Dr James MacMullen

BSc, MSc, PhD, FHEA
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SUMMARY

Fellow of the Higher Education Academy (FHEA) and former Lecturer of Mechanical & Design Engineering at the University of Portsmouth, with a PhD in nanoparticulate polymer coatings and 11 peer-reviewed journal papers. Taught and coordinated CAD/CAE, materials and design units, including distance-learning delivery, and supervised undergraduate, master's, ERASMUS and PhD students. Brings substantial industry experience as a PTC Windchill PLM consultant and trainer for more than 300 UK engineering companies, plus current skills in AI tools, Python and robotics simulation. From 2019 to 2026 a full-time family carer; now seeking a teaching-focused academic role in engineering or product design and available to start immediately.

ACADEMIC QUALIFICATIONS

Fellowship of the Higher Education Academy (FHEA) 2013

University of Portsmouth, Portsmouth, UK

University teaching qualification that requires extensive assessment of teaching, student learning, and professional standards.

Bursary Funded PhD – 'Novel Nanoparticulate/Polymer Treatment Systems for Masonry Enhancement and Protection' Sept 2009 – Jan 2013

University of Portsmouth, Portsmouth, UK

Completed on time, with 8 journal papers published during the 3-year programme. Supervised undergraduate and master's student projects and taught:

- Materials Evaluation (Unit & labs)
- Thermoplastics and Injection Moulding (Lab)
- Metrology (Lab)
- Machine Tools (Lab)

Bursary Funded Master's (MSc) – Technology Management Sept 2008 – Sept 2009

University of Portsmouth, Portsmouth, UK

Award: Distinction.
Major Project Topic: 'Feasibility study on reducing the microbiological attack on timber by moisture repellents'.
Contracted work: Silane/siloxane emulsion energy efficiency study using a 'model house' test rig – 6-month duration.

Undergraduate BSc (Hons) – Product Design & Modern Materials Oct 2004 – Mar 2009

University of Portsmouth, Portsmouth, UK

Award: 1st Class Honours.
Major Project: 'Heat Nucleation Device for Fluid Heating'.
Trained to run the nanoindentation test equipment after the workshop closed.

EMPLOYMENT

Family Carer & Freelance Technical Writer
Jan 2019 – 2026

Full-time carer for family members with long-term illnesses; caring responsibilities have now ended. Alongside caring, kept technical skills current through:

- Freelance technical writing for online technology magazines, covering AI, coding and cybersecurity.
- Harvard online programmes in Computer Science and Artificial Intelligence (certified). Final project: a robot arm designed, built and programmed at home.
- Self-directed AI projects in Python, including local generative-AI applications for product mockups and video, and robot simulation in NVIDIA Isaac Sim.

Implementation Consultant – Concurrent Engineering
Sept 2015 – Jan 2019

Implemented PTC's Windchill Product Lifecycle Management (PLM) system, which controls versions of CAD parts, assemblies and documentation, for engineering companies across the UK, working on site and remotely.

- Supported more than 300 engineering companies, from SMEs to Triumph, GKN Aerospace and BAE Systems.
- Delivered official PTC training in PLM, CAD/CAM and FEA simulation, and designed custom training, onboarding pathways and branded documentation for client-specific workflows.
- Used training engagements to solve live engineering problems as proofs of concept, such as FEA of the thermo-mechanical performance of radiator panels and completing mould tooling for a next-day deadline.
- Rebuilt document templates and workflows for PLM rollouts, including for MoD vendors working under International Traffic in Arms Regulations (ITAR) controls.
- Project-managed larger implementations: liaised with client counterparts, ran weekly progress calls, kept Gantt charts in MS Project, wrote reports and arranged MoD vendor security checks for the team.

Lecturer of Mechanical & Design Engineering – University of Portsmouth
June 2014 – Sept 2015

Promoted from University Tutor in recognition of active research. Member of the Advanced Polymer and Composites (APC) and Engineering Design research groups; supervised a PhD student.

- Published 11 peer-reviewed journal papers (2011–2014) on nanoparticulate smart polymer coatings and biofouling.
- Led materials testing, reverse engineering and fault analysis for industry, including MWCNT fuel cell membranes, smoke sensors, silane/siloxane, sustainable and metal thin-film coatings, and injection-moulded medical and automotive parts.
- Industry partners included Safeguard Europe, Gurit, Pall Europe, Toyota, KCC and EcoDrift, with design projects for Ellis Day, Equisift, Innovative Designs IOW Ltd and New Forest Biscotti. Collaborated with Cardiff, Cadiz, Southampton, Bristol and Loughborough universities.
- Designed and built large test rigs, including model buildings for coating assessment, a wind tunnel for evaporating nanocolloids, and algae and dry-rot biofouling rigs for masonry and timber.
- Set up and ran an air-bearing rheometer and oversaw the purchase of a £100K magnetic-bearing rheometer.
- Testing: SEM with EDAX, nanoindentation, thermal diffusivity and conductivity, TGA, DSC, pendulum impact, surface roughness, Vickers hardness, microscopy, noise level, and goniometry (contact angle, surface tension and surface energy).

University Tutor (Teaching Fellow) – University of Portsmouth
Sept 2012 – June 2014

Taught, prepared support materials and assessments, and handled unit administration. Helped overhaul teaching materials and introduce online learning during a programme restructure. Supervised undergraduate, postgraduate and ERASMUS student projects, and supported outreach activities and open days.

Units taught:

- *Computer Aided Engineering for Product Realisation (Unit Coordinator – Distance Learning)*
- *Advanced Materials for Product Realisation (Unit Coordinator – Distance Learning)*
- *Engineering Materials and Design*
- *Conceptual Design*
- *Computer Aided Engineering for Product Realisation*
- *Computer Aided Design*
- *Computer Aided Engineering & Product Manufacture*
- *Introduction to Design*
- *Introduction to Illustration Techniques*

KEY SKILLS

- CAD/CAM: PTC Creo, Autodesk Fusion, SolidWorks, AutoCAD (surfacing, mould design, machining simulation, FEA)
- PLM: PTC Windchill & ThingWorx (implementation, upgrades, data migration, configuration)
- Product development & reverse engineering
- Additive manufacturing
- Advanced materials and product testing
- Thermoplastics & injection moulding
- Technical training, onboarding & documentation
- Superhydrophobic thin films
- Metrology
- Nanoparticulate enhanced smart polymer coatings and treatments
- Welding: MIG, TIG, arc & oxy-acetylene
- Machine tools
- Technical & article writing
- Project management (MS Project)
- Robotics, PCB design & AI integration

SOFTWARE EXPERIENCE

- Programming: Python, C++, C#, JavaScript, HTML & XML
- AI & robotics: NVIDIA Isaac Sim & Isaac Lab; local generative AI (PyTorch, Hugging Face Diffusers); AI-assisted development (Claude Code)
- Materials selection: Cambridge Engineering Selector (CES)
- PCB design: KiCad
- 3D & rendering: Blender, SketchUp, KeyShot, Maxwell Render
- Graphics: Adobe Photoshop & Illustrator, Corel Painter
- Office: Microsoft Office (including MS Project) & Google Workspace
- Operating systems: Windows & Linux

HOBBIES AND INTERESTS

Making: Building robots, combining 3D printing, PCB design, coding, control systems and AI.

Sport: Won the 2005 American Open in WTF Taekwondo (heavyweight division) and have taught classes.

ACADEMIC DISSEMINATION

Publications

MacMullen J.*, Zhang Z., Dhakal H.N., Radulovic J., Karabela A., Tozzi G., Hannant S., Alshehri M.A., Buhe V., Herodotou C., Totomis M., Bennett N. Silver nanoparticulate enhanced aqueous silane/siloxane exterior facade emulsions and their efficacy against biofouling. International Biodeterioration and Biodegradation 93 (2014) pp54-62.

MacMullen J.*, Radulovic J., Zhang Z., Dhakal H.N., Daniels L., Elford J., Leost M.A., Bennett N. Masonry remediation and protection by aqueous silane/siloxane macroemulsions incorporating colloidal titanium dioxide and zinc oxide nanoparticulates: Mechanisms, performance and benefits. Construction and Building Materials 49 (2013) pp93-100.

Radulovic J., **MacMullen J.***, Zhang Z., Dhakal H.N., Daniels L., Elford J., Leost M.A., Bennett N. Biofouling resistance and practical constraints of titanium dioxide nanoparticulate silane/siloxane exterior facade treatments. Building and Environment 68 (2013) pp150-158.

Dhakal H.N.*, Zhang Z., Guthrie R., MacMullen J., Bennett N. Development of flax/carbon fibre hybrid composites for enhanced properties. Carbohydrate Polymers 96 (2013) pp1-8.

Zhang Z., **MacMullen J.***, Dhakal H.N., Radulovic J., Herodotou C., Totomis M., Bennett N. Biofouling resistance of titanium dioxide and zinc oxide nanoparticulate silane/siloxane exterior facade treatments. Building and Environment 59 (2013) pp47-55.

MacMullen J.*, Zhang Z., Radulovic J., Herodotou C., Totomis M., Dhakal H.N., Bennett N. Titanium dioxide and zinc oxide nano-particulate enhanced oil-in-water (O/W) facade emulsions for improved masonry thermal insulation and protection. Energy and Buildings 52 (2012) pp86-92.

Zhang Z., **MacMullen J.***, Dhakal H.N., Radulovic J., Herodotou C., Totomis M., Bennett N. Enhanced water repellence and thermal insulation of masonry by zinc oxide treatment. Energy and Buildings 54 (2012) pp40-46.

MacMullen J.*, Zhang Z., Radulovic J., Dhakal H.N., Bennett N. An investigation of hydroxyl end-terminated polydimethylsiloxane (PDMS) in exterior oil-in-water (O/W) emulsion treatments. Construction and Building Materials 37 (2012) pp283-290.

Alani A.*, MacMullen J., Telik O., Zhang Z. Investigation into the thermal performance of recycled glass screed for construction purposes. Construction and Building Materials 29 (2012) pp527-532.

MacMullen J.*, Zhang Z., Rirsch E., Dhakal H.N., Bennett N. Brick and mortar treatment by cream emulsion for improved water repellence and thermal insulation. Energy and Buildings 43 (2011) pp1560-1565.

Rirsch E.*, MacMullen J., Zhang Z. Evaluation of mortar samples obtained from UK houses treated for rising damp. Construction and Building Materials 25 (2011) pp2845-2850. Presented prior to publication; International Conference on Durability of Building Materials and Components. Porto: Portugal 2011.

Thesis

MacMullen J. Novel nano-particulate/polymer treatment systems for masonry enhancement and protection. PhD thesis (2012) University of Portsmouth.

Book Chapters

Dhakal H.N.*, MacMullen J., Zhang Z.Y. Chapter Seven: Testing and characterisation of natural fibre reinforced composites. 2015 (Accepted for publication).

Dhakal H.N.*, MacMullen J., Zhang Z.Y. Chapter 13: Moisture measurement and effects on properties of marine composites. MAAFRC. 2015 (Accepted for publication).

Presentations

MacMullen J. Biofouling resistance and practical constraints of titanium dioxide nanoparticulate silane/siloxane exterior facade treatments. University of Portsmouth, School of Engineering. Research Seminar 2013.

MacMullen J. Nanoparticulate enhanced polymer treatment systems for facade protection. University of Portsmouth, School of Engineering. Research Seminar 2012.

MacMullen J., Zhang Z., Herodotou C., Dhakal H.N., Radulovic J., Bennett N. Nano-particulate modified o/w facade emulsions for enhanced masonry water repellence. Presented January at Retrofit 2012 conference, Manchester, UK.

MacMullen J. Development and characterisation of novel nano-particulate/polymer coating systems for materials performance enhancement and protection. University of Portsmouth, School of Engineering. Research Seminar 2011.

MacMullen J., Zhang Z., Herodotou C., Dhakal H.N., Radulovic J., Bennett N. Biofouling resistance of titanium dioxide and zinc oxide nanoparticulate silane/siloxane exterior facade treatments. University of Portsmouth. Technology Faculty Research Day 2012.

Posters

MacMullen J. Investigation of polymer facade cream coating imparting enhanced water repellence and thermal insulation on building materials. University of Portsmouth Research Day 2010.

MacMullen J. Hydroxyl functionalised polydimethylsiloxane (PDMS) and its incorporation into exterior facade emulsion treatments. University of Portsmouth Technology Faculty Research Day 2011. Won 2nd Prize for best poster.

MacMullen J. Titanium dioxide and zinc oxide nanoparticulates and their role in exterior facade emulsion treatments. University of Portsmouth. Technology Faculty Research Day 2012. Won 1st Prize for best poster.