

IRFAN HABEEB C N

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RESEARCH INTERESTS

- Numerical modeling and Finite Element Analysis
- Continuum damage models
- Experimental dynamic fracture

EDUCATION

Degree	Supervisor	Institution	Year of completion
PhD in Mechanical Engineering (awaiting exam)	Dr. Shmuel Osovski	Technion – IIT	2020
M.Tech in Aerospace Engineering	Dr. Sivashambu Mahesh	IIT Madras, India	2015
B.Tech in Aerospace Engineering		IIT Madras, India	2014

SCHOLASTIC ACHIEVEMENTS

- **Marie Skłodowska-Curie ITN-ETN** scholarship from Project [ITN OUTCOME](#) organized by European Union's Horizon 2020 research and innovation program.
- All India Rank 89 in Graduate Aptitude Test in Engineering-2014 (top 0.5%).

PUBLICATIONS

- "Strength distribution of planar local load sharing bundles" - C. N. Irfan Habeeb and S. Mahesh, *Physical Review E*, 2015. **92(2)**:022125.
- "Crack-void interaction in PMMA under dynamic loading"-C.N.Irfan Habeeb and S.Osovski, C.Dascalu(Submitted)
- "Effect of strain rate on fracture using 3D printed soft materials" - C. N. Irfan Habeeb, S. Osovski, V. Slesarenko and S. Rudykh. (In preparation)
- "Effect of strain rate on metal forming using GTN damage model"- C. N. Irfan Habeeb, S. Osovski (In preparation)

RESEARCH HIGHLIGHTS

- **Doctoral thesis** (Technion-IIT, 2016-present)
Title: *Crack-flaw interactions under dynamic brittle fracture*.
 - Experiments and numerical analysis of the dynamic fracture of PMMA to examine the influence of pre-existing flaws on fracture.
 - High-speed photography and Digital Image Correlation (DIC) are employed for the data extraction.
- **Supplementary projects** during the PhD.
 1. Fracture of soft interface under static and dynamic loading.
 - Experimental and numerical analysis of the soft 3D printed material fracture at different strain rates.
 2. Numerical analysis of the effect of environmental factors in metal forming using GTN damage model.
 - Effect of strain rate, temperature and friction on ductile forming by engaging the Nakajima test.
 3. Yield surface development of Gyroid structure using FEM.
 - Yield surface assessment using GTN damage model in finite element frame.
 4. Dynamic brittle fracture of additively manufactured SiC.
 - Dynamic brittle fracture characteristics of SiC using Highspeed photography and DIC.
- **Master's thesis** (IIT Madras, 2014-2015)
Title: *Strength distribution of planar local-load sharing bundles*.
 - Numerical analysis and modeling of the failure patterns in uniaxial fibrous composite under axial load to predict the macroscopic composite characteristics.

SECONDMENTS AND INTERNSHIPS

- Internship: At the **Airbus** Defense and Space S.A.U, Madrid (*July-Sept 2019*) to implement a numerical model of pyrotechnic bolt-cutter employed in the stage separation unit of the satellite launcher.
 - Finite element model was developed with Johnson-Cook material model embedded in the VUMAT subroutine apt to run in Abaqus software.
- Secondment 1: With Dr. C. Dascalu at the LEM3 (*University of Lorraine, France, July-Sept 2018*) to implement a continuous damage model for dynamic brittle fracture and to validate the model using empirical data.
 - Calibrated the damage model with the dynamic brittle fracture experiment on PMMA
- Secondment 2: With Dr. Á Vaz-Romero Santero at the University of Carlos III Madrid (*June-July 2019*) to understand and implement numerical models using the finite element program FEAPpv.

DEVELOPED NUMERICAL TOOLS

(<https://github.com/irfancn>)

- GTN damage model: Implemented in a VUMAT&UMAT subroutine with strain rate, temperature, shear stress dependency.
- Phase Field Model: UEL (User Element) subroutine to implement the continuous damage model developed from the PFM for implicit system (developed from the work of [MA Msekh](#)).
- Matlab codes: Assessment of fracture characteristics (J-Integral, Stress Intensity Factor, crack path and crack propagation velocity) from fracture images by means of the DIC and additional image processing tools.
- VUMAT&UMAT subroutines: For Cohesive Zone Model, Viscoelastic material model (Kelvin-Voigt) and Johnson-Cook material model were developed for FEA.

SCIENTIFIC EVENTS

- Conference talk: Irfan Habeeb and S. Mahesh. "*Reliability of fibre bundles*". Talk at PRAVARTANA conference, held at Indian Institute of Technology, Kanpur (March 2015).
- Conference talk: 22nd European Conference on Fracture (ECF22), Serbia on the topic, "*Crack-flaw interactions in brittle materials under brittle fracture*" (Aug 2018).
- Symposium & conference: Symposium "*Damage and Failure Mechanics: from Microstructure to Macroscopic Response*" held within the framework of the *EMI 2016 International Conference*, Oct 25-28, Lorraine, France.
- Industrial workshop: "*Extreme structural mechanics in Aerospace applications*", June 22-23, 2017, Getafe, Spain.
- Advanced training course: "*Damage and failure of solids subjected to extreme loading conditions*" at the International Centre of Mechanical Sciences (CISM), Oct 2018, Udine, Italy.
- Industrial workshop: "*Extreme Structural Mechanics in defense applications*" held at Technion – IIT, Feb 6, 2018, Haifa, Israel.
- Summer school: On fracture mechanics held at European Conference on Fracture (ECF 22), Aug 25-26, 2018, Belgrade.
- Colloquium: Damage and failure of engineering materials under extreme loading conditions (605), May 21-24, 2019, Madrid, Spain.

SKILLS

- Programming in – Fortran, Python, C++ and Javascript.
- Knowledge and experience in mathematical modeling, programming and solid modeling – Matlab, Mathematica, Abaqus, SolidWorks, AutoCAD, Pro-E and FEAPpv (FEA program).
- Experience in image processing.

DECLARATION

I hereby declare that all the information given above is true to the best of my knowledge.