

Granta EduPack for University Teaching

HOW CAN IT BE USED TO SUPPORT MECHANICAL ENGINEERING EDUCATION?

Granta EduPack is developed specifically for undergraduate materials-related education across engineering, design, science, and sustainability. It can be applied to a broad spectrum of subjects and interdisciplinary areas linked to materials and design. Granta EduPack comes with educational software and more than 200 teaching and learning resources that enable educators to quickly enhance courses throughout all years of study.

“EduPack offers versatility and a tool through which students can understand properties as well as process characteristics”
- Prof. Alejandro Muñoz Zapata, Universidad Pedagógica y Tecnológica de Colombia

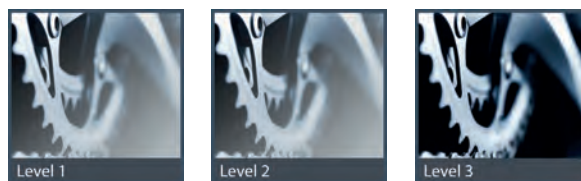
Useful Webinars

- 1) “Materials Selection for Mechanical Design”, recording available [here](#); ➔
- 2) “Case Study: Transportation: Railway Lightweighting”, recording available [here](#); ➔
- 3) “Materials Selection to avoid mechanical Failure”, recording available [here](#). ➔

Example Teaching Resources

- 1) “Lecture Unit 10: Manufacturing processes and cost modeling”, download available [here](#); ➔
- 2) “Selection Case Study: Mechanical Applications”, download available [here](#); ➔
- 3) “Level 3 Industrial Case Study: Automotive Door Panel”, download available [here](#). ➔

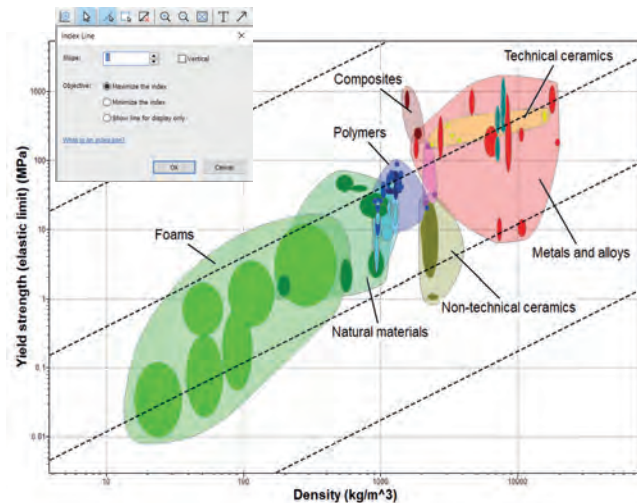
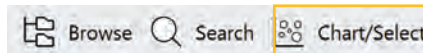
Core Databases for Material and Process Selection



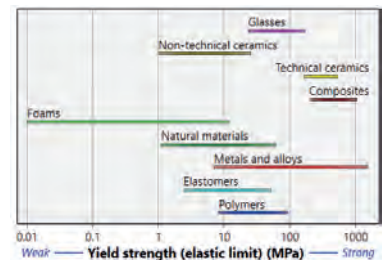
69 Materials 74 Processes	100 Materials 114 Processes + more depth	4000+ Materials 200+ Processes
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- ✓ Adaptable to different teaching levels
- ✓ Suitable for both for science and design-based approaches
- ✓ Fit for Project Based work, including Capstone Projects

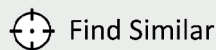
Core Tools



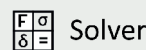
- Plot charts and performance index lines
- Screen materials and processes with line and box selection tools or with the limit and tree stages



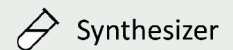
Advanced Tools



Find Similar
Rank materials in terms of similarity to a reference



Solver
Translate engineering requirements into material requirements



Synthesizer
Predict properties of hybrid materials

For more information visit:

www.ansys.com/products/materials/granta-edupack/
or [Ansys Education Resources](#)

Granta EduPack for University Teaching

HOW CAN IT BE USED TO SUPPORT AEROSPACE EDUCATION?

Granta EduPack is developed specifically for undergraduate materials-related education across engineering, design, science, and sustainability. It can be applied to a broad spectrum of subjects and interdisciplinary areas linked to materials and design. Granta EduPack comes with educational software and more than 200 teaching and learning resources that enable educators to quickly enhance courses throughout all years of study.

“EduPack enables... project- based learning, flipped classes and ongoing assessment which favor action learning and collaborative working...”

— Prof. Stéphane Gorsse
Institut Polytechnique de Bordeaux

Useful Webinars

1) “Selection and Sustainability of High-Temperature Aerospace Materials”, recording available [here](#); ➔

2) “Landing on Mars: the materials challenge”, recording available [here](#); ➔

3) “Materials for Rocket Tanks”, recording available [here](#). ➔

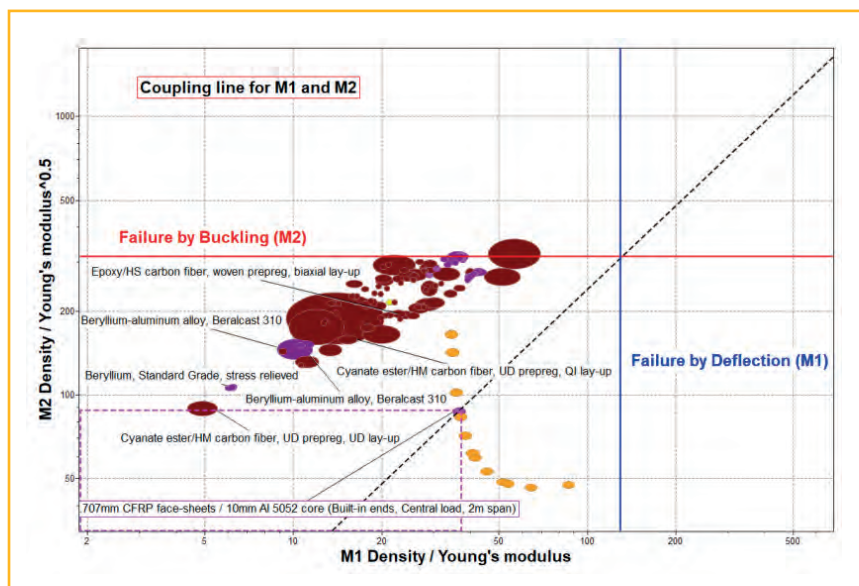
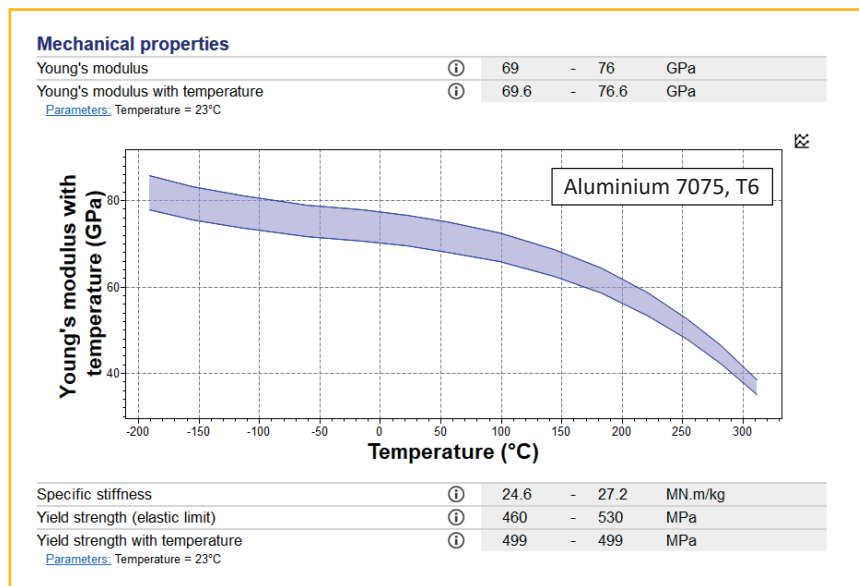
Example Teaching Resources

1) “Case study: aerospace pressure vessels”, download available [here](#); ➔

2) “Case study: Mars lander heat shield”, download available [here](#); ➔

3) “Lecture unit: objectives in conflict”, download available [here](#). ➔

/ Aerospace Engineering Education and Granta EduPack



/ For more information visit:

www.ansys.com/products/materials/granta-edupack/
or [Ansys Education Resources](#)

Granta EduPack for University Teaching

HOW CAN IT BE USED TO SUPPORT MATERIALS SCIENCE EDUCATION?

Granta EduPack is developed specifically for undergraduate materials-related education across engineering, design, science, and sustainability. It can be applied to a broad spectrum of subjects and interdisciplinary areas linked to materials and design. Granta EduPack comes with educational software and more than 200 teaching and learning resources that enable educators to quickly enhance courses throughout all years of study.

“Students get a feel for the materials properties...”

— Dr. -Ing. Kerstin Kern,
Hochschule für Technik Buchs,
Switzerland

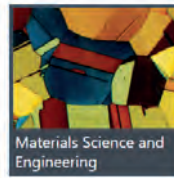
Useful Webinars

- 1) “Introducing Engineering Students to Materials”, recording available [here](#); ➔
- 2) “Bringing MS&E to life: the new Materials Science and Engineering Edition”, recording available [here](#); ➔
- 3) “Increasing Student Engagement in Materials Education Using Ansys GRANTA EduPack”, recording available [here](#). ➔

Example Teaching Resources

- 1) “The Materials Science and Engineering Package”, download available [here](#); ➔
- 2) “Stainless Steel”, case study and exercises, download available [here](#) and [here](#); ➔
- 3) “Aluminum Strengthening”, case study and exercises, download available [here](#) and [here](#). ➔

Materials Science and Engineering database and tools of Granta EduPack



Elements, their properties and countries of origin

Elements

Manufacturing processes and their characteristics

Process

Phase diagrams and the Lever Rule

Phase Diagrams

Materials and their properties

Materials

Chart-building and Selection tools

Selection

Process-property profiles

Property Process Profiles

For more information visit:

www.ansys.com/products/materials/granta-edupack/
or [Ansys Education Resources](#)

Granta EduPack for University Teaching

HOW CAN IT BE USED TO SUPPORT SUSTAINABLE DEVELOPMENT EDUCATION?

Granta EduPack provides engaging visualization of comprehensive data on materials and processes. Together with a set of powerful tools and supporting teaching resources, it helps educators to quickly embed EduPack in their courses. For sustainability teaching, EduPack can be used to explore relevant data (incl. environmental, social, economic, legislation/regulations and cultural), to introduce life-cycle thinking, to use for sustainability assessments and to explore materials-related risks.

“A tool for tackling materials systems problems and introducing students to the complexity surrounding sustainability.”

— Mike Ashby,
Emeritus Professor of Materials,
University of Cambridge

Useful Webinars

1) “Teaching Sustainability with EduPack”, (Nov 2020) recording available [here](#); ➔

2) “Teaching Sustainable Development to Students with Social Impact Audit Tool”, (June 2020) recording available [here](#); ➔

3) “Sustainability assessment”, (March 2020) recording available [here](#). ➔

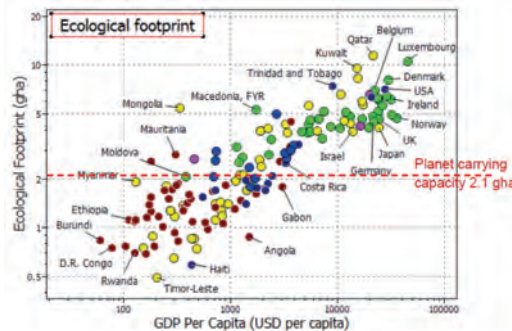
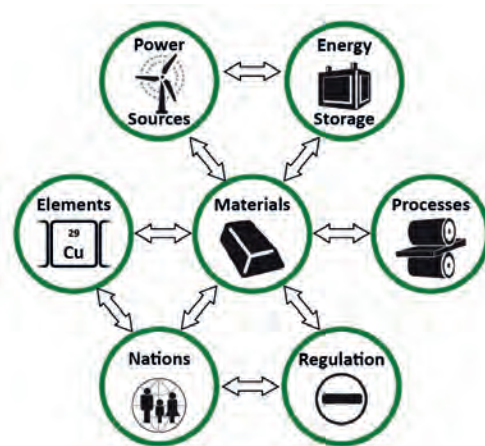
Example Teaching Resources

1) “Teaching Package: Selection and Sustainability of High-Temperature Aerospace Materials”, download available [here](#); ➔

2) “Paper: Social Life-Cycle Assessment and Social Impact Audit Tool”, download available [here](#); ➔

3) “Micro-Projects: Eco and Sustainability”, download available [here](#). ➔

/ Sustainability Database



Eco Audit Tool

The Eco Audit Tool can be used to perform an analysis of the eco impact (energy and CO₂) of a product throughout its life cycle. It is possible to implement custom materials and process data to compare the ecological performance of in-house data with data from the database.

Database:

- Adaptable to different teaching levels
- suitable for multidisciplinary classes
- allows eco-audits for energy, carbon footprint and cost
- supports sustainability assessment methodology (Ashby et al, 2015)*
- supports project-based work, group learning type activities with a comprehensive set of teaching/learning resources

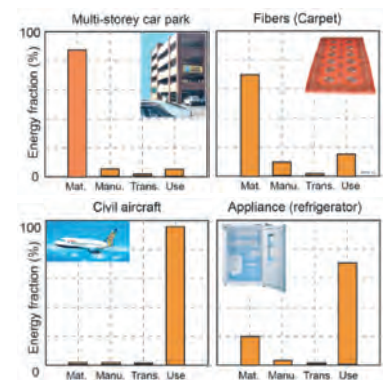
LEVEL 2 in Introductory EduPack:

- 100 materials & 114 processes
- Nations of the World data table
- Legislations & Regulations data table
- Elements data table

LEVEL 3 in Full version of EduPack:

(in addition to LEVEL 2 content)

- Added properties in MaterialUniverse (with 4000+ materials & processes), such as: Food contact, Restricted substances, Criticality, Substitutes, Geo-economic data
- Shape and structural sections data table
- Power systems data table



/ For more information visit:

www.ansys.com/products/materials/granta-edupack/
or [Ansys Education Resources](#)

*Ashby M.F., Ferrer-Balas, D., & Segalas Coral, J. 2015. Materials and Sustainable Development. Butterworth-Heinemann Ltd, Oxford.

Granta EduPack for University Teaching

HOW CAN IT BE USED TO SUPPORT BIOENGINEERING EDUCATION?

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“EduPack provides instructors with quantitative values and easy-to-find definitions to which we can direct students through homework sets, lecture material and the final project. It puts a lot of data in one place and at our fingertips...”

— Dr Kareen Coulombe,
Brown University, USA

Useful Webinars

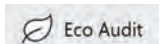
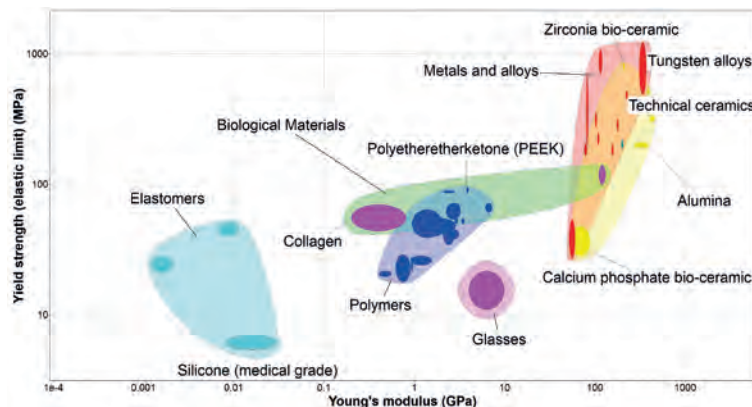
- 1) “Teaching Biomaterials Using Medical Devices”, recording available [here](#); ➔
- 2) “Biomedical materials and the Circular Economy”, recording available [here](#); ➔
- 3) “Biomaterials selection for bone implants – metals, ceramics, polymers”, recording available [here](#). ➔

Example Teaching Resources

- 1) “Industrial Case Study: Biomaterials Selection for a Joint Replacement”, download available [here](#); ➔
- 2) “Paper: Medical Devices Database”, download available [here](#); ➔
- 3) “Exercises: Bioengineering”, download available [here](#). ➔

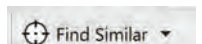
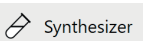
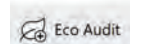
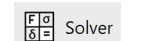
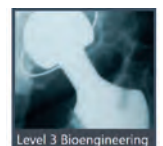
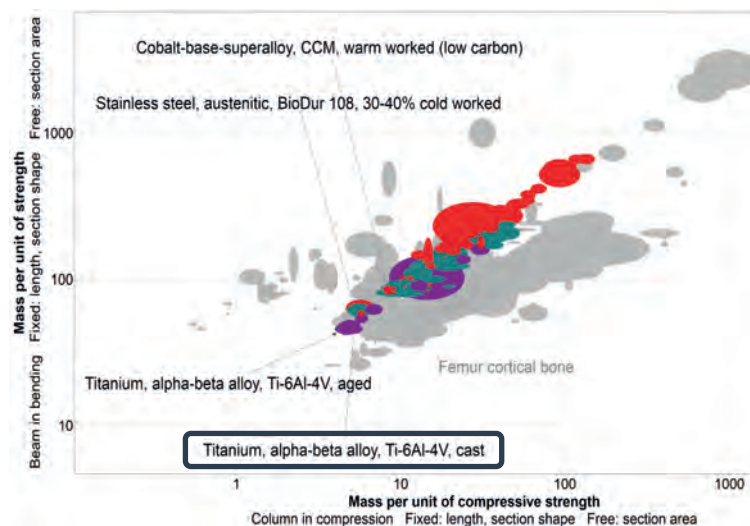
/ Bioengineering and Medical Devices Databases

For Introductory Teaching



Contains 313 materials and 116 processes, 52 Medical Devices, 100 FDA Approved examples, and links to FDA guidance documents

For Advanced Teaching



Contains 4193 materials and 250 processes, a section on Healthcare and Food and links to ASM Medical Materials Database

/ For more information visit:

www.ansys.com/products/materials/granta-edupack/
or [Ansys Education Resources](#)

Granta EduPack for University Teaching

HOW CAN IT BE USED TO SUPPORT ARCHITECTURE & THE BUILT ENVIRONMENT EDUCATION?

Granta EduPack is developed specifically for undergraduate materials-related education across engineering, design, science, and sustainability. It can be applied to a broad spectrum of subjects and interdisciplinary areas linked to materials and design. Granta EduPack comes with educational software and more than 200 teaching and learning resources that enable educators to quickly enhance courses throughout all years of study.

“it enabled nonengineering, Visually oriented students to get a ‘feel’ for material properties.”
 - Dr Dick Groot,
 University of Pretoria,
 South Africa

Useful Webinars

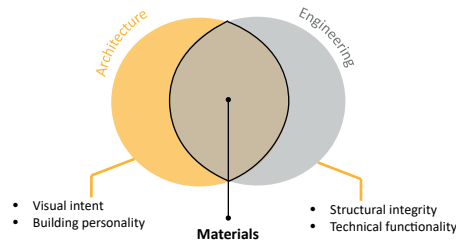
- 1) “Materials of Architecture, Design and Engineering”, recording available [here](#); ➔
- 2) “Teaching materials in Architecture: Material selection for facades”, recording available [here](#); ➔
- 3) “New Materials for Architecture: Materials for Design Pedagogy”, recording available [here](#). ➔

Example Teaching Resources

- 1) “MicroProject: Built Environment”, download available [here](#); ➔
- 2) “Case Study: The Built Environment”, download available [here](#); ➔
- 3) “Exercises: The Built Environment”, download available [here](#). ➔

Granta EduPack Architecture Database

Explore the intersection between Architecture and Engineering



Easy access to data on materials for the built environment'

Soda-Lime glass (float glass)

Dataset view: All Built Environment

Concrete, stone, ceramic, brick, glass and bitumen > Glass >

Description

Illustration

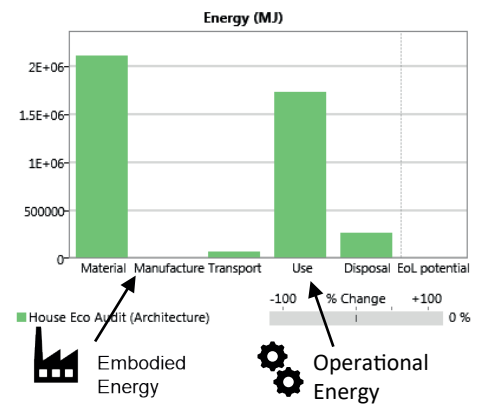
Figure caption

1. Sheets of clear float glass. 2. Float glass is made in large sheets, ideal for facades of commercial buildings. 3. Large glass sheets in a factory. Images used under license from Shutterstock.com

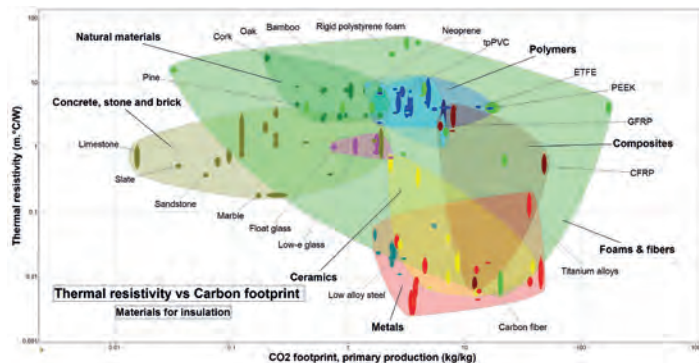
The material

Soda lime glass is the glass of windows, bottles and light bulbs, used in vast quantities, the commonest of them all. The name suggests its composition: 13-17% NaO (the "soda"), 5-10% CaO (the "lime") and 70-75% SiO2 (the "glass"). It has a low melting point, is easy to blow and mold, and it is cheap. It is optically clear unless impure, when it is typically green or brown. Windows, today have to be flat and that was not - until 1950 - easy to do, now the float-glass process, solidifying glass on a bed of liquid tin, makes 'plate' glass cheaply and quickly.

Include life cycle thinking in your teaching



Visually represent materials data



For more information visit:

www.ansys.com/products/materials/granta-edupack/
 or [Ansys Education Resources](#)

Granta EduPack for University Teaching

HOW CAN IT BE USED TO SUPPORT EDUCATION IN DESIGN?

Granta EduPack is developed specifically for undergraduate materials-related education across engineering, design, science, and sustainability. It includes data and tools that support a design-driven approach to materials. The Design database allows students to explore the interconnections between products, materials and processes, with additional aesthetic properties as well as designer and manufacturer references.

“Students find it really informative to explore material property databases offered in EduPack and utilize the same for their assignments related to selection of materials in various design scenarios.”

- Prof. Raman Bedi
Dr. B R Ambedkar National Institute of Technology

Useful Webinars

1) “Artistic Uses of Materials for Engineering and Design Instructors”, recording available [here](#);

2) “New Materials for Architecture: Materials for Design Pedagogy”, recording available [here](#);

3) “Toy cars vs. real ones: Helping students understand different design objectives”, recording available [here](#).

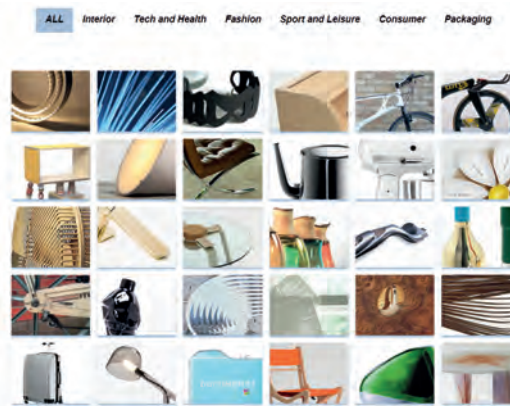
Example Teaching Resources

1) “Lecture unit: Materials in Industrial Design”, download available [here](#);

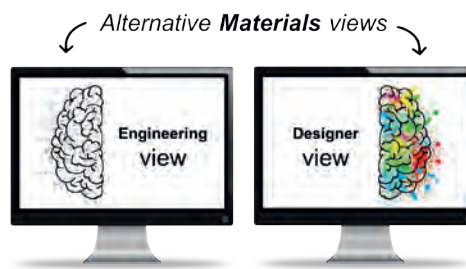
2) “Lecture unit: the Design database for products”, download available [here](#);

3) “Lecture unit: Materials and shape”, download available [here](#).

The Design Database of Granta EduPack

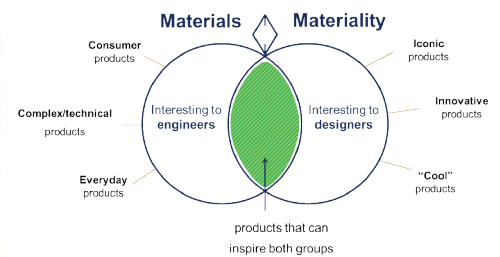


Explore different materials views with both **qualitative** and **quantitative** formats

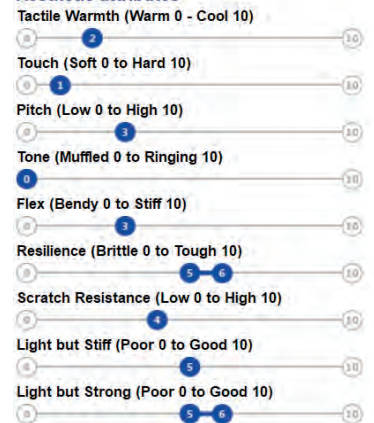


A **product-centered** database with visual references of:

- 187 products;
- 130 materials;
- 122 processes;
- 161 designers;
- 122 manufacturers.



Aesthetic attributes



For more information visit:

www.ansys.com/products/materials/granta-edupack/
or [Ansys Education Resources](#)

Linking Granta EduPack with Simulation for University Teaching

HOW CAN IT BE USED TO SUPPORT EDUCATION?

Material Selection and simulation are often taught separately in the curriculum, however, while the complexity of products increases, there is a growing need of interdisciplinarity in engineering projects. To conceptualize the optimal product it is necessary to find the optimal material and couple it with the optimal design. To bridge this gap we have created a seamless connection between EduPack and the most common CAD/CAE software.

“Using simulation in combination with EduPack provides markedly enhanced learning for engineering students compared to only theoretical concepts.”

- Dr.-Ing. Stefan Dietrich
Karlsruher Institute of Technology,
Institute for Applied Materials

Useful Webinars

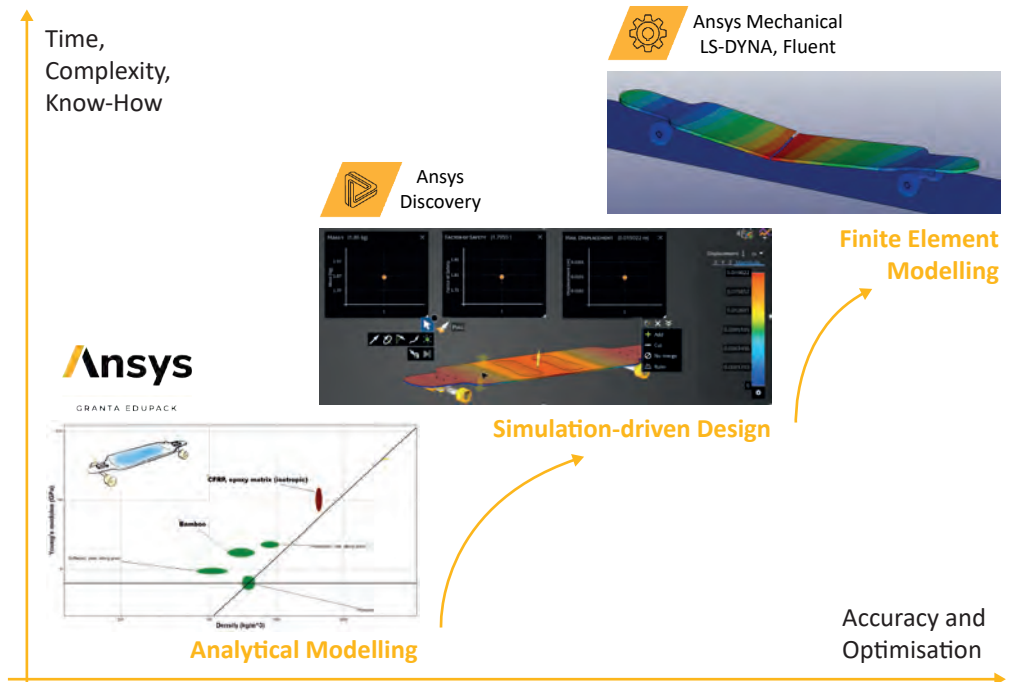
- 1) “Teaching Material Selection and Structural Analysis: A Foot-bridge Example”, recording available [here](#); ➔
- 2) “Material Selection and Modeling of a Bio Stent”, recording available [here](#); ➔
- 3) “Longboard Design with Ansys Mechanical and Granta EduPack”, recording available [here](#). ➔

Example Teaching Resources

- 1) “Level 2 Industrial Case Study: Longboard” (material selection), download available [here](#); ➔
- 2) “Case Study: Longboard Simulation with Ansys Mechanical”, download available [here](#); ➔
- 3) “Lecture Unit: Structural Analysis of Beams with Ansys Discovery”, download available [here](#). ➔

➔ Bridging the gap between material selection and simulation

Supporting the use of simulation earlier in the curriculum to inspire students and enhance the understanding of a holistic design process at an early stage



EXPORTERS

Built-in exporters for materials data to most common CAD/CAE software
(Limited to Level 3 databases)



MDS

“Materials Data for Simulation” is a dedicated dataset that includes more temperature dependent curves and data on fluids and gases



INTEGRATION

Full integration within the Ansys Workbench environment



- Ansys Discovery
- Ansys Electronics Desktop
- Ansys Fluent
- Ansys Granta MI Pro
- Ansys Mechanical APDL (Ansys Classic)
- Ansys Motor-CAD
- Ansys Sherlock
- Ansys Workbench
- Abaqus
- Altair Inspire
- Creo Parametric (Pro/ENGINEER Wildfire)
- NX (MatML)
- Nastran
- SolidWorks

➔ For more information visit:

www.ansys.com/products/materials/granta-edupack/
or [Ansys Education Resources](#)

Using Ansys Granta Research Selector for Academic Research

MATERIALS DATA, SELECTION AND SUSTAINABILITY

Ansys Granta Research Selector offers multiple reference databases and tools to support an academic research project including material/process selection and optimization steps. You can rapidly find the best materials for any application then directly export materials property data; compare your in-house experimental research data with built-in comprehensive materials data; synthesize hybrid materials and assess their properties; use data visualization and analysis tools to guide through the whole research project and support advanced educational reports and all kinds of publications.

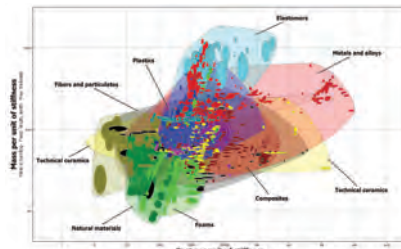
Useful Webinars

- 1) "High Level Material Data for Research Projects", recording available [here](#);
- 2) "Materials Selection in research and teaching: an aerospace additive manufacturing example", recording available [here](#);
- 3) "Finding the Most Cost-Effective Material for Your Application", recording available [here](#).

Example Resources

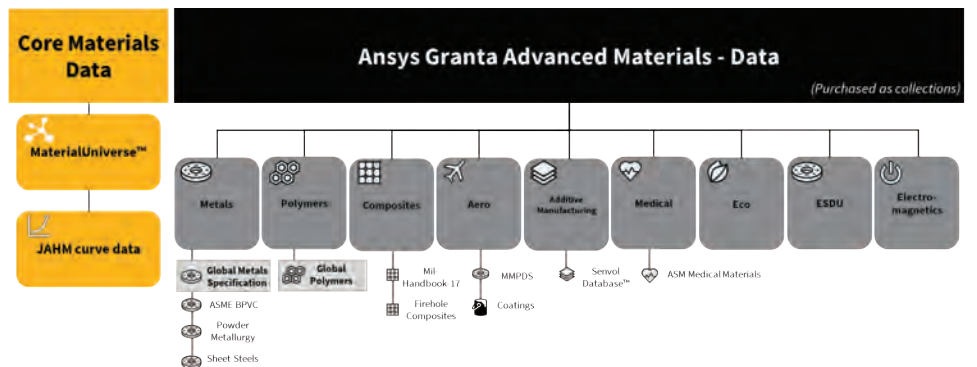
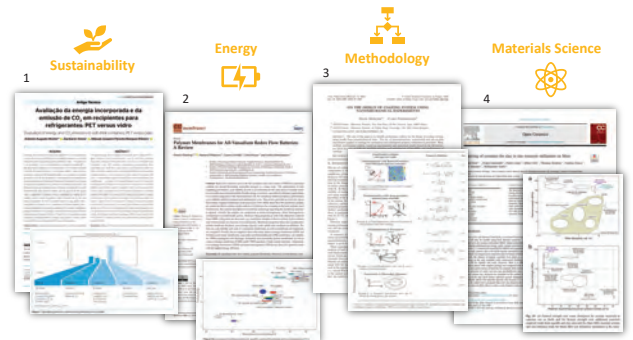
- 1) "Case Study: Materials Selection for a Heat Sink with Ansys Granta Selector", download available [here](#);
- 2) "White Paper: Materials for the Electrification of the Powertrain", download available [here](#);
- 3) "Industrial Case Study: Airinum Uses Ansys Granta Selector to Identify New Textile Materials for Masks, Reducing Environmental Impact", download available [here](#);

/ Access to industry standard advanced data, and tools to analyze the data



Ansys Granta Research Selector supports academics in conducting state of the art research, based on strong reference data. And it gives academics the right to use the data for publishing peer reviewed scientific papers.

- Access to multiple reference databases, such as materials, processes, and providers
- Add in-house materials data using existing schema and compare with materials in the database
- Export simulation ready materials data for a wide range of simulation and CAD/CAE software
- Straightforward evaluation of the environmental impact of your product



Depending on your research needs, you can choose to add [advanced materials data-bundles](#) covering different material families or use cases to the Core materials data available in the software

1) [Link to paper](#) - © 2019, Morini, A., Hotza, D. and Ribeiro, M. 2019. Licensed under a Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>)
 2) [Link to paper](#) - © 2021, Duerkop, D., Widdecke, H., Schilde, C. and Schmiemann, A. 2021. Licensed under a Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>)
 3) [Link to paper](#) - © 2020, Mercier, D. and Fredriksson, C. 2020. Licensed under a Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>)
 4) [Link to paper](#) - © 2020, Karl, D., Kamutzki, F., Lima, P., Gili, A., Duminy, T., Zocca, A., Günster, J., and Gurlo, A. 2020. Published by Elsevier Ltd on behalf of European Ceramic Society. Licensed under a Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>)

For more information visit: <https://www.ansys.com/products/materials/granta-selector>