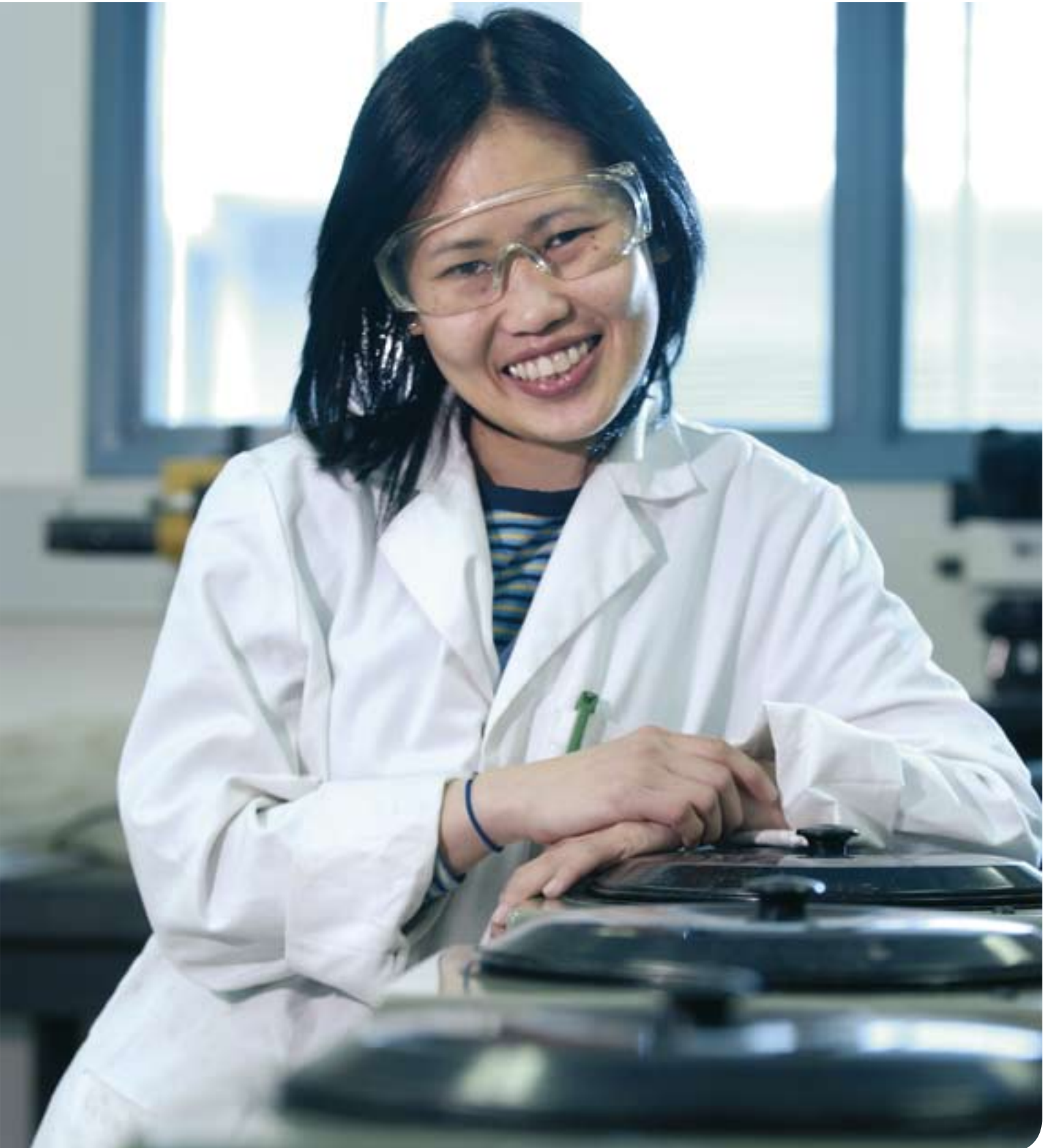




Materials Engineering

Department of Materials Engineering



Materials Engineering

We are in a materials revolution, the way of the future. The ability to understand and manipulate materials and their properties, is often a key factor in any industrial process or technology (new or old). In addition, nanomaterials and biomaterials are becoming important parts of existing industries, and leading to the creation of many new ones. Materials Engineering is crucial in all of this.

What do materials engineers do?

- develop new materials and products,
- make old materials work better by processing them better,
- characterise and understand structure property relationships,
- test materials to determine their properties and predict why they behave the way they do,
- predict the lifetime of materials,
- choose appropriate materials for particular applications,
- make sure materials meet quality specifications

A materials engineer is uniquely prepared to contribute to any design team effort to develop a new device, material product or component, and is often called on to give expert advice in matter such as concrete cancer, weapons used in murder cases, collapsed pipes etc. In many new areas of technological research and development, new materials are the key element required for significant advances. This is particularly true in growing areas such as biotechnology, nanotechnology and energy research.



In which industries do materials engineers work?

Most industries need materials engineers, including: adhesives, aerospace, automotive, biomedical, computer, electronics, energy, environment, manufacturing, telecommunications.

What degrees can I take if I choose Materials Engineering?

The Faculty of Engineering offers a four year Bachelor of Engineering degree specialising in materials engineering, as well as double degree programs where materials engineering is taken in conjunction with a degree in arts, commerce, law, biomedical science or science.

Aims of the Materials Engineering programs

The aim of the program is to equip graduates with the skills and attributes necessary to commence a career in areas as varied as the development of a new process or product, fundamental research, or work in industrial production facilities. The program provides a broad foundation in all areas of materials, recognising the diverse future careers of its graduates who will be well prepared for careers in industry and research. The opportunity to specialise in areas as diverse as corrosion, biomaterials, adhesion, polymer recycling, materials processing is available.

What are the some of the materials areas of study covered?

Metals/alloys, ceramics, polymers, nanomaterials, biomaterials, fracture/failure, stress analysis, modeling of properties, composites, nanocomposites and corrosion.

Course structure

Bachelor of Engineering students undertake a common first year, which provides a foundation in mathematics and sciences and applications in general engineering units. Prior to the commencement of second year, students choose a branch of engineering to specialise in.

Second year units explore topics such as crystallography, thermodynamics and solid mechanics, which underpin the later years of study in materials.

Level three looks at applications of materials, concentrating on the unique properties of specific material groups (eg polymers/ plastics, ceramics, metals, metal alloys).

Level four emphasises the engineering use of materials, and involves a major practical research and/or development project, and specific studies of the engineering use of real materials. Design and management are also significant components of level four.

Students can specialise by their choice of electives, and project topic. Industrial experience is a compulsory component of the Bachelor of Engineering, and many employment opportunities arise from contacts made during the 12 weeks compulsory industrial placement, usually undertaken during vacation.

Double Degrees with Materials Engineering

Degrees in materials engineering can be taken in conjunction with degrees from other faculties, where students can benefit from the breadth of study, making them more attractive to prospective employers in a world where job responsibilities require multiple skills, a broad, cross disciplinary knowledge base, and the ability to adapt.

The total study time required for a double degree is less than that for two degrees taken individually. Advantage is taken with areas of overlap where similar learning is useful for both degrees. For example, the combination of an Arts (BA 3 years) and engineering degree (normally four years) can be completed in five years.

The Bachelor of Engineering degree specialising in materials can be taken in conjunction with arts, biomedical science, commerce, law and science.

Bachelor of Engineering (Materials)/ Bachelor of Arts (BE/BA)

Five years full-time

A double degree with arts is an ideal opportunity for students to pursue interests in materials engineering and languages at the same time. They may also complete any other arts major sequence and any arts minor sequence as for the Bachelor of Arts degree, taught by the Faculty of Arts. Many engineering students find this double degree ideal for continuing on with studies in music or humanities subjects that they enjoyed throughout secondary school. The combination of arts and engineering engenders strong communications skills in graduates who are well suited to roles in consultancy, public bodies and work in the international arena.

Bachelor of Engineering (Materials)/ Bachelor of Laws (BE/LLB)

Six and a half years full-time

Many aspects of law involve situations where technical knowledge is invaluable, such as litigation involving failure of devices or machinery components, patent demarcations, and the ownership of intellectual property. This degree combining Law and Materials Engineering is an ideal background for someone to excel in this interesting and potentially lucrative field.

Bachelor of Engineering (Materials)/ Bachelor of Science (BSc/BE)

Five years full-time

This combination allows students to complete two major sequences in different science disciplines or a double major and a minor sequence in a different science discipline. For example, students interested in biomaterials could do a major in physiology in conjunction with chemistry or another life science, and also complete the requirements for a materials engineering degree. Students could also do a double major in their science discipline of choice.

An alternative pathway is to do the major in Materials Science and another science major, giving the student an comprehensive base in their materials studies. This double degree provides the opportunity for students to advance into such areas as biomaterials, materials chemistry and corrosion science, among many others.



Bachelor of Engineering (Materials)/ Bachelor of Commerce (BCom/BE)

Five years full-time

Alongside their studies in materials engineering, students may choose from one of the many majors offered by the Faculty of Business and Economics, including, management, marketing, economics and accounting to name a few. Career prospects for Bachelor of Commerce/Bachelor of Engineering graduates are excellent.

Graduates of this program are highly sought after by companies looking for employees with both business know-how and the ability to understand technological issues

Many commerce/engineering graduates move into senior management positions.

Biomedical Science/ Bachelor of Engineering (Materials) (BBiomedSci/BE)

Five years full-time

The double degree introduces students to a range of new, interdisciplinary subjects covering areas of modern biomedical sciences, human biology and public health, and develops a solid grounding in materials engineering. The strong research and design focus that characterises the materials engineering component, combined with the interdisciplinary approach of the biomedical science component, will produce graduates who are able to make a unique contribution to both biomedical science and engineering.

Examples of where Materials Engineering considerations are important in medical science include materials used for implants (titanium hip joints, artificial lenses); bonding materials used with implants; in dentistry and prosthetics, in drug delivery and when using materials or scaffolds to induce tissue growth in the shape required for transplanting to the required area (tissue engineering including stem cell technologies).

Australia currently has an urgent need for biomedical engineers with a solid grounding in biomedical science and engineering to work in areas such as biomaterials. This qualification thus provides a pathway to a rewarding career.

Careers in Materials Engineering

What sort of jobs do materials engineers get?

(from talking to our graduates)

Metallurgist, ceramicist, composite engineer, corrosion engineer, adhesives engineer, plastics engineer, rubber scientist, manufacturing engineering, injection molding technology, research scientist (including at CSIRO and DSTO), consultant, manager, sales and marketing, technical services, quality control, process control engineers, performance and failure analysis, manufacturing industries, patent attorney, project engineers, teachers, business development managers.

What types of companies in Australia would hire materials engineers?

Airbus, Arthur Andersen Consulting, Alcoa, BASF, Basell, BlueScope Steel, BHP Billiton, CSIRO, Comalco, Dow, DSTO, EPA, Esso, Exxon Mobil, Ford, Holden, Huntsman Chemical, Kraft, Moldflow, , Mausell , Metlabs, Melbourne Water, Orica, Olex Cables, Qenos, Telstra, Smith and Nephew, Toyota, Webforge, FMP Group

What is the starting salary for a graduate materials engineer?

(from surveying recent graduates)

approx. \$47,000 – \$52,000

Engineering graduates are currently receiving some of the highest starting salaries of any profession*. Many students are recruited by the major companies during their final year. Materials engineers have a broad training which makes them highly employable in all fields of engineering, including management, computer aided design and manufacturing, systems analysis, higher research consulting.

Materials engineering graduates enjoy careers in research and development, production, management, technical sales, in the major oil, chemical and mining companies, in the automotive industry, the aircraft industry, sports equipment development, research organizations, academia, patents and quality control.

*Based on the Association of Professional Engineers, Scientists and Managers, 2005 Graduate Engineer Employment Survey Report. A full copy of the report can be found online at www.apesma.asn.au/online_surveys

Further information

Details of courses are provided in the *Monash University Undergraduate Handbook*, online at www.monash.edu.au/pubs/handbooks

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