

IOWA STATE UNIVERSITY

GRADUATE COLLEGE

Dual-Listed Courses

Departments must request permission to offer courses at the graduate level in conjunction with 300-400 level undergraduate courses. The request is made to the Graduate Curriculum and Catalog Committee. If the dual-listed courses are also experimental courses (400X/500X), submit the experimental course form to the Scheduling Office, 10 Enrollment Services, AND attach an approved copy of the experimental course form(s) to the dual-listed request.

Dual-listed courses permit undergraduate and graduate students to be in the same class but to receive credit under two different course numbers. Credit in the graduate course is not available to students who have received credit in the corresponding undergraduate course. Both graduates and undergraduates receive the same amount of credit for the course, but additional work is required of all graduate students taking the course under the graduate-level course number. This extra work may take the form of additional reading, projects, examinations, or other assignments as determined by the instructor. The instructor must be a member of the Graduate Faculty or a Graduate Lecturer. Each dual-listed course is designated in the catalog with the phrase "Dual-listed with," although the student's official transcript of credits, both graduate and undergraduate, does not identify dual-listed courses as such. There is a limit to the number of dual-listed course credits that may be used to meet the requirement for an advanced degree. (For information about procedures for requesting permission to offer dual-listed courses, faculty should consult the *Graduate Faculty Handbook*.)

In reviewing proposals for dual-listed courses, this committee needs to understand the department's rationale for offering the course. When a department submits a request, an explanation should be given of the purpose served by the course and the criteria used by the department to determine if the course is suitable for dual-listing. Please submit the proposal in electronic form as a word attachment to grad_college@iastate.edu.

The following information should be included in the proposal:

1. Full catalog information for each course to be dual-listed, including the course numbers (or proposed course numbers), title, credits, semester offering (if applicable), prerequisites, and description. Dual-listed courses bear common numbers, e.g., 580 (480).

As an introduction to this dual-listing proposal, it is necessary to explain the context for asking to renumber existing courses and add new courses for both grad and undergrad students in Architecture.

The Department of Architecture offers two professional degrees – Bachelor of Architecture (B.Arch.) and Master of Architecture (M.Arch.). Both degrees are recognized by our accreditation and licensing organizations as first professional degrees. An undergraduate who completes a B.Arch. degree can work in practice, complete their internship requirements, and qualify to take the professional

licensing exam without additional graduate training. A student with an undergraduate degree in any field can also become a licensed architect by enrolling in a 102-credit first professional M.Arch. degree. They still have to work in practice, complete the same internship requirements, and qualify to take the professional licensing exam.

Both curricula have a significant science and technology component. For about seven years, we have been teaching the current courses to undergraduates and graduates separately. They combine lectures and hands-on laboratory work using a single course number. Starting in Fall 2017, the department will combine the lecture portions of the undergraduate and graduate courses (currently Arch 245, 341, 342, 343 for undergrads and Arch 541, 542, 643, 644 for grads). Hands-on laboratory courses will be taught separately. The logic for the department is to best utilize our teaching resources by delivering the lecture content to both the B.Arch. and M.Arch. students together and then having separate lab sections to ensure that the graduate students are challenged appropriately.

To do this, we have to renumber the courses in two ways. First, we have to create a set of dual-listed 300/500-level lecture courses. Second, we are creating a set of undergraduate laboratory courses that must be taken concurrently with the lectures, and a separate set of graduate laboratory courses that must also be taken concurrently. The laboratory components will not be dual-listed. The graduate curriculum will now also have 2 additional total credits (a change that will be reflected in the front of the catalog next year), since 3-credit courses are becoming 3-credit lecture plus 1-credit lab courses.

CURRENT COURSE NUMBERS

NEW COURSE NUMBERS

Undergrad	Graduate	Shared Lecture + Separate Lab
Arch 245, 3 cr.	Arch 541, 5 cr.	Arch 345/545, 2 cr. + Arch 345L (1 cr.) or Arch 545L (3 cr.)
Arch 341, 5 cr.	Arch 542, 5 cr.	Arch 346/546, 3 cr. + Arch 346L (2 cr.) or Arch 546L (2 cr.)
Arch 342, 5 cr.	Arch 643, 3 cr.	Arch 347/547, 3 cr. + Arch 347L (2 cr.) or Arch 547L (1 cr.)
Arch 343, 5 cr.	Arch 644, 3 cr.	Arch 348/548, 3 cr. + Arch 348L (2 cr.) or Arch 548L (1 cr.)
= 18 cr.	= 16 cr.	= 11 cr. shared lecture, 7 cr. separate labs

The course numbers in bold are the dual-listed courses. The ‘L’ sections are the concurrent labs.

<p><u>Arch 345 (545): Building Science and Technology I</u> (2-0) Cr. 2. F. Prereq: Admission to the professional program in architecture; concurrent enrollment in ARCH 345L. First course in a sequence focused on architectural building technologies. Lectures and labs cover: environmental forces and systems (solar orientation, climate, daylighting, natural ventilation, human comfort & occupancy patterns), materials and assemblies (drawing conventions, building codes, and physical properties of materials) and fundamental structural principles (forces/loads, equilibrium, and stability). Students must also enroll in 345L.</p>
<p><u>Arch 345L: Building Science and Technology I Lab</u> (0-2) Cr. 1. F. Prereq: Admission to the professional program in architecture; concurrent enrollment in ARCH 345. Laboratory to accompany Arch 345 and must be taken concurrently. Integrating building technologies into architectural designs through experiments and exercises in laboratory format.</p>

<p><u>Arch 346 (546): Building Science and Technology II</u> (3-0) Cr. 3. S. Prereq: ARCH 345, ARCH 345L, MATH 145 and PHYS 111; concurrent enrollment in ARCH 346L. Second course in a sequence focused on architectural building technologies. Lectures and labs cover: environmental systems (heat transfer in the building envelope, passive heating and cooling, daylighting, thermal comfort, analytical guidelines and building energy calculation methods), materials & assemblies (building envelope systems, accessibility, egress, and material properties), and structural systems (structural system selection/comparison, and design and analysis of “form-active” compression and tension structures). Students must also enroll in 346L.</p>
<p><u>Arch 346L: Building Science and Technology II Lab</u> (0-4) Cr. 2. S. Prereq: ARCH 345, ARCH 345L, MATH 145 and PHYS 111; concurrent enrollment in ARCH 346. Laboratory to accompany Arch 346 and must be taken concurrently. Integrating building technologies into architectural designs through experiments and exercises in laboratory format.</p>
<p><u>Arch 347 (547): Building Science and Technology III</u> (3-0) Cr. 3. F. Prereq: ARCH 346, Arch 346L; concurrent enrollment in ARCH 347L. Third course in a sequence focused on architectural building technologies. Lectures and labs cover: multistory building framing, assembly, and enclosure systems, sizing and selecting structural framing components (foundations, columns, beams, etc.), and an environmental design process that demonstrates the ability to integrate climate into the control of thermal, luminous, ventilative and acoustic environments. Introduction to plumbing and rain water collection systems. Students must also enroll in 347L.</p>
<p><u>Arch 347L: Building Science and Technology III Lab</u> (0-4) Cr. 2. F. Prereq: ARCH 346, Arch 346L; concurrent enrollment in ARCH 347. Laboratory to accompany Arch 347 and must be taken concurrently. Integrating building technologies into architectural designs through experiments and exercises in laboratory format.</p>
<p><u>Arch 348 (548): Building Science and Technology IV</u> (3-0) Cr. 3. S. Prereq: ARCH 347, Arch 347L; concurrent enrollment in ARCH 348L. Fourth course in a sequence focused on architectural building technologies. Lectures and labs cover: ability to demonstrate active environmental HVAC control systems design, use and design of mechanical, electrical, plumbing, fire safety, transportation, and conveying systems and subsystems, constructed building assemblies and details (building envelope details for waterproofing and enclosure, advanced material properties, costs, and serviceability), and structural design for multi-story structures (design and documenting various framing patterns, integration with other building systems, and lateral stability strategies for wind and seismic). Students must also enroll in 348L.</p>
<p><u>Arch 348L: Building Science and Technology IV Lab</u> (0-4) Cr. 2. S. Prereq: ARCH 347, Arch 347L; concurrent enrollment in ARCH 348. Laboratory to accompany Arch 348 and must be taken concurrently. Integrating building technologies into architectural designs through experiments and exercises in laboratory format.</p>

Arch 545 (345): Building Science and Technology I

(2-0) Cr. 2. F.

Prereq: Admission to the M. Arch. program and concurrent enrollment in ARCH 505 and ARCH 595; concurrent enrollment in ARCH 545L.

First course in a sequence focused on architectural building technologies. Lectures and labs cover: environmental forces and systems (solar orientation, climate, daylighting, natural ventilation, human comfort & occupancy patterns), materials and assemblies (drawing conventions, building codes, and physical properties of materials) and fundamental structural principles (forces/loads, equilibrium, and stability). Readings and project presentations. Students must also enroll in 545L.

Arch 545L: Building Science and Technology I Lab

(0-6) Cr. 3. F.

Prereq: Admission to the M. Arch. program and concurrent enrollment in ARCH 505 and ARCH 595; concurrent enrollment in ARCH 545.

Laboratory to accompany Arch 545 and must be taken concurrently. Integrating building technologies into architectural designs through experiments and exercises in laboratory format. Readings and project presentations.

Arch 546 (346): Building Science and Technology II

(3-0) Cr. 3. S.

Prereq: ARCH 505, ARCH 545, ARCH 545L, and ARCH 595; concurrent enrollment in ARCH 506, ARCH 546L and ARCH 596.

Second course in a sequence focused on architectural building technologies. Lectures and labs cover: environmental systems (heat transfer in the building envelope, passive heating and cooling, daylighting, thermal comfort, analytical guidelines and building energy calculation methods), materials & assemblies (building envelope systems, accessibility, egress, and material properties), and structural systems (structural system selection/comparison, and design and analysis of "form-active" compression and tension structures). Readings and project presentations. Students must also enroll in 546L.

Arch 546L: Building Science and Technology II Lab

(0-4) Cr. 2. S.

Prereq: ARCH 505, ARCH 545, ARCH 545L, and ARCH 595; concurrent enrollment in ARCH 506, ARCH 546 and ARCH 596.

Laboratory to accompany Arch 546 and must be taken concurrently. Integrating building technologies into architectural designs through experiments and exercises in laboratory format. Readings and project presentations.

Arch 547: Building Science and Technology III

(3-0) Cr. 3. F.

Prereq: ARCH 506, ARCH 546, ARCH 546L, and ARCH 596 or advanced standing in the M.Arch program; concurrent enrollment in ARCH 601 and ARCH 547L.

Third course in a sequence focused on architectural building technologies. Lectures and labs cover: multistory building framing, assembly, and enclosure systems, sizing and selecting structural framing components (foundations, columns, beams, etc.), and an environmental design process that demonstrates the ability to integrate climate into the control of thermal, luminous, ventilative and acoustic environments. Introduction to plumbing and rain water collection systems. Readings and project presentations. Students must also enroll in 547L.

Arch 547L: Building Science and Technology III Lab

(0-2) Cr. 1. F.

Prereq: ARCH 506, ARCH 546, ARCH 546L, and ARCH 596 or advanced standing in the M.Arch program; concurrent enrollment in ARCH 547 and ARCH 601.

Laboratory to accompany Arch 547 and must be taken concurrently. Integrating building technologies into architectural designs through experiments and exercises in laboratory format. Readings and project presentations.

Arch 548: Building Science and Technology IV

(3-0) Cr. 3. S.

Prereq: ARCH 547, ARCH 547L and ARCH 601; concurrent enrollment in ARCH 548L.

Fourth course in a sequence focused on architectural building technologies. Lectures and labs cover: ability to demonstrate active environmental HVAC control systems design, use and design of mechanical, electrical, plumbing, fire safety, transportation, and conveying systems and subsystems, constructed building assemblies and details (building envelope details for waterproofing and enclosure, advanced material properties, costs, and serviceability), and structural design for multi-story structures (design and documenting various framing patterns, integration with other building systems, and lateral stability strategies for wind and seismic). Readings and project presentations. Students must also enroll in 548L.

Arch 548L: Building Science and Technology IV Lab

(0-2) Cr. 1. S.

Prereq: ARCH 547, ARCH 547L and ARCH 601; concurrent enrollment in ARCH 548.

Laboratory to accompany Arch 548 and must be taken concurrently. Integrating building technologies into architectural designs through experiments and exercises in laboratory format. Readings and project presentations.

2. Graduate faculty status of the proposed instructor.

The instructors for the four lecture courses, all of which are team taught, are:

Ulrike Passe, Associate Professor, current graduate faculty

Robert Whitehead, Assistant Professor, current graduate faculty

Bosuk Hur, Lecturer, eligible to be graduate faculty (if the proposal is approved, the Department will request that he be added to the graduate faculty and complete training by August 2017)

3. Number of the dual-listed course credits the department will permit to be used to meet the requirements for an advanced degree. This limit includes dual-listed courses taken in all departments.

The department has no restriction on the number of dual-listed courses that can meet requirements. Of the 102-credit curriculum, a significant majority of classes are required and 500- or 600-level, therefore the department does not find a restriction necessary. These are the only required courses that will be dual-listed.

4. The differential expectations for graduate students and undergraduates. What additional work will be required for graduate students enrolled in the course? Please describe this work, not in abstract terms (such as "more in-depth participation") but in terms of concrete

measurable outcomes or other tangible evidence. Welcome inclusions: specific examples of the additional assignments with details about paper length; the number of additional readings; the length and frequency of oral presentations; portfolio expectations; indications of how these graduate requirements are weighted in the course grade (ex. 40% of final grade); comparisons with undergraduate expectations.

Examples:

- Graduate students are required to research a topic and write an in-depth paper.
- Graduate students are required to attend additional lectures, and have (X) extra assignment papers (to be determined).

The differential work for the graduate students will be done in the concurrent required laboratory courses (Arch 545L, 546L, 547L, 548L). The labs will be taught by faculty members for the graduate students, while the undergraduate labs will be run by teaching assistants managed by a faculty member. The smaller size of the graduate sections, typically 8-12 students vs. undergraduate groups at 16-18 students, will allow for in-class discussions of readings and project presentations assigned by the faculty member teaching the lab. Although they will be based on the shared lecture content, the graduate labs will be set up independently and faculty will have the opportunity to design the lab exercises and projects for the graduate cohort. We anticipate assigning additional projects for the graduate students (this will be determined by the faculty member assigned to design the new graduate-level lab content).

5. Reason(s) the course is considered sufficiently rigorous and of such an advanced nature as to challenge graduate students.

Since the M.Arch. degree is a first-professional degree and students are not required to have any architectural or design training when they enter, the course content of the lectures in the science and technology sequence is appropriate for them. Students with a first-professional degree (B.Arch. or international equivalent) are not admitted to the M.Arch. program. Students with a non-professional undergraduate degree, such as a B.A. in Architectural Studies or B.S. in Architecture, can be admitted to the M.Arch. with advanced standing (a 60-credit curriculum). In these cases, the students pass out of the first two courses in the sequence and take only the third and fourth course.

Students with the B.Arch. degree who want to do graduate work have the option of doing our M.S. in Architecture program or a post-professional degree such as Master of Urban Design (MUD) or Master of Design in Sustainable Environments (MDesSE). None of these degrees have a science or technology component, since this material is covered in the B.Arch. or M.Arch. curriculum. This is the international standard and will hold true for all students entering our M.Arch. program. For this reason, the content of the science and technology curriculum is never taken twice since architecture students choose one of two paths (B.Arch. or undergraduate degree in any field + M.Arch.).

We chose to use a 300/500-level set of course numbers to reflect that our undergraduates are sophomores and juniors when they take these courses. In departmental discussions of the course numbers, the majority of faculty objected to using 400-level course numbers for sophomore and junior courses even in a dual-listed context.

6. Academic advantages and disadvantages accruing to graduate students taking this course with undergraduates.

There are more advantages for the students than disadvantages. The small size of a graduate course is protected through the 'L' lab sections. They also get the high-quality of the undergraduate lecture sequence, which has won national awards for its innovative presentation of the course material and an integrated approach to building science with 3 modules each semester, each one taught by a different faculty member based on their expertise. We will also have better quality teaching assistants in the labs, since we hire advanced graduate students to lead these undergraduate labs and now we would have consistency in their knowledge of the lecture material.

The disadvantage to them is that they lose the small size of the class for all 18 credits, but by a unanimous vote, the department faculty supported this change and feel that the quality of the lectures is good enough when supported by the labs that there will be no negative effect on learning.

7. The place of the course in a graduate student's program of study and why it is not considered a "remedial" undertaking intended to overcome deficiencies in the student's preparation for graduate work.

As explained above, students in the M.Arch. program do not have a professional undergraduate degree and therefore they have not taken courses in architectural science and technology before entering the program.

We know how the graduate students respond to the course content, because for the last seven years, the lectures have been very similar for the graduates and the undergraduates, although a different faculty team taught the graduate courses. Both groups find the material challenging and rigorous. The unique character of the first-professional M.Arch. degree, which takes the five-year B.Arch. curriculum and condenses it into three years without the general education requirements of a Bachelor's degree, means that in this area of the curriculum the students in the first and second year of the M.Arch. program are quite similar to intermediate undergraduates.

8. The role of the course in an undergraduate's degree program and the academic qualifications undergraduates must have to take this course.

The science and technology sequence is required for our first professional undergraduate B.Arch. degree as explained above. The courses provide the same content to B.Arch. students as M.Arch. students in terms of the technical knowledge expected of a student with a professional architecture degree that makes them eligible to be licensed. The undergraduates have math and physics requirements before they start the second module of the four. These courses are recommended for the graduate students.

9. The name of the person writing the proposal.

Kimberly Zarecor, Associate Professor of Architecture, Undergraduate Coordinator for Architecture.