THE ELEVENTH INTERNATIONAL CONFERENCE ON FRACTURE MECHANICS OF CONCRETE AND CONCRETE STRUCTURES

FraMCoS - 11

10 - 14 September, 2023

IA-FraMCoS

भारतीय विज्ञान संस्थान

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FOREWARD

Dear Delegates to FraMCoS 11,

It is my honor and privilege to welcome you in Bangalore, India, for the eleventh International Conference on Fracture Mechanics of Concrete and Concrete Structures (FraMCoS 11).

The International Association of Fracture Mechanics of Concrete and Concrete Structures (IA-FraMCoS) was established in the year 1991 to promote scientific research in the area of fracture mechanics applied to concrete and concrete structures. To achieve this, an international conference in this specialty area, the FraMCoS, was planned to be organized every three years. The first conference was held in Breckenridge, Colorado, USA, in 1992. Subsequent meetings were held at Zurich (1995), Gifu (1998), Cachan (2001), Vail (2004), Catania (2007), Jeju (2010), Toledo (2013), Berkeley (2016) and Bayonne (2019). The eleventh edition, supposed to be held in 2022, was postponed due to Covid pandemic.

This eleventh edition follows the tradition of the congress series as a focused forum for discussions amongst researchers from all around the world on the latest advances in the application of fracture mechanics to concrete structures. One of this conference's key feature is the participation of a large contingent of young researchers (under forty), with almost sixty percent of the papers being scheduled for presentation. This was possible due to the generous support and award of a travel grant to overseas researchers by the IA-FraMCoS.

I take this opportunity to thank the Board of Directors of IA-FraMCoS, the Advisory Board, the International Scientific Committee, the Local Organizing Committee, the Chairmen of various sessions, the Plenary and Keynote Lecturers and in particular, the authors for their valuable contributions.

With immense pleasure, I warmly welcome you as participants for FraMCoS 11. I hope that this conference will be extremely enriching and your trip very memorable.

J. M. Chandra Kishen

President of IA-FraMCoS

About IA – FraMCoS

Many conferences include discussions on damage, cracking and fracture of concrete, but mostly outside the context of fracture mechanics. Other conferences cover the subject of fracture mechanics, but rarely focused on its application to concrete and concrete structures. IA-FraMCoS was founded to help fill this gap.

Concrete is an archetypical quasibrittle material. It consists of brittle constituents and is characterized by a non-negligible material characteristic length, which endows the material with a behavior that is transitional between the stress-strain relations for distributed damage at small scales and linear elastic fracture mechanics at large scales. This transitional behavior poses difficult challenges for theoretical, experimental and computational research.

Professor Zdenek Bazant is the founding President of this scientific Society and continues to serve as an Honorary President. Originally, the only activity of IA-FraMCoS was the triennial conference series with a focus on concrete. Presently, it seeks to expand its activities to cover not only fundamental developments in concrete but also the promotion of fracture-based approaches in engineering practice.

The official website of IA-FraMCoS is https://framcos.org . Thanks to the efforts of our past president Prof. Victor Saouma, the complete collection of conference proceedings from all previous editions of FraMCoS is available in downloadable pdf format, which is undoubtedly, a big treasure on the website.

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CONFERENCE AT A GLANCE

Conference Venue: J. N. Tata Auditorium, Indian Institute of Science, Bangalore 560012

Sunday, 10 September 2023		
15:30 – 18:00	REGISTRATION AND HIGH TEA	J. N. Tata Auditorium

Monday, 11 September 2023		
8:00 – 8:45	REGISTRATION	Foyer area, J. N. Tata Auditorium
8:45 – 9.00	WELCOME ADDRESS	Main Auditorium
9:00 – 10:00	PLENARY LECTURE	Main Auditorium
10:00 – 10:35	KEYNOTE LECTURE	Main Auditorium
10:35 – 11:00	COFFEE BREAK	
11:00 – 12:45	KEYNOTE LECTURES	Main Auditorium
12:45 – 14:15	LUNCH BREAK	
14:15 – 15:35	PARALLEL SESSIONS	
15:35 – 16:00	COFFEE BREAK	
16:00 – 17:20	PARALLEL SESSIONS	
18:30 – 20:00	CULTURAL PROGRAM	Main Auditorium
20:00 – 21:00	DINNER	

FraMCoS-11	11th International Conference on Fracture Mechanics of Concrete and Concrete Structures	10-14 September 2023 Bangalore, India

Tuesday, 12 September 2023		
9:00 – 10:00	PLENARY LECTURE	Main Auditorium
10:00 – 10:35	KEYNOTE LECTURE	Main Auditorium
10:35 – 11:00	COFFEE BREAK	
11:00 – 12:45	KEYNOTE LECTURES	Main Auditorium
12:45 – 14:15	LUNCH BREAK	
14:15 – 15:35	PARALLEL SESSIONS	
15:35 – 16:00	COFFEE BREAK	
16:00 – 17:20	PARALLEL SESSIONS	
19:00 – 22:00	CONFERENCE DINNER	Four Seasons Hotel Bangalore

Wednesday, 13 September 2023		
8:50 – 10:00	KEYNOTE LECTURES	Main Auditorium
10:00 – 10:30	COFFEE BREAK	
10:30 – 11:05	KEYNOTE LECTURES	Main Auditorium
11:10 – 12:50	PARALLEL SESSIONS	
12:50 – 14:15	LUNCH BREAK	
14:15 – 16:00	PARALLEL SESSIONS	
16:00 – 16:30	COFFEE BREAK	
16:30 – 17:30	FraMCoS ASSEMBLY	

Thursday, 14 September 2023		
8:30 – 20:00	MYSORE TRIP (Lunch arranged)	

MAIN TOPICS

Mini Symposia

MS1	Cyclic damage processes in HPC and HPFRC – Computational and experimental aspects
MS2	Fracture and durability of Concrete Structures
MS3	Non-destructive testing
MS4	Computational Modelling

Technical Sessions

TS1	Structural concrete applications
TS2	Fatigue and cyclic behavior
TS3	Novel cementitious and other quasi brittle materials
TS4	Fracture properties
TS5	Cementitious interfaces
TS6	Analysis of AE parameters

PROGRAM DETAILS

Sunday, 10 September 2023		
15:30 – 18:00	**REGISTRATION AND HIGH TEA**	**J. N. Tata Auditorium**

Monday, 11 September 2023		
8:00 – 8:45	**REGISTRATION**	**Foyer area, J. N. Tata Auditorium**
8:45 – 9.00	**WELCOME ADDRESS** ***J. M. Chandra Kishen***	**Main Auditorium**
9:00 – 10:00	**PLENARY LECTURE 1** ***Chair: Gilles Pijaudier-Cabot***	**Main Auditorium**

Transformational Advance in Concrete Fracture Inspired by Gap Test and Curvature-Resisting Sprain Energy
- Zdeněk P. Bažant, Northwestern University, USA

10:00 – 10:35	**KEYNOTE LECTURE** ***Chair: Gilles Pijaudier-Cabot***	**Main Auditorium**
10:00 – 10:35	**Keynote 1:** X-ray CT-Based Measurements of Rate Effects in Fracture of High Performance Concrete *- Eric Landis, University of Maine, USA*	
10:35 – 11:00	**COFFEE BREAK**	
11:00 – 12:45	**KEYNOTE LECTURES** ***Chair: Tetsuya Ishida***	**Main Auditorium**
11:00-11:35	**Keynote 2:** Experimental and numerical study of fatigue damage in hardened cement paste at the microscale. *- Branko Šavija, Delft University of Technology, Netherlands*	
11:35 – 12:10	**Keynote 3**: A continuous approach for modeling fracture formation in porous, quasi-brittle materials and its application to callovo-oxfordian claystone. *- Christian La Borderie, Université de Pau et des Pays de l'Adour, France*	
12:10 – 12:45	**Keynote 4**: Advances on high-fidelity phase-field models for fracture mechanics of quasi-brittle materials and interfaces. *- Marco Paggi, IMT School for Advanced Studies Lucca, Italy*	
12:45 – 14:15	**LUNCH BREAK**	

14:15 – 15:35 **PARALLEL SESSIONS**

SEMINAR HALL A	SEMINAR HALL B	SEMINAR HALL C
MS1-I: Cyclic damage processes in HPC and HPFRC - Computational and experimental aspects ***Chair: Günther Meschke***	**MS4-I: Computational modeling** ***Chair: Jan Cervenka***	**TS2-I: Fatigue and cyclic behavior** ***Chair: Alvaro Mena Alonso***
MODELING OF DAMAGE PROCESSES IN CONCRETE UNDER MONOTONIC AND CYCLIC LOADING *– Vladislav Gudzulic , Koussay Daadouch, Günther, Meschke*	MODELING THE BEHAVIOR OF RC BEAMS SIMULTANEOUSLY STRENGTHENED FOR FLEXURAL AND SHEAR WITH CFRP SYSTEMS *-Joaquim Barros*	ENERGY DISSIPATION APPROACH TO CHARACTERIZE THE FRACTURE BEHAVIOR OF CONCRETE UNDER FATIGUE LOADING *- Bineet Kumar, Sonalisa Ray.*
INFLUENCE OF FIBER ORIENTATION ON THE CYCLIC BEHAVIOR OF STRAIN-HARDENING CEMENT-BASED COMPOSITES (SHCC) *-Dominik Junger, Viktor Mechtcherine .*	FINITE ELEMENT ANALYSIS OF CONCRETE USING COMPLEMENTARY X-RAY AND NEUTRON COMPUTED TOMOGRAPHY IMAGES *-Razakamandimby Ranjanoro Diamondra Fenosoa Tiana*	FRACTURE PROCESS ZONE ANALYSIS OF CEMENTITIOUS MORTARS SUBJECTED TO CYCLIC LOADING *-Nuhamin Eshetu Deresse*
MICROCRACK AND FATIGUE BEHAVIOR OF HIGH-PERFORMANCE FIBER-REINFORCED CONCRETE UNDER CYCLIC COMPRESSIVE LOADING *-Niklas Schäfer*	NUMERICAL MODELING OF MASONRY-LIKE MATERIALS UNDER CYCLIC LOADING *- Héloïse Rostagni, Cédric Giry , Frédéric Ragueneau*	FATIGUE DAMAGE PREDICTION OF CONCRETE USING ACOUSTIC EMISSION APPROACH WITH ACCOUNT OF CONCRETE HETEROGENEITY. *-Sandeep Kumar Dubey*
FATIGUE-INDUCED CONCRETE FRACTURE UNDER COMBINED COMPRESSION AND SHEAR STUDIED USING STANDARD CYLINDER AND REFINED PUNCH-THROUGH SHEAR TEST SETUP *-Mario Aguilar, Rostislav Chudoba, Martin Classen, Abedulgader Baktheer, Henrik Becks*	MULTI-SCALE MODELING OF THE ELASTIC PROPERTIES OF HYDRATED CEMENT PASTE WITH CONSIDERATION OF ADHESION BETWEEN PHASES. REACTIVE MOLECULAR DYNAMICS SIMULATIONS AND HOMOGENIZATION *- Sela Hoeun, Fabrice Bernard, Frédéric Grondin, Siham Kamali-Bernard, Syed Yasir Alam.*	EFFECTS OF COUPLED CORROSION AND FATIGUE ON THE PERFORMANCE OF REINFORCED CEMENT CONCRETE. *- Vivek Vishwakarma, Sonalisa Ray.*

15:35 – 16:00	**COFFEE BREAK**	
16:00 – 17:20	**PARALLEL SESSIONS**	

SEMINAR HALL A	SEMINAR HALL B	SEMINAR HALL C
MS2-I: Fracture and durability of concrete structures ***Chair: Branko Šavija***	**TS2-II: Fatigue and cyclic behavior** ***Chair: Dominik Junger***	**TS3-I: Novel cementitious and other quasi-brittle materials** ***Chair: G. Appa Rao***
INVESTIGATIONS INTO THE MICROSTRUCTURAL COMPOSITION OF CEMENT PASTE WITH CARBON DIOXIDE SEQUESTRATION *- Pranjal V Chechani, Ananth Ramaswamy*	MICROMECHANICS-BASED PHASE-FIELD MODELING OF FATIGUE IN (QUASI-)BRITTLE MATERIALS *-Mina Sarem*	A NEW MIX DESIGN METHOD FOR STEEL-FIBER REINFORCED CONCRETE BASED ON ITS RHEOLOGICAL AND FRACTURE BEHAVIOUR *- Ángel De La Rosa Velasco, Gonzalo Ruiz, Vaibhav W Masih, Riccardo Zanon.*
HOW DO CORROSION-DRIVEN MECHANISMS CHANGE CEMENTITIOUS MATERIAL'S PORE STRUCTURE AND IMPACT THE CORROSION-DRIVEN FRACTURE? *- Mohit Pundir, Ueli Angst, David Kammer.*	STOCHASTIC MODELING OF FATIGUE CRACK PROPAGATION IN CONCRETE BEAMS USING MARKOV CHAIN SIMULATION *- Sumit S Thakur, Pervaiz F. K. Mehmanzai.*	DIC ANALYSIS OF CRACK INITIATION AND GROWTH IN THE MODIFIED BRAZILIAN TEST OF STEEL FIBER-REINFORCED CONCRETE *- Vaibhav W Masih, Gonzalo Ruiz, Ángel De La Rosa Velasco, Rena C Yu.*
DISCRETE MODELING OF CONCRETE FAILURE AND SIZE EFFECT *- Gilles Pijaudier-Cabot, Madura Pathirage, Danyang Tong, Flavien Thierry, Gianluca Cusatis, David Gregoire.*	FATIGUE LIFE PREDICTION OF CEMENTITIOUS MATERIALS USING ARTIFICIAL NEURAL NETWORK. *- Keerthy Mary Simon, Bharati Raj J, Meenu Rajeev.*	CRACKING BEHAVIOUR UNDER CREEP IN STRAIN-HARDENING CEMENTITIOUS COMPOSITES (SHCC) APPLIED AS A PROTECTIVE LAYER ON REINFORCED CONCRETE FLEXURAL ELEMENTS. *- K. A. Shan D. Ratnayake, Christopher K. Y. Leung.*
FATIGUE CHARACTERIZATION OF A HIGH-PERFORMANCE STEEL FIBER REINFORCED CONCRETE (HPFRC) BY MEANS OF COMPRESSIVE, FLEXURAL, AND Z-TYPE SHEAR TESTS *- Marco Davolio; Hamza Azhar, Giovanni Volpatti, Alfredo Alan Florez Gutierrez, Davide Zampini, Francesco Lo Monte, Liberato Ferrara*	PREDICTION OF FATIGUE CRACK GROWTH RATE IN CORRODED REINFORCEMENT BARS *- Muneem Ahmad Dar, Pervaiz F. K. Mehmanzai.*	EXPERIMENTAL INVESTIGATIONS ON THE FRACTURE CHARACTERISTICS OF ULTRA-HIGH-PERFORMANCE CONCRETE USING DIFFERENT ASPECT RATIOS. *-Sneha*

18:30 – 20:00	**CULTURAL PROGRAM : *The Myriad colors of Indian music*** ***-Geetanjali, IISc***	**Main Auditorium**
20:00 – 21:00	**DINNER**	

Tuesday, 12 September 2023

9:00 – 10:00	**PLENARY LECTURE 2** ***Chair: Eric Landis***	**Main Auditorium**

Advancing Concrete Structures Design and Maintenance through Multi-scale and Multi-physics modeling-based Digital Twin Technology
- Tetsuya Ishida , University of Tokyo, Japan

10:00 – 10:35	**KEYNOTE LECTURE** ***Chair: Eric Landis***	**Main Auditorium**
10:00 – 10:35	**Keynote 5:** Predictive power of crack opening rate for flexural fatigue life of steel fiber-reinforced high and ultra-high performance concrete *- Steffan Anders, Bergische Universität Wuppertal, Germany*	
10:35 – 11:00	**COFFEE BREAK**	

11:00 – 12:45	KEYNOTE LECTURES *Chair: Bernhard L.A. Pichler*	Main Auditorium

11:00-11:35	**Keynote 6:** Acoustic emission monitoring on full-scale prestressed concrete (PC) deck beams *- Giuseppe Lacidogna, Politecnico di Torino, Italy*
11:35 – 12:10	**Keynote 7**: Autogenous self-healing in hydraulic-binder-based materials induced by compressive fatigue *- Gonzalo Ruiz, University of Castilla-La Mancha, Spain*
12:10 – 12:45	**Keynote 8**: Fracture toughness of high strength concrete in direct tension *- G. Appa Rao, Indian Institute of Technology, Chennai, India*

12:45 – 14:15	LUNCH BREAK	

14:15 – 15:35	PARALLEL SESSIONS	

MAIN AUDITORIUM	SEMINAR HALL A	SEMINAR HALL B	SEMINAR HALL C
TS1-I: Structural concrete applications ***Chair: Niels Kostense***	**MS1-II: Cyclic damage processes in HPC and HPFRC - Computational and experimental aspects** ***Chair: Xiaozhi Hu***	**MS4-II: Computational modeling** ***Chair: Christian La Borderie***	**TS2-III: Fatigue and cyclic behavior** ***Chair: Steffen Anders***
FRACTURE CHARACTERIZATION OF 3D - PRINTED ULTRA-HIGH PERFORMANCE FIBER CONCRETE BEAMS USING ACOUSTIC EMISSION *-Vignesh kumar ; Prabhat R Prem; Vaibhav Ingle; Greeshma Giridhar*	FATIGUE DAMAGE VERSUS CREEP DEFORMATION – DIFFERENTIATION USING THE DEVELOPMENT OF STIFFNESS *- Fabian M Weber, Steffen Anders.*	NON-LOCAL ANISOTROPIC DAMAGE COUPLED TO PLASTICITY. *- Mathias Tricoche, Alain Sellier, Alain Millard, Pierre Morenon , Aurelie Papon, Etienne Grimal, Romain Tajetti , Philippe Kolmayer, Simon Raude.*	PARIS LAW BASED MODELLING OF MIXED-MODE FATIGUE CRACK PROPAGATION IN CONCRETE-CONCRETE INTERFACE *- Zeeshan Abbas, Pervaiz F. K. Mehmanzai.*

MACHINE LEARNING REGRESSION MODELS FOR PEAK SHEAR STRENGTH PREDICTION OF SQUAT SHEAR WALLS *-Shashank Tyagi*	PHASE-FIELD MODEL FOR DEGRADATION OF STEEL FIBER-REINFORCED ULTRA-HIGH PERFORMANCE CONCRETE DURING LOW CYCLE FATIGUE *- Mangesh Pise, Jörg Schröder, Dominik Brands, Gregor Gebuhr, Steffen Anders.*	A PSO IDENTIFICATION PROCEDURE FOR PHASE-FIELD FRACTURE MECHANICS PARAMETERS *- Rakesh Kumar Tota, Marco Paggi.*	PREDICTING THE RATE OF FATIGUE CRACK PROPAGATION IN CONCRETE USING ACOUSTIC EMISSION *-Radhika V. and J. M. Chandra Kishen*
3 ACTION: A VIABLE SETUP FOR DIRECT-TENSILE TESTING OF CONCRETE *- Roberto Felicetti, Ramin Yarmohammadian, Enrico Cantu*	MACRO AND MESO STRUCTURAL PARAMETERS FOR ESTIMATING FATIGUE LIFE IN HIGH-PERFORMANCE FIBER-REINFORCED CONCRETE IN BENDING *- Alvaro Mena-Alonso, Gregor Gebuhr, Miguel A. Vicente, Steffen Anders, Jesús Mínguez, Dorys C. González.*	A NONLINEAR MODEL FOR PREDICTING THE EARLY AGE CREEP OF CONCRETE UNDER COMPRESSIVE LOADINGS *-Chaymaa Lejouad*	CARBONATION AND CHLORIDE-INDUCED CORROSION FATIGUE LIFE PREDICTION OF REINFORCED CONCRETE *- Sonali Bhowmik, Ram Lal Riyar.*
MESOSCALE SIMULATION FOR PREDICTING THE FLEXURAL CAPACITY OF RC BEAMS WITH CORROSION-INDUCED CRACKS BY 3D-RBSM *-Yi Gao; Suhas Joshi; Kohei Nagai*	APPROACH FOR DETECTION OF FATIGUE PHASES USING THE EXAMPLE OF HIGH-PERFORMANCE CONCRETE *- Gregor Gebuhr, Steffen Anders, Mangesh Pise, Dominik Brands, Jörg Schröder.*	EFFICIENCY OF BOND-SLIP RESPONSE FOR FE NUMERICAL MODELING OF REINFORCED CONCRETE- A REVIEW *- Abhishek Kumar, G. Appa Rao.*	FLEXURAL FATIGUE BEHAVIOR OF TEXTILE-REINFORCED CONCRETE PANELS *- Keerthana Kirupakaran, Nerswn Basumatary , Roshini Ramanathan.*

15:35 – 16:00	**COFFEE BREAK**	

16:00 – 17:20 **PARALLEL SESSIONS**

SEMINAR HALL A **MS2-II: Fracture and durability of concrete structures** *Chair: Jörg Schröder*	SEMINAR HALL B **TS5-I: Cementitious interfaces** *Chair: Gonzalo Ruiz*	SEMINAR HALL C **TS6-I: Analysis of AE parameters** *Chair: Se-Yun Kim*
IDENTIFYING DAMAGE IN CONCRETE USING CODA SIGNALS, MULTI-SCALE SIMULATIONS AND MACHINE LEARNING *- Jithender J. Timothy, Giao Vu, Christoph Gehlen, Günther Meschke*	MODIFIED CYCLIC MODEL OF INTERFACES WITH ROUGHENED SURFACE AND DOWEL BAR SUBJECTED TO NORMAL AND SHEAR STRESSES *-Yuya Takase*	Q-STATISTICS FOR INTER-EVENT TIME DISTRIBUTION OF ACOUSTIC EMISSION IN CONCRETE FRACTURE UNDER MONOTONIC LOADING *- Nitin Baban Burud, J. M. Chandra Kishen*
AXIAL MODE I CRACKING IN CORE REGIONS OF COMPRESSED REINFORCED CONCRETE COLUMNS SUBJECTED TO FIRE LOADING *- Bernhard L.A. Pichler, Maximilian Sorgner, Rodrigo Díaz Flores, Hui Wang, Christian Hellmich.*	STUDY ON INTERFACE FRACTURE AND FAILURE MODES IN STEEL PLATE AND CONCRETE EMBEDMENT *- Selva Ganesa Moorthi A, G. Appa Rao*	ACOUSTIC EMISSION ATTENUATION IN SINGLE-MIX AND FUNCTIONALLY LAYERED CONCRETE SLABS *- Sam Cocking, Mar Giménez Fernández, Nikolaos Tziavos, Janet Lees*
STUDY OF DAMAGE MECHANISMS IN ULTRA HIGH PERFORMANCE CONCRETE USING ACOUSTIC EMISSION TECHNIQUE *- Md Adil Ahmed, Sudakshina Dutta.*	NUMERICAL INVESTIGATION ON INTERLAYER AND FILAMENT FRACTURE BEHAVIOUR OF 3D PRINTED CONCRETE(3DPC) *- Pradeep Saravanan, Ananth Ramaswamy.*	ACOUSTIC EMISSION CHARACTERIZATION OF 3D-PRINTED ULTRA-HIGH PERFORMANCE CONCRETE BEAMS UNDER BENDING *-Prabhat R Prem; Vaibhav Ingle; Vignesh Kumar*
META-ANALYSIS OF CODE-BASED DESIGN METHODS TO QUANTIFY THE FIRE RESISTANCE RATINGS OF CONCRETE COLUMNS *- Mahadev Sitaram Rokade, David Rush, Tim Stratford.*	INVESTIGATION ON THE INFLUENCE OF INTERFACIAL TRANSITION ZONE (ITZ) ON CONCRETE CRACKING USING ACOUSTIC EMISSION TECHNIQUE. *- Dinesh Samal, Sonalisa Ray, Hemalatha T.*	TIME FUNCTION ANALYSIS OF ACOUSTIC EMISSIONS GENERATED DURING COMPRESSIVE FRACTURE PROCESS IN STEEL FIBER REINFORCED CONCRETE. *- Nikhil Gupta, Vidya Sagar R, J. M. Chandra Kishen*

19:00 – 22:00 **CONFERENCE DINNER** **Four Seasons Hotel Bangalore, Embassy One, Ganganagar**

Wednesday, 13 September 2023

8:50 – 10:00	KEYNOTE LECTURES *Chair: Marco Paggi*	Main Auditorium
8:50 – 9:25	**Keynote 9:** Modeling fibre-reinforced brittle-matrix composites: Cohesive (single-phase) vs bridged (multi-phase) crack options - *Federico Accornero, Politecnico di Torino, Italy*	
9:25 – 10:00	**Keynote 10**: Influence of inter-layer interfaces on fracture behavior of 3D printed concrete *-Kolluru Subramaniam, Indian Institute of Technology, Hyderabad, India*	

10:00 – 10:30	COFFEE BREAK	

10:30 – 11:05	KEYNOTE LECTURE *Chair: Marco Paggi*	Main Auditorium
10:30 – 11:05	**Keynote 11:** Fracture prediction for large concrete beams using measurements from small notched concrete samples - *Xiaozhi Hu, University of Western Australia, Australia*	

11:10 – 12:50 **PARALLEL SESSIONS**

MAIN AUDITORIUM MS3-I: Non-destructive testing *Chair: Giuseppe Lacidogna*	SEMINAR HALL A MS4-III: Computational modeling *Chair: Kolluru Subramaniam*	SEMINAR HALL B MS4-IV: Computational modeling *Chair: Amirtham Rajagopal*	SEMINAR HALL C TS1-II: Structural concrete applications *Chair: Angel De La Rosa Velasco*
ULTRASONIC INVESTIGATION ON CONCRETE CUBES SUBJECTED TO LOAD-INDUCED CRACKS *-Ramesh Gopal , Manu Santhanam; Bhaskar Sangoju*	MATERIAL MODELING AND SIMULATION OF 3D CONCRETE PRINTING PROCESS *-Jiří Rymeš, Jan Cervenka, Libor Jendele*	DISCRETE MESOSCALE MODELING OF CONCRETE USING DISCRETE EXTERIOR CALCULUS *-Pieter D Boom, Madyan Al Shugaa; Muhammad Rahman*	MODELING THE BEHAVIOR OF I-SHAPE CONCRETE BEAMS REINFORCED WITH FIBERS AND PRESTRESSED STEEL AND GFRP BARS *-Kamyar Bagherinejad Shahrbijri, Joaquim Barros, Isabel Valente, Gintaris Kaklauskas*
STUDY OF ACOUSTIC EMISSIONS RECORDED DURING UNIAXIAL COMPRESSION OF ULTRA HIGH PERFORMANCE CONCRETE USING TSALLIS GENERALIZED STATISTICS *-Kashif Naukhez, Vidya Sagar R, J. M. Chandra Kishen*	UNCERTAINTY IN THE SIMULATION OF CONCRETE FRACTURE AND COMPARISON WITH BLIND COMPETITIONS *-Jan Cervenka*	NUMERICAL MODELING OF FLEXURAL BEHAVIOUR OF TEXTILE REINFORCED CONCRETE *-Manas Bhadury, Keerthana Kirupakaran*	SHEAR STRENGTH OF RC DEEP BEAMS WITH AND WITHOUT WEB OPENINGS *-Rajprabhu A, G. Appa Rao*
USE OF INFRARED DATA FOR DETECTION OF CONCRETE DEFECT IN SERVICE THRUST BLOCK BASED ON HEAT BALANCE ANALYSIS *-Shibano Kazuma, Kimura Masaomi, Ohno Kentaro, Suzuki Tetsuya*	A NEW PERSPECTIVE ON CRACK INSTABILITY OF SPALLING CONCRETE IN FIRE *-Ramin Yarmohammadian, Roberto Felicetti, Patrick Bamonte*	STUDY ON INTERACTION BETWEEN FRACTURE AND CREEP OF UHSC USING MICRO INDENTATION TECHNIQUE *-Mahesh Shankar*	EFFECT OF NOTCH SIZE ON THE FRACTURE BEHAVIOUR OF CONCRETE *-Yogesh R., J. M. Chandra Kishen*

NON-DESTRUCTIVE DETECTION OF AN ARTIFICIAL DEFECT IN CONCRETE WITH INFRARED THERMOGRAPHY AND HEAT BALANCE SIMULATION *-Taiki Hagiwara*	COMPUTATIONAL MODELING OF DYNAMIC FRACTURE OF LAYERED COMPOSITE UNDER VARIOUS STRAIN-RATE LOADING *-Sobhan Pattajoshi*	A COMPARATIVE STUDY OF IMPLICIT AND EXPLICIT SOLUTION PROCEDURES FOR COMPUTATIONAL MODELING OF REINFORCED CONCRETE STRUCTURES *-Niels Kostense*	EFFECT OF DILATION ANGLE AND ECCENTRICITY PARAMETERS ON THE BEHAVIOUR OF RC SHEAR WALLS *-Hymavathi Annapoorna Chandrabhatl, G. Appa Rao*
FATIGUE FRACTURE BEHAVIOUR OF CONCRETE THROUGH WEDGE-SPLITTING TESTS *-Srinithya A. , Yogesh R., and J. M. Chandra Kishen*	VIRTUAL EXPERIMENTS FOR STEEL FIBER-REINFORCED HIGH PERFORMANCE CONCRETE BASED ON UNIT CELL CALCULATIONS - NUMERICAL CALIBRATION OF PHENOMENOLOGICAL MATERIAL MODEL *-Mangesh Pise, Dominik Brands, Jorg Schroder*	STUDY OF SCALED FRACTURE PARAMETERS IN CONCRETE USING FINITE SIMILITUDE THEORY *-Sonali Bhowmik, Mansi Gupta*	*SIZE AND SIZE EFFECTS ON THE COMPRESSIVE FATIGUE OF SFRC* *-Gonzalo Ruiz*

12:50 – 14:15	**LUNCH BREAK**	

14:15 – 16:00	**PARALLEL SESSIONS**	

MAIN AUDITORIUM	SEMINAR HALL A	SEMINAR HALL B	SEMINAR HALL C
MS4-V: Computational modeling ***Chair: Tong-Seok Han***	**TS3-II: Novel cementitious and other quasi-brittle materials** ***Chair: Federico Accornero***	**TS4-I: Fracture properties** ***Chair: Mohit Pundir***	**TS1-III: Structural concrete applications** ***Chair: Mathias Tricoche***
MODELING ANISOTROPIC FRACTURE IN QUASI-BRITTLE MATERIALS BY A PHASE FIELD APPROACH *-Amirtham Rajagopal*	EXPERIMENTAL STUDY: FRACTURE PROPERTIES OF FLY ASH-SLAG BASED GEOPOLYMER CONCRETE *-Rajeev Kumar Ranjan, Ananth Ramaswamy*	EVALUATION OF TENSILE STRENGTH OF SLAG BLENDED CEMENT PASTE USING MULTI-SCALE ANALYSIS FRAMEWORK *-Se-Yun Kim, Donghwi Eum, Deokgi Mun, Tong-Seok Han*	STUDY ON HYBRID STRENGTHENING FOR RC BEAMS DETERIORATED BY REBAR CORROSION *- Naoshi Ueda, Hanako Shimomura, Yasuhiko Sato, Mitsuhiko Ozaki*

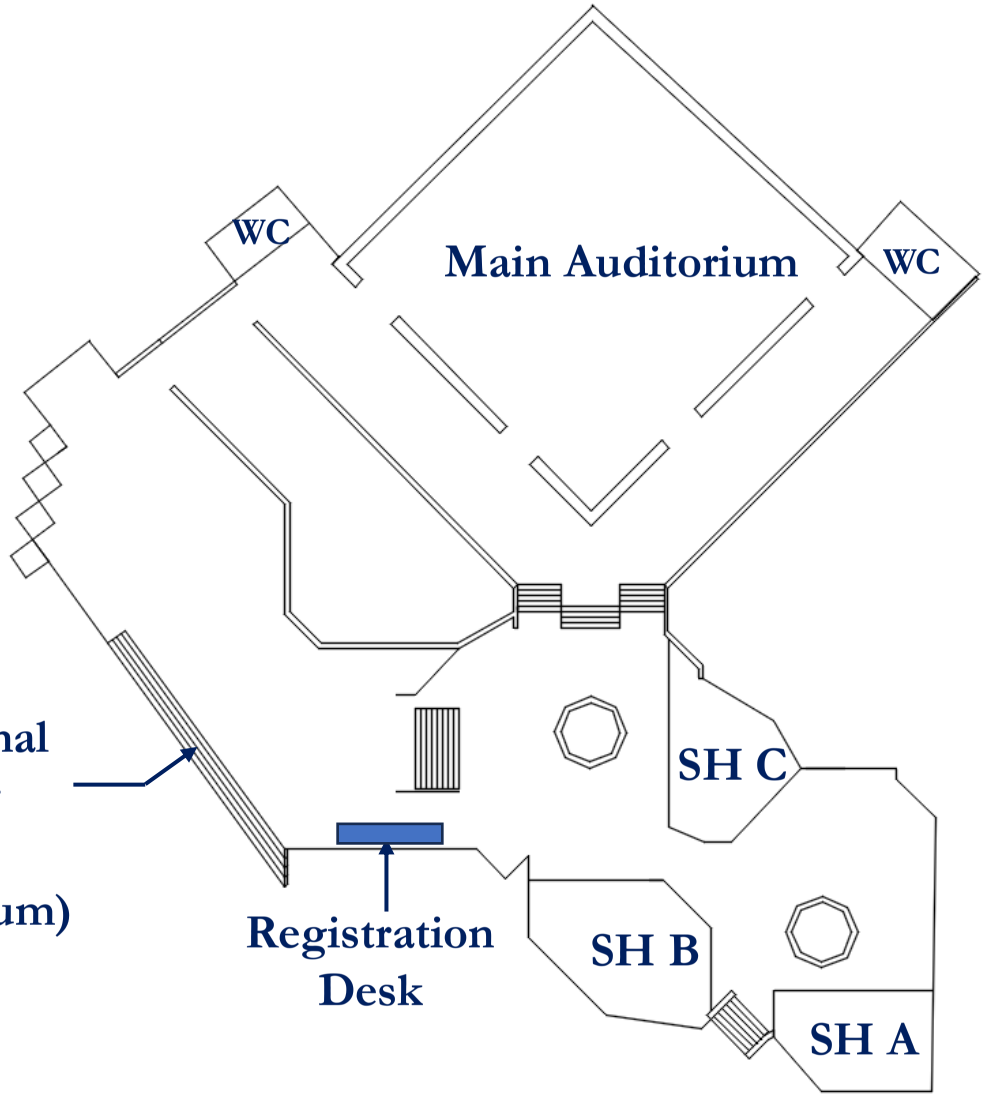
FINITE ELEMENT ANALYSIS OF CONCRETE CONE FAILURE MECHANISM IN POST-INSTALLED ANCHORS APPLIED TO FROST-DAMAGED CONCRETE *-Yutaro Ishida, Yuya Takase , Taito Shiokoshi , Tsutomu Ishigaki , Muneomi Takahashi*	EFFECT OF LOADING RATE AND GEOMETRY ON FLEXURAL BEHAVIOR OF TEXTILE REINFORCED CONCRETE *-Nerswn Basumatary, Roshini Ramanathan ,Keerthana Kirupakaran*	FRACTURE PROPERTIES IN COMPRESSION - DETERMINATION OF A COMPRESSIVE FRACTURE ENERGY USING DIGITAL IMAGE CORRELATION TECHNIQUE *- Steffen Anders, Arndt Goldack, Nils Mueller*	EFFECT OF STEEL FIBER DOSAGE ON CORROSION RESISTANCE OF REINFORCED CONCRETE *-Hemalatha T, Ramesh Gopal*
NUMERICAL MODELING OF GFRP BAR-REINFORCED CONCRETE SLABS-ON-GROUND SUBJECTED TO CONCENTRATED LOADS AT THE EDGE AND CORNER *-Mohammed Fasil , Muhammad Kalimur Rahman , Mesfer M. Al-Zahrani, Mohammed A. Al-Osta*	NONLINEAR FRACTURE BEHAVIOR OF FIBER REINFORCED SELF COMPACTING CONCRETE USING “R - CURVE” *-Santosh G Shah*	A NOVEL EXPERIMENTAL METHOD TO CALCULATE THE FRACTURE SURFACE ENERGY OF GEOTHERMAL BEDROCKS IN REALISTIC TEMPERATURE CONDITIONS, AS A CONTRIBUTION TO CLIMATE CHANGE MITIGATION *-Omar Rodriguez*	FRACTURE BEHAVIOR AND ITS INFLUENCE ON THE SHEAR CAPACITY OF HIGH-STRENGTH REINFORCED CONCRETE BEAMS WITH RECYCLED CONCRETE AGGREGATE *-Sourav Chakraborty, Kolluru V.L. Subramaniam*
INTERFACE NON-LINEAR FRACTURE STUDIES IN RECYCLED COARSE AGGREGATE CONCRETE UNDER FLEXURE WITH DIC *-Prashanth V*	EFFECT OF TYPE OF NUTRIENT ON CRACK HEALING PERFORMANCE OF BACTERIAL CONCRETE *-P Gouthami Patnaik*	FRACTURE TOUGHNESS OF PLAIN CONCRETE UNDER MODE II LOADING *-Sudhakar Darla, G. Appa Rao*	MIXED MODE CRACK PROPAGATION IN REINFORCED CONCRETE BEAMS - EFFECTS OF SIZE AND REINFORCEMENT RATIOS *-Prashanth M.H, J. M. Chandra Kishen*
	ECC SUBJECTED TO DYNAMIC TENSILE LOADING USING THE MODIFIED SPLIT HOPKINSON BAR (SHPB) TEST *-Jiaying Wei, Wang Tianyu*		

16:00 – 16:30	**HIGH TEA**	
16:30 – 17:30	**FraMCoS ASSEMBLY**	**Main Auditorium**

Thursday, 14 September 2023

8:30 – 20:00	**MYSORE TRIP** **(Lunch arranged)**	

LAYOUT OF J. N. TATA AUDITORIUM



Entrance to National Science Seminar Complex (J. N. Tata Auditorium)

Registration Desk

Plenary lectures, Keynotes and Cultural program

- Main Auditorium

Parallel Sessions

- Main Auditorium
- Seminar Hall A
- Seminar Hall B
- Seminar Hall C

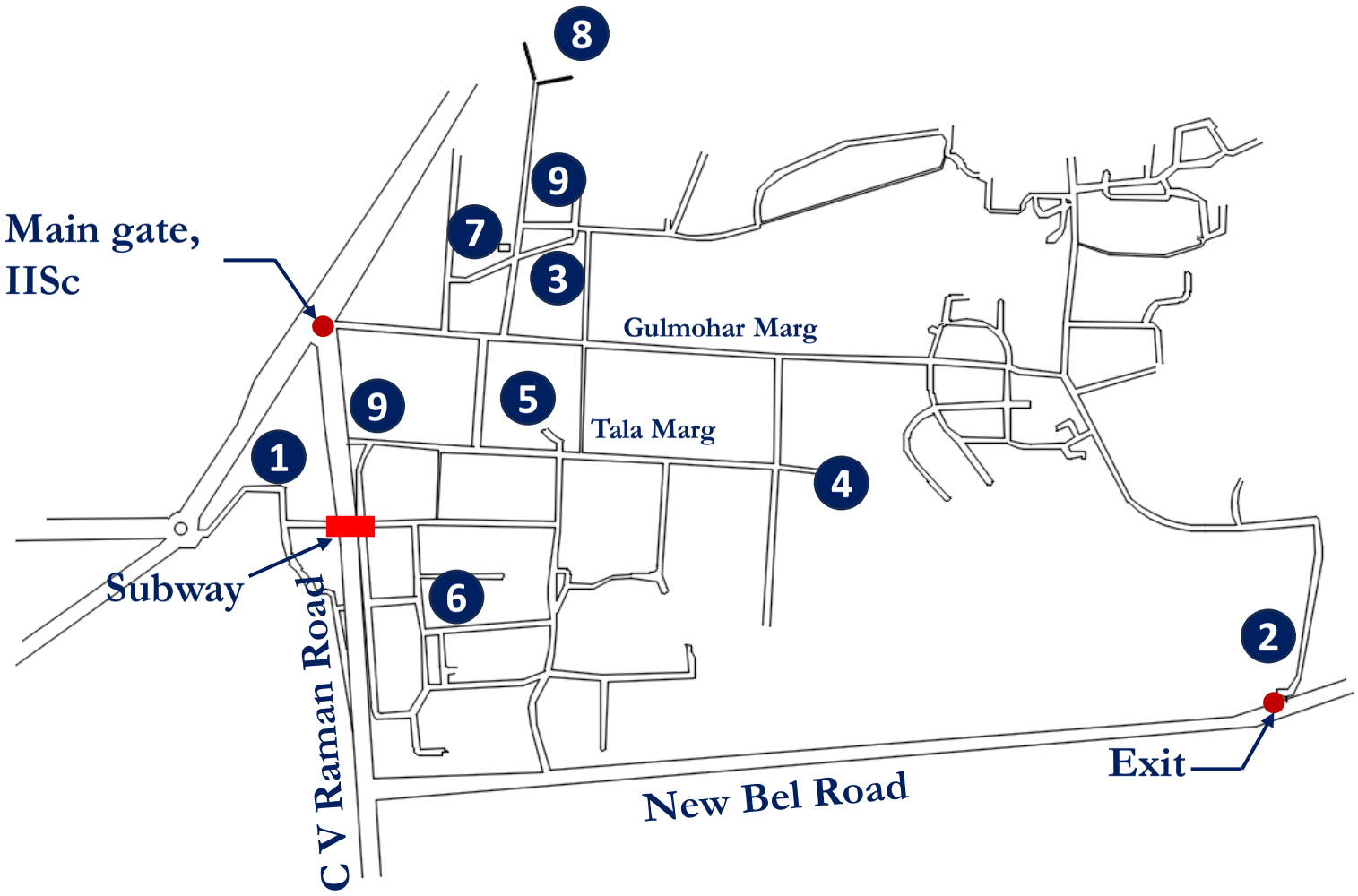
SH: Seminar Hall

WC: Washrooms (Ladies and Gents)

FraMCoS-11

11th International Conference on
Fracture Mechanics of Concrete and Concrete Structures

10-14 September 2023
Bangalore, India



1. J. N. Tata Auditorium
2. Centenary Visitors House
3. Hoysala Guest House
4. Main Guest House
5. Main Building
6. Department of Civil Engineering
7. Nesara Restaurant
8. Sarvam Food court
9. ATM

J. N. Tata Auditorium

Centenary Visitors House

Main Guest House

Hoysala House

Department of Civil Engineering
Indian Institute of Science
Bangalore, India