NANOENGINEERING DEGREE PROGRAM
Professor Donald Sirbuly
Nanoengineers *(that could be you!)* control materials and processes on the scale of 1-100 nm.
This highly interdisciplinary research is of fundamental importance for

Nanomedicine, flexible and stretchable electronics, energy conversion and storage, biomaterials and bioinspired materials, nanophotonics, nanoelectronics, nanomagnetics, complex metallic and ceramic materials, composites and alloys, computational materials science, high-performance computing, machine learning, data science and artificial intelligence, ... etc ...
Impact of Nanoengineering

- In the coming years, nanotechnology will impact nearly every aspect of human life, in tangible, obvious ways.
A great overview of the research activities in NanoEngineering at UCSD can be found in the journal *ACS Nano*:
Industries Employing Nanoengineers

- Earning a B.S. in Nanoengineering will provide training for *traditional engineering fields*, in addition to *new, developing fields* that involve nanostructured materials. These include:
  - Electronic materials & device manufacturing
  - Polymers and composite materials
  - Sensor technology & environmental remediation
  - Alternative and renewable energy
  - Paints, coatings, advanced inks
  - Agriculture; food and drink
  - Pharmaceuticals, drug delivery, & toxicology
  - Advanced textiles
  - Personalized medicine: tissue engineering, gene therapy, stem cell development
- 90% employed in a position related to major
A degree in NanoEngineering gives you a jumpstart in training!
The NANO curriculum will enable you with different engineering skills than other majors, by combining strong fundamentals of applied science with a nanoengineering skillset.

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<tr>
<th>YEAR</th>
<th>Course(s)</th>
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<tbody>
<tr>
<td>1</td>
<td>• Engineering Prep</td>
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<tr>
<td>2-3</td>
<td>• Fundamentals in Applied Science</td>
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<tr>
<td></td>
<td>(102:Chemistry, 104:Physics, 108:Materials</td>
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<td>Science and Engineering)</td>
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<td>• Nanoengineering Skillset</td>
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<td>(111:Characterization, 107:Electronics,</td>
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<td>112:Fabrication)</td>
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<td>4</td>
<td>• Capstone Design</td>
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There are courses to provide experiential training at all levels

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<tr>
<th>YEAR 1</th>
<th>• NANO 4: Experience Nanoengineering (1 unit)</th>
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<tr>
<td>YEAR 2</td>
<td>• NANO 20L: Nanomaterials Synthesis (1 unit), concurrent with NANO 102: Chemical Principles</td>
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<td>YEAR 3</td>
<td>• NANO 100L: Physical Properties of Materials Laboratory (4 units, NANO 108: Materials Science prereq.)</td>
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<td>• NANO 115L: Nanoengineering Lab (4 units)</td>
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<td>YEAR 4</td>
<td>• NANO 119: Engineering Design (1 unit)</td>
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<td>• NANO 120 A&amp;B: Nanoengineering System Design, Capstone Design (8 units, 2 quarters)</td>
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All incoming NANO students are assigned a faculty advisor for the first year.

What can I discuss with my faculty advisor?

- Academic questions related to Nanoengineering
- Research areas of interest & opportunities
- Courses they will be teaching throughout the year
- Internships, volunteer opportunities or organizations they work with in the community
- Recommendations for other majors, minors, professors, or courses in a particular area of interest
- Referrals to campus resources
- Developing academic goals
- Graduate school
- Careers (and visit the Career Center!)
- Building skills needed in areas of interest
- University life

**TIP:** Email your faculty advisor and set up an appointment to meet. Be prepared!
NANO 199. Independent Study for Undergraduates

Independent research by special arrangement with a faculty member. P/NP grades only. **Prerequisites: agreement of faculty advisor.**

- Equivalent to Senior Thesis
- Minimum GPA of 3.0
- Two consecutive quarters (can be approved for two NE electives – 8 units)
- Most continue beyond the two quarters
Advanced BS/MS Program

- A contiguous program leading to a bachelor of science and a master of science degree in nanoengineering is offered to students with a junior standing who has an upper-division GPA of 3.5 or better.

- Students are admitted without having to take the GRE.

- The degree is offered under both the Thesis Plan and the Comprehensive Examination Plan.
NANO majors can earn a minor in Data Science!

The emerging discipline of **Materials Informatics** is at the intersection of materials science, computational science, and information science. Data science tools are currently being developed to accelerate the rate at which new materials can be designed, manufactured, and deployed.

If interested, schedule a meeting with a Data Science Undergrad Advisor: [https://datascience.ucsd.edu/current-students/academic-advising/](https://datascience.ucsd.edu/current-students/academic-advising/)

**Lower-division courses (36 units):** COGS 9, DSC 10, DSC 20, DSC 30, DSC 80, MATH 18, MATH 20A, MATH 20B, MATH 20C

Please be advised: students must plan to complete DSC 40A and DSC 40B as pre-requisites to their required courses. See DSC website for more information ([https://datascience.ucsd.edu/current-students/minor-requirements/](https://datascience.ucsd.edu/current-students/minor-requirements/)).

**Upper-division courses (20 units):**
- ECON 120A or MATH 183 or MATH 181A
- MATH 189: Exploratory Data Analysis and Inference
- DSC 140A or (DSC 148 or CSE 158(R)) or CSE 150A or (DSC 140B or CSE 151A) or COGS 118A or COGS 118B
- DSC 106: Introduction to Data Visualization or COGS 108: Data Science in Practice
- Upper-division DSC course
NanoEngineering Student Affairs

- Each student has two advisors:
  - Department Advisors – help with major related courses and questions
  - College Advisors – help with general education and university-wide questions
- Questions about Chemistry, Math, Physics, and Biology requirements: direct to the respective department.
- All courses on academic plan must be taken for a letter grade (except NANO 4, CENG 4, or NANO/CENG 199). Stick to the academic plan. Core courses only offered once a year!
- We recommend that you register for general courses (CHEM, MATH, PHYS) during your first pass, and major courses (CENG/NANO) during your second pass (two passes start your Winter quarter).
- Pre-authorization Request vs Petitions: know the difference and when to use what form. Info is on our website.
- How to contact advising: Virtual Advising Center messages, walk-in advising, and appointments only.
- Familiarize yourself with our website, the student handbook, and your advisors!

https://nanoengineering.ucsd.edu/
Undergraduate Career Development

- Career Center (campus-wide)
- Panels on graduate school & industry
- Resume workshops
- Local outreach (Fleet Science Center)
- Undergraduate development / service organizations
Undergraduate Involvement in Research

• Undergraduate research is the reason many people decide to come to UC San Diego.

• Some research groups have as many as 10-20 undergraduate researchers.

• Research can be taken on a volunteer basis or for NANO 199 technical elective credit.

• Many opportunities exist for getting funded over the summer.

• Write specific emails to professors, talk to your TAs, be persistent!
EnVision
Arts and Engineering Maker Studio

The Jacobs School’s Makerspace
It’s a creative space

- Hands-on classes
- Open hours for your own projects
- EnVisionaries student org
- Envision.ucsd.edu

SME 301