ASHISH RANJAN KUMAR, Ph.D., P.E.

Assistant Professor, Energy and Mineral Engineering
Falkie Mining Engineering Faculty Fellow
121 Hosler Building, Department of Energy and Mineral Engineering
The Pennsylvania State University, State College, PA 16802
Email: awk5528@psu.edu, Phone: 814 863 4771
Google Scholar Link, ORCID:0000-0002-8611-8346

EDUCATION

Dec 2018	Ph.D., Mining Engineering, University of Kentucky, Lexington, KY
Dec 2015	M.S., Mining Engineering, University of Kentucky, Lexington, KY
May 2010	B.Tech., Mining Engineering, Indian School of Mines, Dhanbad

PROFESSIONAL LICENSES

PE, Mining and Mineral Processing, KY State Board of Licensure

ACADEMIC APPOINTMENTS

2022 - present	Assistant Professor, Department of Energy and Mineral Engineering, The Pennsylvania State University, State College, PA
2020 - 2022	Post-doctoral Fellow/ Assistant Research Professor, Department of Mining Engineering, Missouri Univ. of Science and Tech, Rolla, MO
2018 - 2020	Post-doctoral Scholar, Department of Mining Engineering, University of Kentucky, Lexington, KY

RESEARCH EXPERIENCE

2013 - 2018	Graduate Research Assistant, Department of Mining Engineering, University of Kentucky, Lexington, KY
2010	Summer Research Project Fellow, Geological Oceanographic Division, National Institute of Oceanography, India
2009 - 2010	Undergraduate Research Assistant, Indian School of Mines, Dhanbad

GRANTS RECEIVED

2026	PI ($8,000 from EMS, Penn State) on modeling mineral availability for large-scale battery deployment
2026 - 2027	PI ($40,000 from IEE, Penn State) on designing bio-inspired robots capable of autonomous navigation in underground mines
2024 - 2029	PI ($1,249,350 from NIOSH) on designing a safe electrification for smart mines through ventilation modeling, monitoring, control, and training
2024 - 2025	PI ($149,465 from the US Department of Labor) on the development of respirable silica training modules
2023 - 2026	co-PI ($275,914 from NIOSH), on the use of powered air-purifying respirators in underground mines
2023	PI ($4,876 from the College of Earth and Mineral Science, Penn State), on the use of virtual reality systems in classroom teaching
2019 - 2021	co-PI (∼ $ 372k from NIOSH), on the development and testing of maintenance-free filters for continuous miner scrubber systems

COURSES TAUGHT

Spr 2026/25/24	Introduction to Combustion (EEGE / ME 430), Process Automation and Control (EME 597), Energy Systems Automation (MNG 497),
Fall 2025/24/23	Mine Systems Engineering (MNG 497)
Fall 2022	Underground Mining (MNG 410), Mine Systems Engg. (MNG 497)
Spr 2022/21	Surface Mine Design (MINE 6936), Surface Mining Methods (MINE 5933), Capstone Senior Design Project (MINE 4097)
Fall 2021/20	Material Handling in Mines (MINE 3912), Mine Power and Drainage (MINE 5912), Underground Mining Methods (MINE 5932)

INDUSTRY EXPERIENCE

2010 - 2013	Assistant Manager / Graduate Engineering Trainee (Mine operations and technical services), Sasan Power Limited, Reliance Power, India
2007 - 2009	Summer Intern: TATA Steel, SAIL, & Coal India Ltd.

PATENTS

1. Schafrik, S. J., Kumar, A. R., & Taylor, A. (2022). Efficient non-clogging inertial vortex type particle scrubber. *U.S. Patent No. 11,338,232. Washington.*
2. Kumar, A. R., Schafrik, S., Wedding, W. C., & Velasquez, O. (2021). Filter assembly and scrubber section for a continuous miner. *U.S. Patent No. 11,207,627. Washington.*

BOOK EDITED

1. Kumar, A. R., Liu, S., & Bhattacharyya, S. (Eds.). (2026). Mine Ventilation, Environment, Safety, and Health: Innovations from North American Mine Ventilation Symposium 2025. CRC Press.

BOOK CHAPTER

1. Tukkaraja, P., Stewart, C., and Kumar, A. R. (2024). Safety and health considerations in electric mine ventilation, E. J. Haas, Ed., *Mine Safety and Health Handbook: Approaches From the Field.* Society of Mining, Metallurgy, and Exploration.

SELECTED RECENT PEER-REVIEWED JOURNAL PUBLICATIONS

1. K. O. Said, Sharma, P., Agarwal, S., Bhattacharyya, S., & Kumar, A. R. (2026). Advances in autonomous navigation for underground mining operations driven by camera, LiDAR, and radar-based SLAM. *Journal of Industrial Safety.*
2. Pareek, Y., Said, K. O., Dey, S., & Kumar, A. R. (2026). A Cyber-physical systems framework for tracking post thermal-runaway temperature and smoke dynamics in underground mines. *IEEE Transactions on Reliability.*
3. Behera, L., Agarwal, S., Sandhan, T., Sharma, P., Kumar, A. R., Ranjan, A., Watsa, S., Singh, A. & Kasina, J. S. (2025). A cyber-physical system based unmanned ground vehicles for safety inspection and rescue support in an underground mine. *International Journal of Intelligent Unmanned Systems*, 13(1), 92-128.
4. Gonzalez, L. S., Kumar, A. R., & Arnold, B. (2025). Powered air purifying respirators (PAPRs) for protection from respirable dust in underground mines. *Mining, Metallurgy & Exploration*, 42(5), 2743-2759.

5. Said, K. O, Ray, A., & Kumar, A. R.(2025). A perspective on the safety of large-format lithium-ion battery in underground mining operations: Thermal runaway and its mitigation. *International Journal of Coal Science and Technology*, 12.
6. Kumar, A. R., Salami, O., Amoah, N. A., & Xu, G. (2024). Comparative analysis of different CFD turbulence models for a diesel pool combustion event in an underground mine: a case study. *International Journal of Mining, Reclamation and Environment*, 38(7), 549-561.
7. Amoah, N. A., Zaid, M. M., Kumar, A. R., Chang, P., & Xu, G. (2024). Optimized canopy air curtain dust protection using a two-level manifold and computational fluid dynamics. *Mining, Metallurgy & Exploration*, 41(4), 1807-1818.
8. Salami, O. B., Kumar, A. R., Aamir, I., Pushparaj, R. I., & Xu, G. (2024). Enhancing fire safety in underground mines: Experimental and large eddy simulation of temperature attenuation, gas evolution, and bifurcation influence for improved emergency response. *Process Safety and Environmental Protection*, 183, 260-273.
9. Pushparaj, R. I., Kumar, A. R. & Xu, G. (2023). Enhancing safety in Li-ion batteries with additive-based liquid electrolyte: A critical review. *Journal of Energy Storage*, 72.
10. Amoah, N. A., Xu, G., Kumar, A. R., & Wang, Y. (2023). Calibration of low-cost particulate matter sensors for coal dust monitoring. *Science of the Total Environ*, 859(2).
11. Kumar, A. R., Gupta, N., & Schafrik, S. (2022). CFD modeling and laboratory studies of dust cleaning efficacy of an efficient four stage non-clogging impingement filter for flooded-bed dust scrubbers. *International J. of Coal Science & Technology*, 9(1), 16.
12. Kumar, A. R., Schafrik, S. & Velasquez, O. (2020). Designing, modeling, and laboratory testing of a non-clogging impingement type filter for mining dust scrubbers. *Mining, Metallurgy & Exploration*, 37, 1911–1918.
13. Kumar, A. R., & Schafrik, S. (2020). Multiphase CFD modeling and laboratory testing of a Vortecone for mining and industrial dust scrubbing applications. *Process Safety and Environmental Protection*, 144, 330-336.
14. Kumar, A. R., Schafrik, S., & Novak, T. (2020). Multi-phase computer modeling and laboratory study of dust capture by an inertial Vortecone scrubber. *International Journal of Mining Science and Technology*, 30(3), 287-291.

SYNERGISTIC ACTIVITIES

1. Instructor of SME PE review course (`https://smepereviewcourse.org/instructors/`)
2. Chair of 20th North American Mine Ventilation Symposium, 2025 and co-editor of the proceedings (`https://namvs2025.psu.edu/`)
3. Organizing Committee member of the 7th International Symposium of Mine Safety Science and Engineering (`https://sites.psu.edu/ismsse/organization/`)
4. Director of 'Mining Rocks' (`https://sites.psu.edu/miningcamps/about/`), the annual summer camp of the Penn State mining engineering program
5. Member of Ph.D. qualification examination and dissertation committee in the Department of Energy and Mineral Engineering, Penn State
6. Reviewer of mining engineering research proposals developed by faculty members and researchers developed in the United States, Canada, and others