



# Instructor ReadMe

## Fundamentals of Crystallography and Crystal Defects with Ansys Granta EduPack Software

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## Software Access

Ansys Granta EduPack™ teaching software for materials education is a license-only product. Please check with your institution's IT department to determine if you already have access to this software.

To learn more about Granta EduPack, please check out the [link here](#). If you are interested in a demo, you can reach out to your Ansys representative or use the “Contact us” link on the product webpage to get in touch with us.

## Software Training

Ansys Granta EduPack software is a straightforward tool to use, with majority of users picking up the key functionalities quickly.

If you want to introduce key functions of the software such as basic database layout or creating charts, you can use the two PowerPoint lectures below.

- [Intro to Ansys Granta EduPack Lecture | Education Resource](#)
- [Intro to Ansys Granta EduPack Charts | Education Resource](#)

Students can also follow along with robust video tutorials linked both within the software and [here on YouTube](#).

This teaching package utilizes the Materials Science & Engineering database. To learn more about this specific database, you can use the PowerPoint lecture below.

[Material Science in Ansys Granta EduPack | Education Resource](#)

## References

Below are the references used during the creation of this set of resources.

1. Callister, W. D., & Rethwisch, D. G. (2018). Materials science and engineering: an introduction (10th ed.). Wiley.
2. Porter, D. A., Easterling, K. E., & Sherif, M. (2009). Phase Transformations in Metals and Alloys, (Revised Reprint). CRC press.
3. Abbaschian, R., & Reed-Hill, R. E. (2008). Physical metallurgy principles. Cengage Learning.
4. Granta EduPack Software, Materials Science & Engineering Database, 2020

## Solution Guides- INSTRUCTOR ACCESS ONLY

Instructors may email [education@ansys.com](mailto:education@ansys.com) to request access to the following solution and support documents. Documents will be sent as a single zip file for ease of sharing.

1. Exercise solutions
2. Quiz question solutions
3. Quiz questions in Blackboard LMS and QTI (Canvas) format
4. Example concept map solutions
5. MicroProject solutions

## Educational Resources in Teaching Package

Below are content descriptions and potential use cases for each of the resources available to download from the teaching package landing page. They are designed to work together but can also be used separately depending on course needs.

### Lecture & Student Note Document

Theory focused lecture, with detailed slide notes to aid in presentation

The accompanying Student Note document has been made to help guide note taking during lecture, emphasizing key theoretical concepts that students should pay attention to during lecture.

#### *Potential uses:*

- In-class lecture
- Online lecture, with note sheet to help students stay engaged

### Exercise & Quiz Questions

The exercise set includes eight multi-step open-ended questions that directly connect to the MS&E database in Granta EduPack.

The quiz questions include 26 questions, mostly multiple choice with a few open-ended and True/False.

#### *Potential uses:*

- Exercises
  - » Homework assignment
- Quiz questions
  - » Short knowledge checks in LMS/class
  - » Questions for a larger assessment

### MicroProjects

MicroProjects, originally designed by Prof. Mike Ashby, are short investigations of an aspect of Materials Science and Engineering that can be completed in less than an hour. Each poses a set of questions that can be answered using the Granta EduPack Material Science and Engineering (MS&E) database.

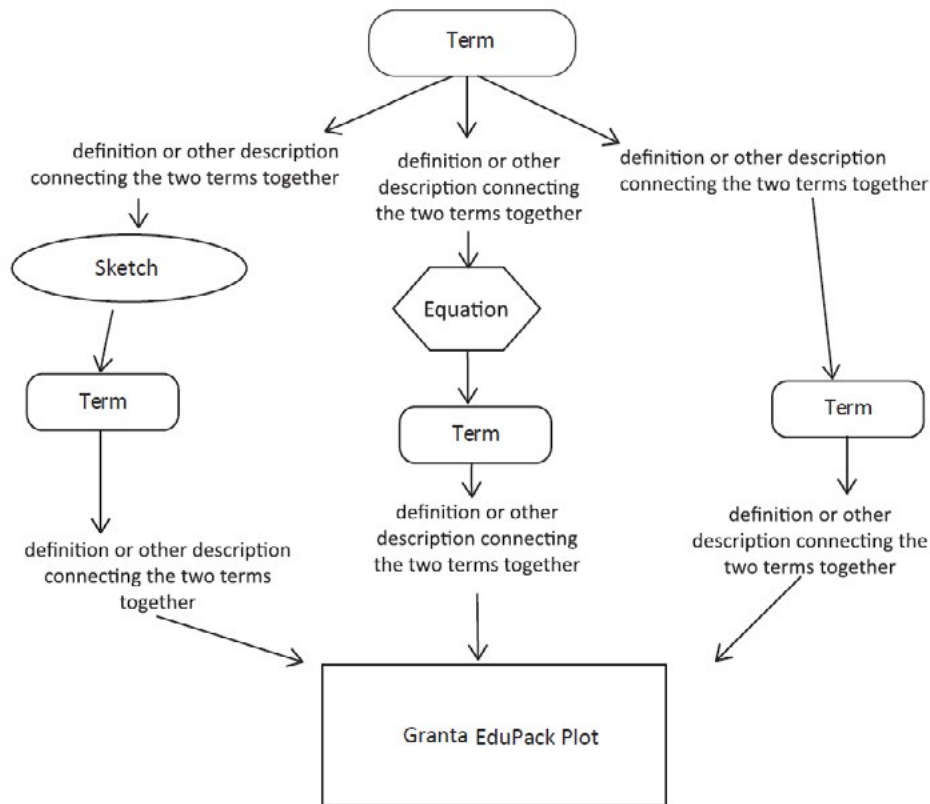
All start at a level that is readily accessible, using the SEARCH function to find records, creating charts using the CHART/SELECT function, and extracting relevant data from a Record and its linked SCIENCE NOTES. Hints in gray help with any difficult step. Each MicroProject has an attached Discussion Point – a challenge to go further. The Discussion Point poses a question linked to or arising from the MicroProject. Responding to the Discussion point requires independent thought and research, takes longer, but is rewarding if followed. It is an add-on for more advanced study.

#### *Potential uses:*

- In-class activities (lecture hall or lab)
- Homework assignments
- Activity to introduce students to functionalities of Granta EduPack

## Concept Maps

A concept map can help by giving students a way to visualize these connections. By providing a focused set of terms, definitions, sketches, equations, and plots, a map can be drawn with a specific topic area in mind; the end goal of these map prompts is to help students understand the connections between key terminology. An example of the different elements of a map and how they could connect is shown below.



Three different crystallography and crystal defect-related prompt lists are provided, covering (1) Crystallography and Unit Cells, (2) Point Defects, and (3) Non-Point Defects.

### *Potential uses:*

- Solo activity with detailed faculty feedback
- In pairs or groups to be shared in class
- Solo activity, then switch maps to provide peer review
- Solo activity drawing one map, then reversing the logic flow and adjusting descriptions to match

## Miller Indices Guides

To support students drawing and labeling crystallographic planes and directions, two guides were created. One covers Miller Indices in Cubic crystal systems and the other covers Miller-Bravais Indices in Hexagonal crystal systems.

Both guides provide logical steps that students can follow to get repeatable results.

### *Potential uses:*

- Homework support documentation
- Guides for in-class activities

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## Document Information

This case study is part of a set of teaching resources to help introduce students to topics related to fluids.

## Ansyes Education Resources

To access more undergraduate education resources, including lecture presentations with notes, exercises with worked solutions, microprojects, real life examples and more, visit [www.ansys.com/education-resources](http://www.ansys.com/education-resources).

## Feedback

Here at Ansys, we rely on your feedback to ensure the educational content we create is up-to-date and fits your teaching needs.

[Please click the link here](#) out a short survey (~7 minutes) to help us continue to support academics around the world utilizing Ansys tools in the classroom.

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