

Dear Members of the Selection Committee,

I am writing to express my strong interest in the advertised position in the Civil Engineering Department at IIT Bombay, specializing in Geotechnical Engineering with an emphasis on Environmental Geotechnology. As a researcher and educator, my aim is to contribute to the department's legacy of excellence by advancing cutting-edge research in Geotechnical and Geoenvironmental Engineering and fostering transformative educational experiences.

### **(a) Why I Wish to Join IIT Bombay**

IIT Bombay's reputation for fostering innovative research and interdisciplinary collaboration aligns closely with my academic aspirations. The institute's dedication to addressing critical global challenges in infrastructure development and environmental sustainability deeply resonates with my vision. As a globally recognized hub for excellence, IIT Bombay offers an unparalleled platform to advance my research on integrating Artificial Intelligence (AI) and sensor-based technologies with traditional geotechnical practices. Moreover, the opportunity to mentor and inspire a diverse cohort of students at one of India's premier institutions is a profound motivator for me.

### **(b) Meeting the Requirements of the Advertised Post**

I hold a PhD in Geotechnical Engineering from Monash University, where my research focused on developing innovative solutions such as Australia's first Intelligent Compaction Analyzer, which integrates AI-driven predictive models with real-time sensor data. This work, recognized through a patent and more than three required SCI publications, demonstrates my ability to lead pioneering research. During my master's and bachelor's studies, I contributed to developing novel experimental setups and participated in interdisciplinary research, including work on Microbially Induced Calcite Precipitation (MICP).

With over four years of teaching experience, I have successfully designed and delivered courses such as Advanced Geomechanics and Environmental Geomechanics, employing methodologies that prioritize critical thinking, inclusivity, and practical application. My contributions to curriculum development, combined with my interdisciplinary research background, align well with IIT Bombay's mission to foster academic excellence and innovation.

### **(c) Research and Teaching Plans**

#### *Research Vision:*

My research seeks to revolutionize Geotechnical and Geoenvironmental Engineering by integrating AI, Machine Learning (ML), and sensor-based technologies to address challenges in infrastructure development and environmental sustainability. Short-term goals include evaluating the use of recycled materials for ground improvement and expanding AI-driven predictive models for real-time geotechnical monitoring. Long-term aspirations involve scaling up sustainable solutions like Microbially Induced Calcite Precipitation (MICP) for field applications and developing digital twins of geotechnical systems for predictive maintenance.

*Proposed Courses:*

I propose to teach the following courses at IIT Bombay:

- CE-236: Soil Mechanics
- CE-323: Geotechnical Engineering I
- CE-330: Geotechnical Engineering II
- CE-342: Introduction to Geotechnics
- CE-407: Foundation Engineering
- CE-488: Environmental Geotechnics
- CE-632: Ground Improvement
- CE-641: Environmental Geomechanics
- CE-643: Experimental Geotechnics

Additionally, I aim to develop new modules that integrate AI, sustainability, and advanced computational techniques into the curriculum, ensuring students are equipped to address modern engineering challenges.

At IIT Bombay, I aspire to cultivate a dynamic environment where students and researchers collaborate to innovate solutions that address critical infrastructure and environmental challenges. My interdisciplinary approach, industry collaborations, and commitment to research excellence position me to make meaningful contributions to the department's objectives.

Thank you for considering my application. I look forward to the opportunity to discuss my vision and how it aligns with IIT Bombay's mission.

Sincerely,

**Amir Tophel**

Postdoctoral Research Fellow  
Monash University, Australia

# Amir Tophel

Postdoctoral Research Fellow (Oct 2023-current)  
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Monash University  
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Clayton, VIC 3168

## EDUCATION

<i>PhD</i> , Geotechnical Engineering Monash University, Melbourne, Australia Thesis: Proximal Estimation of Soil Density using Sensing and Modelling	(July 2019-Oct 2023)
<i>Master of Technology</i> , Geotechnical and Geoenvironmental Engineering Indian Institute of Technology (IIT), Delhi, India Thesis: The behavior of Sand Grain Loaded Uniaxially and Deformation Analysis by Digital Image Correlation (DIC) GPA 9.6/10	(July 2017-June 2019)
<i>Bachelor of Technology</i> , Civil Engineering Indian Institute of Technology (IIT), Delhi, India Thesis: Improving the engineering properties of Yamuna sand using Biocalcification GPA 8.5/10	(July 2013-June 2017)

## EDITORSHIP

**Guest Editor**, *Infrastructures*, Special Issue on “Advanced Research in Geotechnics for Sustainable Infrastructure Development” (2024)

## REVIEWER

**Reviewer**, Journal of Rock Mechanics and Geotechnical Engineering, Computers and geotechnics, Journal of environmental management, Experimental techniques, Buildings

## TEACHING EXPERIENCE

- TA: CIV5147 (Advanced Geomechanics) (July 2024-Oct 2024)
- TA: CIV3247 (Geomechanics II) (July 2024-Oct 2024)
- TA wDoc: CIV3248 (Groundwater and environmental geomechanics) (Feb 2024-July 2024)
- TA: CIV5147 (Advanced Geomechanics) (July 2023-Oct 2023)
- TA: CIV3247 (Geomechanics II) (July 2023-Oct 2023)
- TA wDoc: CIV3248 (Groundwater and environmental geomechanics) (Feb 2023-July 2023)
- TA wDoc: CIV2263 (Water Systems) (Feb 2023-July 2023)
- TA: CIV3247 (Geomechanics II) (Aug 2022-Oct 2022)
- TA: CIV3248 (Groundwater and environmental geomechanics) (Mar 2022-July 2022)
- TA: CIV4248 (Ground hazards engineering) (Mar 2022-July 2022)
- TA: CIV3248 (Groundwater and environmental geomechanics) (Mar 2021-July 2021)
- TA: CIV5886 (Infrastructure Geomechanics) (Mar 2020-July 2020)

## JOURNAL PUBLICATIONS

- **Tophel, A.**, Dutta, T. T., Walker, J. P., Bodin, D., & Kodikara, J. (2024). Influence of initial state and residual stresses on the modulus-density relationship of geomaterials: insights from multiple experimental setups. International Journal of Pavement Engineering, 25(1), 2418920.

- Dutta, T. T., **Tophel, A.**, & Kodikara, J. (2024). Resilient and rutting response of unbound granular material and subgrade soil influenced by initial state and stress conditions. *Road Materials and Pavement Design*, 1-33.
- Chen, L., **Tophel, A.**, Hettiyadura, U., & Kodikara, J. (2024). An Investigation into the Utility of Large Language Models in Geotechnical Education and Problem Solving. *Geotechnics*, 4(2), 470-498.
- **Tophel, A.**, Walker, J. P., Dutta, T. T., Bodin, D., and Kodikara, J. (2023). Model development to Predict Dynamic Interactions of Roller and Geomaterial using Simulated Roller Compaction. *Transportation Geotechnics*, 39, 100946.
- **Tophel, A.**, Vogt, S., and Ramana, G. V. (2023). Investigation of deformation behaviour of uniaxially loaded sand grains using a novel high-resolution imaging apparatus and ensemble machine learning models. *International Journal of Geotechnical Engineering*, 17(5), 464-479.
- **Tophel, A.**, Dutta, T. T., Otsubo, M., and Kuwano, R. (2023). Machine learning models to estimate stress wave velocities of cohesionless soils during triaxial compression influenced by particle characteristics. *Soil Dynamics and Earthquake Engineering*, 165, 107649.
- **Tophel, A.**, Walker, J. P., Dutta, T., and Kodikara, J. (2022). Theory-Guided Machine Learning to Predict Density of Sand Dynamically Compacted Under Ko Condition. *Acta Geotechnica*, 1-19
- **Tophel, A.**, Walker, J. P., Lu, Y., and Kodikara, J. (2022). Proximal Sensing of Density During Soil Compaction by Instrumented Roller. *Australian Geomechanics Journal* 57(3):161–169
- Singh, P., **Tophel, A.**, and Swamy, A. K. (2017). Properties of asphalt binder and asphalt concrete containing waste polyethylene. *Petroleum Science and Technology*, Taylor & Francis, 35(5), 495–500

## PATENT

- **Tophel, A.**, Kodikara, J., and Walker, J. P. (2021). Systems and methods for measuring/estimating geomaterial layer properties due to compaction. *Patent Cooperation Treaty (PCT)*, AU2021/051505, Australia.

## CONFERENCE PUBLICATIONS

- Chen, L., Ghorbani, J., **Tophel, A.**, and Kodikara, J. (2023). An unsaturated soil mechanics approach for performance-based intelligent compaction. In E3S Web of Conferences (Vol. 382, p. 12002). EDP Sciences.
- **Tophel, A.**, Walker, J. P., Dutta, T. T., and Kodikara, J. (2022, September). Using a Novel Instrumented Roller to Estimate Soil Dry Density During Compaction. In International Conference on Trends on Construction in the Post-Digital Era (pp. 538-546). Cham: Springer International Publishing.
- **Tophel, A.**, and Ramana, G. V (2021). Control and Regeneration of Degraded Protected Forest Area using Microbially Induced Calcite Precipitation: A review. Presented at the Euro-Mediterranean Conference for Environmental Integration
- **Tophel, A.**, and Ramana, G. V. (2019). Protecting Heritage Structures Against Liquefaction: Recent Developments. Recent Advances in GeoEnvironmental Engineering, Geomechanics and Geotechnics, and Geohazards. *Advances in Science, Technology & Innovation*, 507–509

## AWARDS

- Finalist, Project Innovation Award, “Intelligent Construction of Transport Infrastructure Addressing Sustainability, Digitalisation and Productivity, Engineers Australia (2023)
- Finalist, Australian Geomechanics Society (AGS) Best PhD research award (2022)
- Winner and People’s choice award winner (3 Minute Thesis round, Department of Civil Engineering) (June 2021)
- People’s choice award winner (3 Minute Thesis round, Faculty of Engineering) (July 2021)
- Runner up (3MT round, Monash Wild card entry) (July 2021)

## SCHOLASTIC ACHIEVEMENTS

- Monash Research Impact Fund of 50,000 AUD, Monash University (Oct 2022)
- Monash University Postgraduate Travel grant to attend International Conference (Sep 2022)
- Monash Research Scholarship (MRS) (July 2019)
- Faculty of Engineering International Postgraduate Research Scholarship (FEIPRS), Monash University (July 2019)
- Monash University Graduate Scholarship (MGS) (July 2019)
- DAAD scholarship (Sept 2018- March 2019)
- Secured 1st Rank in M.Tech in Geotechnical and Geoenvironmental Engineering in IIT Delhi with GPA of 9.6 (June 2019)
- DAAD Fellow, Department of Civil, Geo and Environmental Engineering, Technische Universität München (TUM) Germany (September 2018-March 2019)
- Ministry of Higher Resource Development (MHRD) Post Graduate Scholarship, IIT Delhi (2017-2019)
- Discover and Learn R&D Award: Initiated by Industrial Research and Development (IRD) Unit IIT Delhi. Grant of 2 Lakh INR per year for 4 years (January 2017)
- Summer Undergraduate Research Award (SURA): One of the select few projects approved and recognized by IRD IIT Delhi. A project exploring the utilization and reuse of waste polyethylene (2014)
- IIT Delhi Semester Merit Award - Top 7% of all students in the department (2016-2017)

## POSITION OF RESPONSIBILITY

*HDR Mentor, Monash Graduate Association (MGA), Monash University* (Aug 2021-Nov 2021)

- Responsible for guiding new Monash PhD/Masters by Research students to survive and thrive through the early stages of their research journey

*Deputy President, Civil Postgraduate Committee, Monash University* (Feb 2021-Jan 2022)

- Newly elected member of the Postgraduate committee, responsible for overseeing departmental matters
- Core committee member for organizing the 1st Engineering Conference at Monash University

*Academic Vice-president, Civil Postgraduate Committee, Monash University* (May 2020-Feb 2021)

- Core team member of the Postgraduate committee, responsible for handling all funds and grants

*Convener, Department of Civil Engineering, Co-Curricular and Academic Interaction Council, IIT Delhi* (2015-2017)

- Effectively represented over 400+ Undergraduate students and awarded outstanding contribution (2017) and significant contribution (2016) to CAIC IIT Delhi

*Nucleus team member (Civil Engineering department), IIT Delhi* (Dec 2014- March 2017)

- Spearheaded a team of 5 to invite and pitch over 200 companies for training & Placement

*Civil Engineering Department Coordinator, Tryst IIT Delhi (Annual Technical Fest)* (Feb 2016)

- Spearheaded a team of 30 to organize various events in the technical fest of the college (TRYST) in association with the Civil Engineering departmental fest (DIMENSIONS).

# भारतीय प्रौद्योगिकी संस्थान दिल्ली

अभिषद की अनुशंसा पर

सिविल इंजीनियरी में प्रौद्योगिकी स्नातक  
की उपाधि

## अमीर तोफेल

को प्रदान करता है। आपने इस उपाधि के अर्जन हेतु विनियम विहित निर्धारित अपेक्षाओं को वर्ष 2017 में सफलतापूर्वक पूर्ण किया है।  
10 अंकीय मापक्रम में आपका उपाधि कोटि अंक माध्य 8.517 है।

भारतीय गणराज्य में दिल्ली स्थित संस्थान की मुद्रा अंकित यह उपाधि आज दिनांक 4 नवम्बर 2017 को प्रदान की गई।

### Indian Institute of Technology Delhi

Upon the recommendation of the Senate hereby confers the degree of

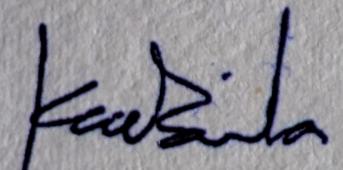
Bachelor of Technology in Civil Engineering

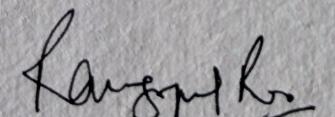
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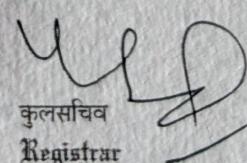
## AMIR TOPHEL

who has successfully completed in the year 2017 the requirements prescribed under the regulations for the award of this degree  
with a Degree Grade Point Average of 8.517 on a 10 point scale.

Given this day, the 4<sup>th</sup> of November 2017, under the seal of the Institute at Delhi in the Republic of India.

  
अध्यक्ष, अभिशासक परिषद  
Chairman, Board of Governors

  
अध्यक्ष, अभिषद एवं निदेशक  
Chairman, Senate & Director

  
कुलसचिव  
Registrar



# भारतीय प्रौद्योगिकी संस्थान दिल्ली

अभिषद की अनुशंसा पर

भूतकनीकी एवं भूपर्यावरणीय इंजीनियरी में प्रौद्योगिकी निष्णात  
की उपाधि

## अमीर तोफेल

को प्रदान करता है। आपने इस उपाधि के अर्जन हेतु विनियम विहित निर्धारित अपेक्षाओं को वर्ष 2019 में सफलतापूर्वक पूर्ण किया है।

10 अंकीय मापक्रम में आपका उपाधि कोटि अंक माध्य 9.625 है।

भारतीय गणराज्य में दिल्ली स्थित संस्थान की मुद्रा अंकित यह उपाधि आज दिनांक 2 नवम्बर 2019 को प्रदान की गई।

**Indian Institute of Technology Delhi**

Upon the recommendation of the Senate hereby confers the degree of

**Master of Technology in Geotechnical and Geoenvironmental Engineering**

on

**AMIR TOPHEL**

who has successfully completed in the year 2019 the requirements prescribed under the regulations for  
the award of this degree with a Degree Grade Point Average of 9.625 on a 10 point scale.

Given this day, the 2<sup>nd</sup> of November 2019, under the seal of the Institute at Delhi in the Republic of India.

*Rangarajan*

अध्यक्ष, अभिशासक परिषद  
Chairman, Board of Governors

*Rangarajan*

अध्यक्ष, अभिषद एवं निदेशक  
Chairman, Senate & Director

*Wazil*

कुलसचिव  
Registrar





*In the name and by the authority of the Council  
be it known that*

***Amir Tophel***

*having fulfilled all the requirements and  
having passed all the prescribed assessments has  
on the fourth day of October 2023  
been admitted to the degree of*

***Doctor of Philosophy***

*in token whereof the Council has authorized the  
Common Seal of the University to be hereto affixed.*

*Lynne V. M Keon*

*Chancellor*



*Interim President and  
Vice-Chancellor*