

Undergraduate Program Handbook

Packaging Engineering Program

<http://packaging.rutgers.edu>



RUTGERS

School of Engineering

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Undergraduate Program Handbook

B.S. in Applied Science Engineering, concentration in Packaging Engineering

1. Introduction

The Packaging Engineering Program at Rutgers University School of Engineering offers students a comprehensive education in the realm of packaging engineering. Within this program, students earn an Applied Science Engineering degree, with a designated concentration in Packaging Engineering distinguished on their official transcripts. As the only comprehensive packaging engineering curriculum within an engineering school in the United States, the program offers students an exceptional education that seamlessly aligns with industry standards and positions them for successful careers in this perpetually evolving field.

The Packaging Engineering Program is grounded in an interdisciplinary approach, drawing from chemical, industrial, materials, mechanical engineering, and supply chain disciplines to equip students with the skills and knowledge necessary to excel in the packaging industry. For those interested in a broader engineering education, the Packaging Engineering Program also offers opportunities for cross-disciplinary learning. Students can select electives from related fields such as industrial design, marketing, and business, allowing them to develop a holistic understanding of the packaging industry's various facets.

The Packaging Engineering curriculum is designed to foster collaboration and innovation. Through project-based coursework, students engage in real-world challenges faced by the packaging industry, honing their problem-solving and teamwork skills. Our program is committed to producing graduates who not only excel in their technical abilities but also understand the ethical and environmental dimensions of their work.

As you navigate this handbook, you will find detailed information about the Packaging Engineering curriculum, concentrations, electives, and opportunities for hands-on experience. We are excited to guide you through your academic journey in packaging engineering, preparing you for a rewarding career in a field that marries innovation with functionality.

Within the Packaging Engineering (PE) curricula, every endeavor is directed towards accomplishing the program's educational objectives, which encompass:

1. Equipping students with a robust education in Packaging Engineering, ensuring their adeptness, mettle, and professionalism within the discipline.
2. Preparing students for prosperous careers, empowering them to contribute positively to their industry and wider society, or to pursue advanced studies for research and education at the graduate level.

3. Cultivating within students an awareness of the ethical and societal facets inherent to their field, nurturing a profound sense of responsibility and an enduring commitment to a lifelong journey in the realm of packaging engineering.

For each student graduating from the Packaging Engineering Program, the following proficiencies are expected:

1. Problem-solving expertise: Identifying and resolving complex engineering challenges using principles of engineering, science, and mathematics specific to packaging engineering.
2. Design proficiency: Applying engineering design principles to create solutions that meet defined needs while considering health, safety, culture, environment, and economics in the context of packaging.
3. Effective communication: Skilfully conveying packaging engineering concepts to diverse audiences through coherent and comprehensive communication.
4. Ethical judgment: Recognizing ethical responsibilities and making informed decisions regarding the broader impact of packaging engineering solutions on global, economic, environmental, and societal contexts.
5. Collaborative and analytical skills: Functioning adeptly within teams, conducting appropriate experimentation, analyzing data, drawing sound conclusions, and continuously acquiring and applying new knowledge as the packaging engineering landscape evolves.

2. PE Curricula

Welcome to the Packaging Engineering Program within the Department of Mechanical and Aerospace Engineering (MAE) at Rutgers University School of Engineering. This program is designed to offer a robust education leading to a Bachelor of Science (BS) degree in Applied Science Engineering, with a specialized concentration in Packaging Engineering. Packaging Engineering students are presented with an extensive array of program courses, affording them the opportunity to tailor their academic journey according to their individual interests and career aspirations.

Packaging Engineering Curriculum:

Students will engage with a comprehensive curriculum comprising a total of 15 specialized packaging courses, four of which are designated as packaging electives. These courses provide a strong foundation in packaging engineering, enabling students to master the essential skills and knowledge required for success in the field.

Core Packaging Courses:

- Introduction to Packaging Engineering (14:440:301)
- CAD for Packaging Engineering (14:440:302)
- Packaging Evaluation (14:440:371)
- Packaging Lab 1 (14:440:470)
- Packaging Development Processes (14:440:418)
- Distribution Packaging (14:440:471)
- Packaging Lab II (14:440:473)
- Packaging Manufacturing (14:440:373)
- Innovation and Design (14:440:419)
- Packaging Manufacturing II (14:440:477)
- Senior Design (14:440:420)
- Packaging Electives:

The program also offers a range of engaging elective courses that allow students to delve deeper into specific areas of packaging engineering. These elective options include:

Fall electives courses:

- Sustainable Packaging (14:440:378)
- Special Problems in Packaging (14:440:489)

Spring electives courses:

- Safety Packaging (14:440:403)
- Packaging Printing and Design (14:440:406)
- Packaging Machinery (14:440:468)
- Special Problems in Packaging (14:440:489)

Students have the flexibility to complete up to two synchronous packaging graduate courses towards the packaging undergraduate electives requirements.

3. Capstone Design Projects

All packaging engineering students during their senior year should register for the sequence of two courses: 440:419 Innovation & Design (3 credits) during the fall semester and 440:420 Senior Design (3 credits) during the spring semester. Fulfilling these courses successfully is essential for graduation.

Team building

Each team is composed of 3 to 4 PE students with one industry advisor guiding the students. Students and advisors from other departments may join the teams upon agreement of all team members and advisors.

Projects

At the beginning of 14:440:420 Senior Design, projects will be announced for groups to select their interested project.

4. Electives for Packaging Engineers: Technical, Humanities/Social Science

- A. **Technical Electives** are advanced courses that benefit students studying packaging engineering. In the Packaging Engineering (PE) program, students need to pick one technical elective from the list provided in this handbook. If you take extra program elective courses beyond the four required, students can also count them as technical electives.

Students can use the Packaging Engineering Internship/Co-op (440:498/499) to fulfill the technical elective requirement. However, only up to 3 credits can be used for this purpose. To request a special permission number, go to packaging.rutgers.edu/forms.

- B. **Humanities/Social Science Electives** are intended to serve the objectives of a broad education, and to make engineers fully aware of their social responsibilities and better able to consider related factors in the decision-making process. A list of acceptable Humanities/Social Science Electives courses is provided on the School of Engineering website at <https://soe.rutgers.edu/oas/electives>

Course descriptions for PE courses as well as courses on Sciences, Humanities, and Math can be found at the pertinent Rutgers Course Catalogues.

For example, PE course descriptions are found at:
https://catalogs.rutgers.edu/generated/nb-ug_current/pg1291.html .

5. Hands-On Experience in Packaging Engineering: A Practical Approach

At the core of the Packaging Engineering program lies a pivotal component that distinguishes it: hands-on experience. The program understands that learning extends beyond the classroom, particularly within the realm of packaging engineering.

Students within the program have the unique opportunity to engage with real-world challenges in the packaging industry. Through cooperative (co-op) and internship programs, students immerse themselves in industrial settings, translating theoretical knowledge into practical solutions and gaining firsthand insights into the functioning of packaging engineering in a real-world context.

These experiences involve collaborating with professionals from industry-leading companies like Bayer HealthCare, Estée Lauder, and L'Oréal Paris. By participating in teams that design, develop, and assess packaging solutions, students witness the complete lifecycle of products, from initial concept to final consumer. This practical exposure reinforces classroom learning and hones tangible skills that are highly coveted within the job market.

The co-op/ internship program offers students the opportunity to earn academic credits while actively participating in industry work, enabling them to acquire knowledge while simultaneously gaining professional experience. This immersive exposure often results in post-graduation employment offers, as companies recognize the advantage of hiring individuals who have already demonstrated their competence in real-world scenarios.

Moreover, students benefit from mentorship by industry experts who possess a comprehensive understanding of packaging engineering intricacies. This mentorship not only guides their educational journey but also facilitates networking opportunities critical for future career growth.

In essence, the hands-on experiences within the Packaging Engineering program transcend theoretical boundaries, equipping students with practical skills and a confident demeanor that empowers them to excel in the field. Graduates are not only well-versed in knowledge but also adept at translating it into tangible contributions within the packaging industry.

6. Packaging Engineering Curriculum

FRESHMAN YEAR					
01:160:159	Gen Chem for Engr	3	01:160:160	Gen Chem for Engr	3
01:160:171	Intro to Experimentation	1	14:440:127	Intro Computers for Engr	3
01:355:101	Expository Writing	3	14:440:221	Eng'g Mech: Statics	3
14:440:100	Engineering Orientation	1	01:640:152	Calculus II	4
01:640:151	Calculus I	4	01:750:124	Analytical Physics IB	2
01:750:123	Analytical Physics IA	2	____: ____	Hum/SocSci Elective	3
____: ____	Hum/SocSci Elective	3			
	Total	17		Total	18
SOPHOMORE YEAR					
01:640:251	Multivariable Calculus	4	01:640:244	Differential Equations	4
01:750:227	Analytical Physics IIA	3	14:440:222	Eng'g Mech: Dynamics	3
01:750:229	Anal. Physics IIA Lab	1	33:799:301	Intro to Supply Chain	3
14:440:301	Intro to Packaging	3	14:440:____	Packaging Elective*	3
14:440:302	CAD in Packaging	3	____: ____: ____	Hum/SSci Elective 300+	3
14:540:343	Engineering Economics	3			
	Total	17		Total	16
JUNIOR YEAR					
14:440:371	Packaging Evaluation	3	14:440:418	Pkg Development Proc	3
14:440:470	Packaging Lab I	2	14:440:471	Distribution Packaging	3
14:440:____	Packaging Elective"	3	14:440:473	Packaging Lab II	2
____: ____	Mechanics*	3	14:440:____	Packaging Elective*	3
____: ____	Statistics*	3	01:355:302	Sci & Tech Writing	3
	Total	14		Total	14
SENIOR YEAR					
14:440:373	Packaging Manufacturing I	3	14:440:420	Senior Design Project	3
14:440:419	Innovation and Design	3	14:440:477	Packaging Manufacturing II	3
____: ____	Hum/SSci Elective 300+	3	14:440:____	Packaging Elective*	3
____: ____	Technical Elective	3	____: ____	Science Elective*	3
	Total	12		Total	12

Total Credits: 120

*Notes:

- Highlighted in yellow are core packaging courses.
- Packaging Electives 14:440:378, 14:440:403, 14:440:406, 14:440:408, 14:440:468, 14:440:489, 16:731:5xx
- Mechanics Elective: 14:635:314, 14:635:407, 14:180:243, 14:650:291
- Statistics Elective: 01:960:379, 01:960:384, 01:960:401
- Science Elective: 14:155:208, 14:635:206, 14:650:351, 01:160:209, 01:160:307, 14:635:361, 14:635:312

7. Technical Elective

Take one 3-credit course from the science/math/engineering courses offered by the departments below.

School	Code	Department	Courses
01x	105	Astrophysics	300+, 400+
01x	119	Biological Sciences	300+ (only research and honor courses)
01x	146	Cell Biology and Neuroscience	245, 270, 295, 300+, 400+
01x	160	Chemistry	251, 300+, 400+ ,
01x	198	Computer Science	205, 206, 211, 213, 214, 300+,
01x	220	Economics	210, 211, 300+,
01x	447	Genetics	300+, 400+
01x	450	Geography	213, 300+,
01x	460	Geological Sciences	300+
01x	640	Mathematics	244, 250, 251, 252, 285, 292, 300+, 400+,
01x	694	Molecular Biology and Biochemistry	209, 300+, 400+,
01x	750	Physics	202, 203, 204, 227, 228, 271, 272, 273, 300+, 400+,
01x	960	Statistics	201, 211, 212, 285, 300+, 400+,
10x	762	Planning and Public Policy	300+, 400+
10x	975	Urban Studies	300+, 400+
11x	115	Biochemistry	209, 300+, 400+
11x	117	Bioenvironmental Engineering	203, 300+,
11x	126	Biotechnology	300+, 400+
11x	127	Bio resource Eng.	300+, 400+
11x	573	Environmental Planning &	232, 233, 300+, 400+
11x	375	Environmental Science	201, 202, 203, 300+, 400+,
11x	400	Food Science	201, 202, 203, 300+, 400+,
11x	628	Marine and Coastal Sciences	300+, 400+
11x	704/216	Ecology and Natural Resources	272, 300+, 400+
14	XXX	School of Engineering	All Engineering dept. 200+, 300+, 400+ courses

8. Professional and Supplemental Programs

Dual Degree, Double major, and Minor programs

Minors, majors, and dual degrees provide students with the opportunity to broaden skill sets outside of engineering. These programs are offered in conjunction with various other undergraduate schools at Rutgers University, including the School of Arts and Sciences and the School of Environmental and Biological Sciences. For more information about these programs, see <https://soe.rutgers.edu/oas/minors-majors>

BS/Master's programs

There are three special joint programs offering the opportunity for engineering students to obtain a master's degree within one calendar year of completing the baccalaureate degree requirements. Qualified School of Engineering students are eligible to apply for admission to these accelerated master's programs in their junior year. For more information, see <https://soe.rutgers.edu/oas/BS-Masters>.

The James J. Slade Scholars Program

In the third year, students who have maintained a 3.2 university cumulative grade-point average may apply to the undergraduate director of their major department to be admitted into the James J. Slade Scholars Program. The Slade Scholar Program honors long-time School of Engineering faculty member James J. Slade who was a noted researcher, mathematician, and professor for 36 years. His commitment to teaching, scholarly excellence, and impact on students was legendary, and continues to resonate through this prestigious research program.

Each Slade Scholar prepares a plan of study under the guidance of a three-member faculty committee and the Honors Committee of the School of Engineering.

The chairperson of the student's committee shall be the research thesis adviser and should be a member of his or her major department. For more information, see <http://soe.rutgers.edu/slade>.
PE, MAE Department Requirements:

1. GPA 3.2
2. Independent research and a thesis giving a total of six credits, **650:542/543 graduate level credits** which may be transferred in MS program, beyond the minimum required for graduation.
3. Thesis presented to advisor's group.
4. Participation in Poster Session at the end of the Spring semester.

JJ SLADE Experience is a [letter grade](#) course.

Study Abroad

Many engineering students take advantage of Rutgers' Study Abroad educational opportunities choosing to study for a semester, a summer, or an academic year at one of the many international programs open to Rutgers students. Students can study abroad as early as sophomore year at locations including Hong Kong, Australia, London, South Africa, and more. Orientation sessions

provide valuable information for making the necessary educational and logistical plans. For more information, see <https://soe.rutgers.edu/student-experience/study-abroad>.

Cooperative (Co-Op) & Internship Experiences

Engineering students who have completed the required major courses by the fall semester of their sophomore year and maintain a cumulative GPA of at least 2.5 are eligible to participate in the co-op or internship program.

Co-op Option: The PE co-op requires that students complete a 6-month, full-time (40 hrs/wk) work experience in a corporate engineering position. Upon request, students can register 6 credits towards technical electives. Enrollment is in either course 14:440:498 or 14:440:499.

Internship Option: The PE internship requires that students complete a 3-month, full time (40 hrs/wk) or 6 months, part time (>19 hrs/wk) work experience in a corporate engineering position. Upon request, students can register for 3 credits towards technical electives. Enrollment is in course 14:440:498 or 14:440:499.

Note 1: Since the packaging curriculum only requires one technical elective, only 3 credits will be applied to degree requirements. Co-op and internship **do not** count towards packaging elective courses.

After a student finds an engineering position in the company of his/her liking the following steps should be accomplished for technical elective credits in packaging:

- Complete special permission request at packaging.rutgers.edu/forms.
- Submit job offer with job description for approval to the packaging undergraduate office.
- After approval of job description, student will receive SPN to register for 440:498/499.
- Upon completion of the co-op/internship the student should submit at the packaging undergraduate office the following:
 - A technical report that is due the ***first day of final exams*** in the semester you are registered for the course.
 - An evaluation letter from his/her supervisor indicating: 1) length and full-time employment of the student, 2) his/her duties, and 3) assessment of his performance.

Note 2: For full-time jobs, students are not encouraged to take courses during their co-op experience. If under extenuating circumstances a student is to take a course during his/her co-Op, the student is reminded that all packaging classes have mandatory attendance, and no credit will be given for missed classes.

The Office of Career Services provides listings of co-op opportunities, but students may also obtain positions on their own. For more information, see: <https://soe.rutgers.edu/student-experience/career-development>.

Note 3: No credit towards technical electives in PE will be given if the student is not registered for 440:498/499.

Both Co-op and Internship courses are graded on a Pass/Fail basis.

Undergraduate Research

This experience seeks to expand student participation in research projects with engineering faculty. It provides students with valuable interactions with faculty, access to well-equipped facilities, and opportunities for professional growth.

Students may earn up to 3 credits (total) counting towards a technical elective upon student's request in PE if they register under a department's undergraduate research.

The students are required to make a poster presentation of their research project and findings at the end of the academic year if they elect to use their undergraduate research experience for Technical Elective credits.

Undergraduate research is graded with letter grades.

Note 4: Total number of Undergraduate Research/Internship/Co-Op experience credits that may count towards a Technical Elective is limited to 3 credits (1 TE).

9. Undergraduate PE Certificate for Non- Majors

The Undergraduate Certificate in Packaging Engineering (PE) is a comprehensive 12-credit program developed to deliver specialized training in the dynamic field of packaging to students within Rutgers School of Engineering. Designed to enhance the educational and career opportunities of engineering students who are not pursuing the packaging curriculum, this certificate equips them with a distinct competitive advantage. Administered by the Department of Mechanical and Aerospace Engineering, the certificate seamlessly integrates into the engineering academic curriculum.

The completion of 14:440:301, "Introduction to Packaging," along with three additional 3-credit packaging courses, is the benchmark for acquiring the Undergraduate Certificate in Packaging Engineering. Delving into the course array, the following courses are eligible components of the packaging certificate curriculum:

14:440:301, 440:302, 440:371, 440:378, 440:403, 440:406, 440:468, 440:471, 440:477.

Note 5: Seniors are eligible to take one synchronous packaging graduate course (16:731:xxx) towards their packaging engineering certificate.

10. Departmental Student Advising

To enhance student awareness about the significance of academic advising, students are encouraged to establish communication with any of the listed advisors for course-related inquiries. With extensive expertise, PE advisors provide comprehensive support across various facets of students' academic pathway.

A list of current packaging engineering faculty is found at <https://packaging.rutgers.edu/faculty>. Core program advisors include Professors Hao Lin (PE UG Director); Professor Chris Miller; Professor Patricia Santos; and Professor Martin Golden. Students are strongly encouraged to reach out to their advisors for assistance with course selection and any career-related inquiries.

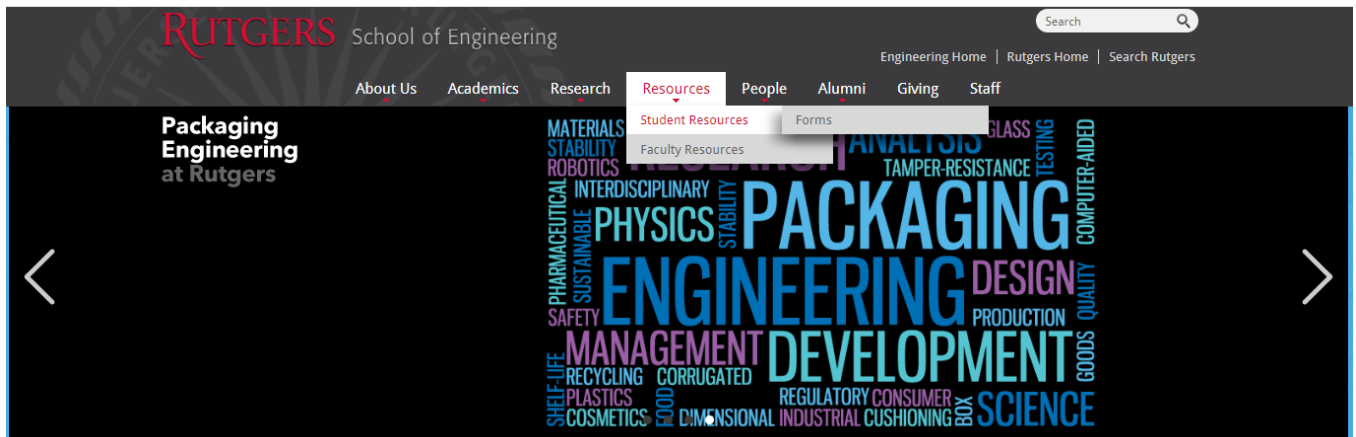
11. SPECIAL PERMISSION NUMBERS/PREREQUISITE OVERRIDES

Requests for special permission numbers (SPN) and prerequisite overrides are accepted ONLY electronically.

Procedure to request a Special Permission Number (SPN):

The direct link is packaging.rutgers.edu/forms.

Please go to Packaging Engineering website packaging.rutgers.edu



Then go **Resources** tab -> **Student Resources** tab -> **Forms** and complete the online Special Permission Number form or Override Prereqs form.

An email from the department will be sent to you with the decision on your request. If you do not receive a response within one week, send an email to the Undergraduate Office Administrator at packaging@soe.rutgers.edu with your name on the subject line, your type of request (e.g., SPN) and the data of the online request.

PLEASE NOTE: SPECIAL PERMISSION NUMBERS WILL ONLY BE ISSUED THROUGH E-MAIL.

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