



Materials Science and Engineering Outreach Brochure

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What is Materials Science and Engineering?

The field of Materials Science and Engineering offers limitless possibilities for innovation and development.

Materials scientists and engineers work on developing high-performance metallic, ceramic, polymeric, composite, nano-structured, bio- and nature-inspired materials, as well as designing new products and technologies that impart a substantial benefit to society. This is achieved through the way they positively impact the environment, improve health, increase our standard of living, increase productivity of our vital resources, enhance national security, and promote economic prosperity.

Materials scientists and engineers are also involved in every aspect of technology, ranging from designing new materials for use in integrated circuits, transport vehicles, water purification systems, biomedical implants, and green energy generation and storage, through to developing sustainable processes and recyclable products. In this century, sustainability, environmental impact, and the ongoing quest to improve our health and standard of living, lie at the core of materials development and application.

As technology continues to advance, there is an increasing demand for Materials Scientists and Engineers who can design better materials and more sustainable processes that meet the rapidly evolving needs of society. This offers outstanding career prospects across various sectors, such as aerospace, transportation, defence, construction, mining, electronics, energy conversion, and biomedical science.

Our Outreach Program

At the School of Materials Science and Engineering we offer a great hands-on Outreach Program that gives a great peak into our world looks like, what we offer in our degree and what the ever-changing world of Materials Science and Engineering looks like.

We do have our standard outreach experiences but if you do want something more tailored you can always feel free to reach out and contact us through our contact information to see what we can do for you and how we can customise an experience to suit your needs.

For our standard outreach experiences please refer to the table below and for more details on the activities refer to the next page:

Group Size	Timing	Activities	Cost Estimates
Up to 24	1.5 hour Standard Session	Lab Session	\$100 overhead + additional costs per student
Up to 24	2 hour+ session	Lab Session + Extra Session/s	\$150+ overhead + additional costs per student
24-48 (split evenly in 2 groups)	3 hour session (1.5 hour session each with swap over between activities)	Lab Session – 1.5 hours Extra Sessions – 1.5 hours Lunch – 1 hour break in- between (optional)	\$300 overhead + additional costs per student

Lesson Plans

We also provide lesson plans that go in conjunction with what we teach in our outreach sessions. We will provide you with some lesson plan material prior to your session on campus and will be part of the take home material we give the students at the end of each session. You can also find some lesson plan materials and resources on our website *insert website link here*.

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Activity Break Down

Lab Session			
Activity Name	Description	Cost	Time
1a. Effect of cracks in PMMA tensile testing (Option 1)	In this activity, students will learn about the effect of cracks on the strength of materials. This is an important consideration in the use of materials in everyday life. Students will break into groups and test a notched and un-notched sample to compare their strengths. Students will be provided with a worksheet explaining how to process the data and an electronic copy of the data can be sent to the school as a post workshop activity.	\$3 per student	30mins
OR			
1b. Tensile testing of metals (Option 2)	Tensile testing is a fundamental materials testing technique used to determine materials' mechanical properties. In this activity, students will learn why we conduct tensile testing and about the properties that we obtain from the experiments. The students will then break into groups of three and test three different materials. Students will be provided with a worksheet explaining how to process the data and an electronic copy of the data can be sent to the school as a post workshop activity.	\$12 per student	40mins
2. Charpy	Students will learn about the ductile to brittle transition in materials. Different crystal structures will be introduced to explain why some materials become brittle at low temperatures. Three different samples will be tested at room temperature and at -196 °C. The energy absorbed through each fracture will be measured. Students will also view the fracture surfaces and learn about fractography.	\$16 per group (incl. in overhead cost)	20mins
3. Optical Microstructures	The microstructure of materials has an immense impact on their mechanical properties. Students will learn how to use the optical microscopes and investigate the microstructures of a range of metal samples. The effect of composition and heat treatment on the specimens will be analysed using the images.	\$10 per group (incl. in overhead cost)	30mins
4. Liquid Nitrogen Train	This activity is a demonstration of the superconducting effect that causes magnetic levitation. Students will learn about the continuing research area and see a magnetic levitation train in action. Students will see the effect of “pinning” the magnetics in the magnetic field and be able to test the strength of the field on a levitated magnet.	NA	10mins
Extra Sessions			
Activity Name	Description	Cost	Time
SMaRT Centre Tour	The UNSW SMaRT Centre is renowned for pioneering the transformation of waste for use as a new generation of ‘green’ materials and products. Pending availability, we can offer a tour of the facilities they have on campus and take you behind the scenes in this truly innovative part of the world of Materials Science and Engineering.	NA	30mins

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Academic In-depth Info Session + Q&A	We can offer a more in-depth information session about the world of Materials Science and Engineering, along with advice on pathways to get into the degree, career choices and what studying with us entails! Perfect for those who are about to leave High School and want to know more about what we offer.	NA	30mins
Study Help Sessions	These sessions are catered more to people in year 11 or 12 who are undertaking engineering studies. Our outreach teachers are very familiar with the syllabus as a lot of the content covered in Engineering Studies crosses over with the course of Materials Science and Engineering. We will help teachers and students go through syllabus content in a customised study session to cover your needs.	NA	30+ mins

Tailored Sessions

The way our Outreach program is designed is that we offer our standard lab sessions which consist of a predesigned set of activities, however depending on your needs and requirements for your students we can happily adjust and tailor our outreach sessions accordingly.

If you are interested in something that isn't present in our activities break down list, please feel free to reach out and contact us so we can discuss options and hopefully come up with a solution that meets your requirements.

Cost Information

Depending on the group size there will be an overhead fee that will incorporate certain costs. In the activities breakdown table where the cost is stated as "per group", this cost is already included as a part overhead fee for the group.

Many factors can change or adjust this overhead cost as well i.e. time chosen to do and complete activities, group size, activities chosen and cost of materials as a few examples. All overhead costs will be specified in a final quote provided prior to booking the outreach session.

To finalise a quote for your outreach session, please contact us with your desired Outreach Session plan and we can give you a quote of estimated costs to undertake the outreach session.

If your school is struggling with costs or finances, please don't hesitate to reach out to us so we can talk through other options and come up with alternative solutions to help host an outreach experience for you.

Contact Information

For outreach related enquiries: outreach.materials@unsw.edu.au

For general Materials Science and Engineering enquiries: enquiries.materials@unsw.edu.au

For all other enquiries contact our Outreach Officer Chris Seymour: c.seymour@unsw.edu.au

Resources

Online Lesson Plans + Further Information: <https://www.unsw.edu.au/science/our-schools/materials/engage-with-us/high-school-students-and-teachers>

Website: <https://materials.unsw.edu.au/>