

Undergraduate Program Handbook

Packaging Engineering Program

B.S. in Applied Science Engineering,
concentration in Packaging Engineering (CODE 073A)

1. INTRODUCTION	1
2. CURRICULA	4
2.1. COURSES IN PACKAGING: CORE AND ELECTIVE COURSES	4
2.2. TECHNICAL ELECTIVE (TE)	5
2.3. HUMANITY AND SOCIAL SCIENCE ELECTIVES (H/SS).....	6
2.4. MECHANICS, STATISTICS, AND SCIENCE ELECTIVES	6
2.5. CAPSTONE DESIGN PROJECTS	6
2.6. THE INTERNSHIP/CO-OP PROGRAM	6
2.7. PACKAGING ENGINEERING CURRICULA AND PREREQUISITES AT A GLANCE	8
3. PROFESSIONAL AND SUPPLEMENTAL PROGRAMS	9
3.1. DEGREE, DOUBLE MAJOR, AND MINOR PROGRAMS.....	9
3.2. BS/MASTER’S PROGRAMS	10
3.3. THE JAMES J. SLADE SCHOLARS PROGRAM	10
3.4. STUDY ABROAD	10
3.5. UNDERGRADUATE RESEARCH	11
3.6. UNDERGRADUATE PE CERTIFICATE FOR NON-MAJORS	11
4. DEPARTMENTAL STUDENT ADVISING	11
5. FORMS AND RESOURCES	12
6. VERSION HISTORY	12

1. Introduction

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. 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 mechanical, chemical, industrial, materials 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. Curricula

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.

2.1. Courses in packaging: Core and elective courses

Students will engage with a comprehensive curriculum comprising a total of 15 specialized packaging courses, 4 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 include:

- 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)

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

Packaging electives 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)

Besides, students have the flexibility to complete up to two synchronous packaging graduate courses towards the packaging undergraduate elective requirements.

2.2. Technical elective (TE)

Technical electives are advanced courses that benefit students studying packaging engineering. In the PE program, students need to fulfill **one** TE. TE can be fulfilled by:

- A 3-credit course from the table below.
- The Packaging Engineering Internship/Co-op (440:498/499). However, only up to 3 credits can be used for this purpose. Further details on this course are described below.
- Any packaging electives beyond the required four per 2.1.
- Undergraduate experience per 3.5.

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 & Geomatics	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

2.3. Humanity and social science electives (H/SS)

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>.

The students are required to fulfill **two** H/SS electives, **one** of which should be 300+ level.

2.4. Mechanics, statistics, and science electives

Students are required to fulfill **one** course in each of the elective categories below:

- 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

2.5. 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.

2.6. The internship/co-op program

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.

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.

Eligibility

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 while only 3 will be needed to apply toward degree fulfillment. 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.

Notes

- Co-op and internship **do not** count towards packaging elective courses.
- 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>.
- Both Co-op and Internship courses are graded on a Pass/Fail basis.

Application guidelines

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 <https://mae.rutgers.edu/mae-forms>.
- Submit job offer with job description for approval along with the form.
- After approval of job description, student will receive SPN to register for 440:498/499. **No credit towards technical electives in PE will be given if the student is not registered 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.

2.7. Packaging Engineering curricula and prerequisites at a glance

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

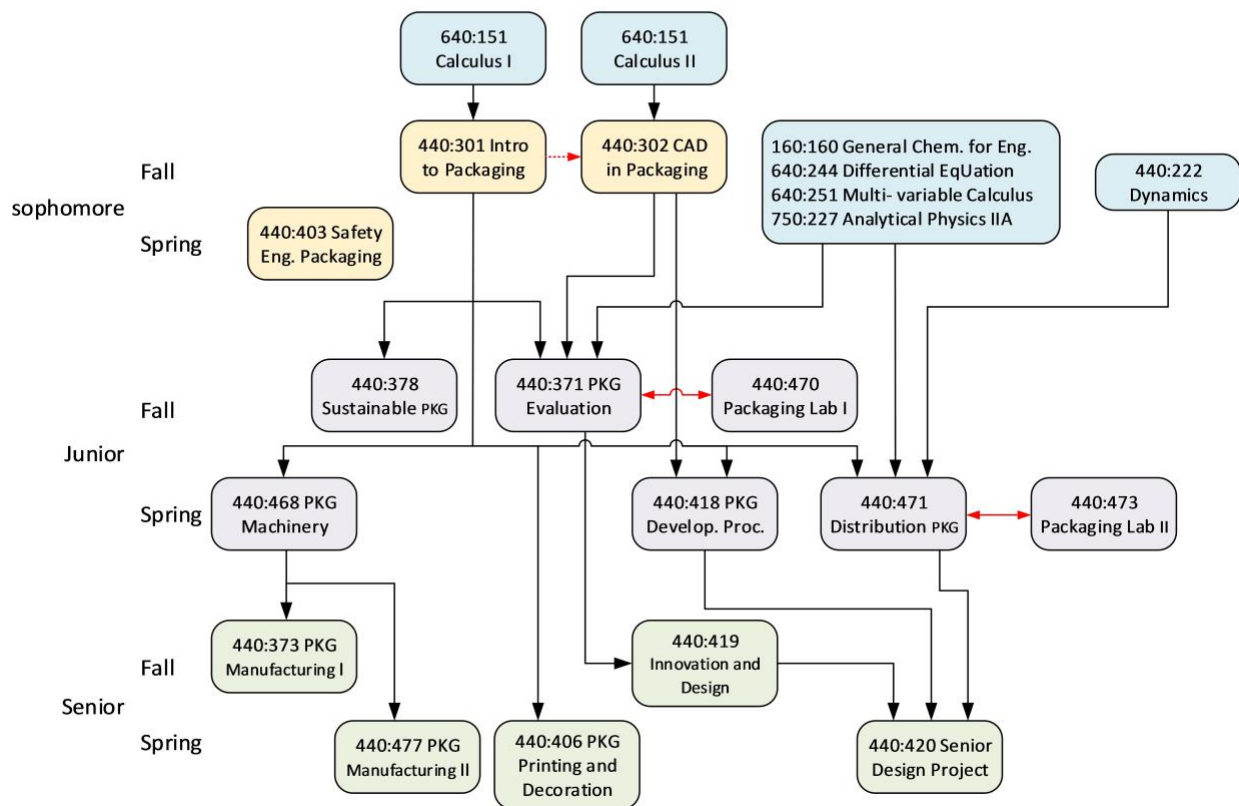
14:440:373	Pkg Manufacturing I	3	14:440:420	Senior Design Project	3
14:440:419	Innovation and Design	3	14:440:477	Pkg Manufacturing II	3
____: ____	H/SS Elective 300+	3	14:440:____	Packaging Elective*	3
____: ____	Technical Elective*	3	____: ____	Science Elective*	3
	Total	12		Total	12

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
- Technical Elective: Consult section 2.2

Packaging Engineering Program Prerequisites Flows



3. Professional and supplemental programs

3.1. 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>

3.2. 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>.

3.3. 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. JJ SLADE Experience is a **letter grade** course. For more information, see <http://soe.rutgers.edu/slade>.

PE, MAE Department requirements

1. GPA 3.2 or above.
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.

3.4. 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>.

3.5. 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.

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

3.6. 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.

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

4. 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 and instructors for course-related inquiries. A list of current packaging engineering faculty and staff is found at <https://mae.rutgers.edu/staff-directory>.

5. Forms and resources

Find forms and resources, including those for special permission request, prerequisite override, and certification application at <https://mae.rutgers.edu/mae-forms> where you scroll down for the “Packaging Engineering Forms” section.

This handbook is available online at <https://mae.rutgers.edu/undergraduate-academics>.

6. Version history

9.15.2024: This handbook was major incremented by Hao Lin, Professor of Mechanical and Aerospace Engineering and Undergraduate Director of the Packaging Engineering Program.

- Sections are re-organized and consolidated.
- Table of contents are generated.
- Links are validated and updated.