DSL for Trace Analysis. Barringer, Havelund.

Using Debuggers to Understand Failed Verification Attempts. Müller, Ruskiewicz.

Sampling-based Runtime Verification. Bonakdarpour, Navabpour, Fischmeister

15.30 Coffee

16.00 **Case Studies / Tools**

Specifying and Verifying the SYNERGY Reconfiguration Protocol with LOTOS NT/CADP. Boyer, Gruber, Salaün.

Formal Development of a Tool for Automated Modelling and Verification of Relay Interlocking Systems. Haxthausen, Kjaer, Le Bliguet.

Relational Reasoning via SMT Solving. El Ghazi, Taghdiri.

Building VCL Models and Automatically Generating Z Specifications From Them. Amalio, Glodt, Kelsen.

17.45 Close

INDUSTRY DAY KBG-13



Kemmy Business School

FM 2011 Industry Day will be dedicated to sharing experience using formal methods in industrial environments

Tool Exhibitions and Demonstration in the Lobby

09.00	Registration and Welcome
09.30	Keynote Speaker
	Samin Ishtiaq. "*Slayer: Safety for Systems-Level Code*"
10.30	Coffee
11.00	Session I
	Formal Methods for Business Information Systems. Wei Wei
	Practical Formal Validation Method for Interlocking Systems. Marc Anthony
	Event-B Correctness and More: A Short Feedback.Marc Benveniste
12.30	Lunch
13.30	Session II
	Safety Formal Verification of Metro RailwaySignalling Systems: Feedback From RAPT Projects. Jean Marc Mota
	Doing the Same Thing Better-Improving the Validation Process by the Use of Fromal Methods. Aryldo Russo

Formal Analysis of Aerospace Domain models in an Industrial Context. Michael Dierkes

A FAQ Approach for Collecting Evidence on Formal Method Industrial Usage. Jean Christophe

15.30 ***Closing/ Networking Break***

FM2011 BBQ

A BBQ will be held at the Stables on Wednesday 22nd June at 19.00pm



Music will be provided by Planxty O'Rourke along with traditional Irish dancers.

We hope that this will provide you with an enjoyable opportunity to meet other delegates and colleagues

.

THURSDAY 23RD JUNE 2011

MAIN CONFERENCE THURSDAY KEMMY BUSINESS SCHOOL KGB12

09.00 **Invited Talk**
David Harel. *Some Thoughts on Behavioral Programming*

10.00 **Experience Report**
The 1st Verified Software Competition: Experience Report. Klebanov, Müller, N. Shankar, Leavens, Wüstholz, Alkassar, Arthan,
Bronish, Chapman, Cohen, Hillebrand, Jacobs, Leino, Monahan, Piessens, Polikarpova, Ridge, Smans, Tobies, Tuerk, Ulbrich, Weiß..

10.30 Coffee

11.00 **Program compilation and transformation**
Validated Compilation Through Logic. Li.

Certification of Safe Polynomial Memory Bounds. De Dios, Peña.

Relational Verification Using Product Programs. Barthe, Crespo, Kunz

12.45 Lunch

14.00 **Security**

Specifying Confidentiality in Circus. Banks, Jacob.

Formally Verifying Isolation and Availability in an Idealized Model of Virtualization. Barthe, Betarte, Campo, Luna.

The Safety-critical Java Memory Model: a formal account. Cavalcanti, Woodcock, Wellings.

15.30 **Coffee**

16.00 **Process Algebra**

Failure-Divergence Refinement of Compensating Communicating Processes. Chen, Liu, Wang.

Termination Without Tick in CSP. Dunne.

Timed Migration and Interaction with Access Permissions. Ciobanu, Koutny.

17.30 **Close**

FM2011 CONFERENCE BANQUET



The Conference banquet will take place in Dromoland Castle, one of the most impressive and distinguished castle hotels in Ireland with an extraordinary history stretching back to the 5th Century.Guests will dine in the Brian Boru Banquet Hall where they will enjoy an exquisite meal of gourmet foods and wines. A traditional entertainment show will be provided on the night by some of the region's finest musicians and dancers. The meal will be accompanied by music with instrumental pieces and ballads weaving the history of the music through the ages. There will also be a performance from an Irish dancer between courses and after the meal.

An authentic night of traditional Irish music, dance, food and craic, not to be missed!!

Buses will leave Cappavilla Village between 18.00 and 18.30 for arrival in Dromoland at 19.00 for a drinks reception. Guests will be seated for dinner at 20.00. The Keynote Speech will commence at 21.30 and buses will depart for the University from 10.00 to 10.30.

FRIDAY 24TH JUNE 2011

MAIN CONFERENCE FRIDAY KEMMY BUSINESS SCHOOL KGB12

09.00 **Invited Talk**
Jasmin Fisher. *Executable Biology: Towards Computer*

Programmes that Mimic Life.

10.00 **Education**

From a Community of Practice to a Body of Knowledge: A case study of the formal methods community. Bowen, Reeves.

10.30 Coffee

11.00 **Concurrency**

Verifying Linearisability with Potential Linearisation Points. Derrick, Schellhorn, Wehrheim.

Refinement-based Verification of Local Synchronization Algorithms. Méry, Mosbah, Tounsi.

Simulating Concurrent Behaviors With Worst-Case Cost Bounds. Albert, Genaim, Gomez-Zamalloa, Johnsen, Schlatte, Tapia Tarifa

12:45 FM12 Presentation

13.00 Lunch

14.00 **Dynamic Structures**

*Automatically Refining Partial Specifications for Program Verification.*Qin, Luo, Chin, He.

Structured Specifications for Better Verification of Heap-Manipulating Programs. Gherghina, David, Qin, Chin.

Verification of Unloadable Modules. Jacobs, Smans, Piessens.

15.30 **Coffee**

16.00 **Model checking**

*A Multi-Encoding Approach for LTL Symbolic Satisfiability Checking.*Rozier, Vardi.

*On Combining State Space Reductions with Global Fairness Assumptions.*Zhang, Sun, Pang, Liu, Dong.

17.00 **End**

CONFERENCE AT A GLANCE

June 2011	Description	Room
Sunday 19th	SEW/ CPA Welcome Reception & Registration ~ The Scholars Club	The Scholars Club
Monday 20th	Doctoral Symposium Old Lero Building	LRG-032
	Workshops Morning and Afternoon	KBG 13-14-15
	Tutorials Afternoon Only	KBG10-11
	Knappogue Castle Medieval Banquet	
Tuesday 21st	Workshops Morning and Afternoon	KBG 13-14-15
	Tutorials Morning and Afternoon	KBG10-11
	FM2011 Welcome Reception	Lero Centre
Wednesday 22nd	FM2011 Symposium	KBG12
	Industry Day ~ Kemmy Business School	Kemmy Foyer
	BBQ ~ Student Centre	The Stables,
Thursday 23rd	FM2011 Symposium	KBG12
	Conference Banquet	Dromoland Castle
Friday 24th	FM2011 Symposium	KBG12
End of Conference		

FM2011 CONFERENCE LOCATIONS



Kemmy Building. The main **FM2011 Symposium, Workshops, Tutorials, I-Day and Registration** will take place here.

Coffee breaks for all events will be in the foyer of the Kemmy Building

Schumann Building – CPA & SEW Workshops will take place here

The **Restaurant** is located in the main Building. All lunches are served here

Current Lero Building. **The Doctoral Symposium** will take place here

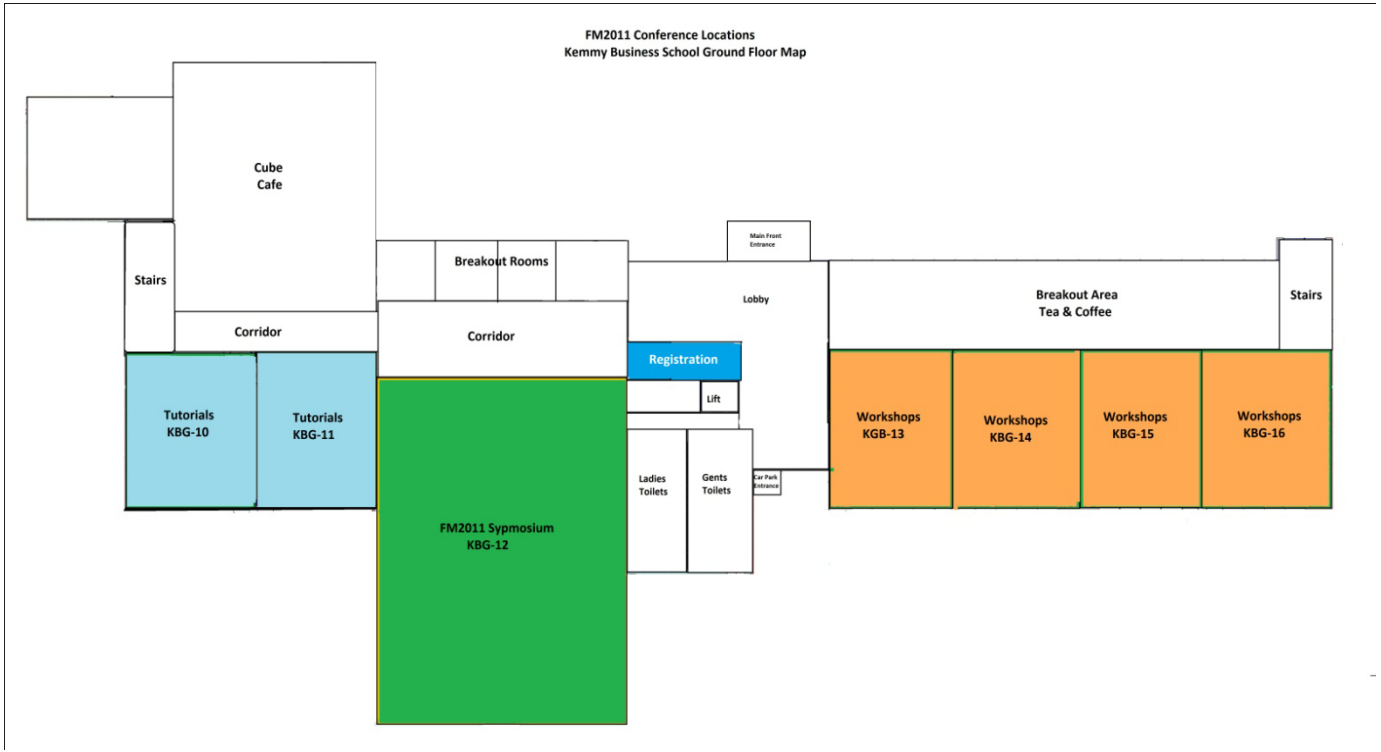
Scholars Bar - CPA opening reception and Registration

New **Lero** Building – **FM2011 Opening Reception**

Stables Bar – BBQ is on here

Cappavilla On Campus Accommodation. Accessible by Living Bridge

KEMMY BUSINESS SCHOOL GROUND FLOOR



CAMPUS RESTAURANT OPENING HOURS

Restaurants	Opening Hours
Starbucks - Main Building	Monday – Thursday: 8.30am – 4.00pm Friday: 8.30am – 3.30pm
Subway - Main Building	Closed for the Summer. Re-Opens Monday August 29th
Red Raisins - Main Building	Closed for the Summer Re-Opens Monday August 29th
Eden Restaurant - Main Building	Monday – Thursday: 10.00pm – 4.00pm Friday: 12.00pm – 3.00pm
Cube Café - Kemmy Business School	Monday – Friday: 8.30am – 3.00pm Closed from Friday July 29th.Re-Opens Monday August 22nd
Café Verdi - Health Sciences Building	**Café** Monday – Thursday: 8.30am – 3.00pm Friday: 8.30am – 2.30pm **Food** Closed. Re-Opens Monday September 5th
Café Allegro - Foundation Building	Monday to Thursday: 9.00am – 3.30pm Friday: 9.00am – 3.00pm
Café Sportif - Old Sports Building	Closed from Tuesday May 16th
Café Aroma - CSIS Building	Closed for the Summer Re-Opens Monday August 29th
River Café - Millstream Courtyard	Monday – Friday 9.00 – 3.00pm Closed from Friday July 29th.Re-Opens Monday August 22nd
Millstream Restaurant - Millstream Courtyard	Monday – Friday: 12.00 – 2.30pm Closed from Friday July 29th.Re-Opens Monday August 22nd
Common Room - Millstream Courtyard	Closed for the Summer.Re-Opens Monday August 22nd