**Washington State University**

**MAJOR CURRICULAR CHANGE FORM - NEW/RESTORE COURSE**

- Please attach rationale for your request, a complete syllabus, and explain how this impacts other units in Pullman and other campuses (if applicable).
- Obtain all required signatures with dates.
- Provide original stapled packet of signed form/rationale statement/syllabus PLUS 10 stapled copies of complete packet to the Registrar's Office, campus mail code 1035.
- Submit one electronic copy of complete packet to wsu.curriculum@wsu.edu.

<table>
<thead>
<tr>
<th>Requested Future Effective Date: 08/2016 (term/year)</th>
<th>Course Typically Offered: Fall</th>
</tr>
</thead>
</table>

**DEADLINES:** For fall term effective date: October 1st; for spring or summer term effective date: February 1st. See instructions.

**NOTE:** Items received after deadlines may be put to the back of the line or forwarded to the following year. Please submit on time.

<table>
<thead>
<tr>
<th>New Course</th>
<th>Temporary Course</th>
<th>Restore Course</th>
</tr>
</thead>
</table>

**CE 508 Concrete Durability**

<table>
<thead>
<tr>
<th>course subject/crosslist</th>
<th>course no.</th>
<th>title</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 (</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Credit hrs</td>
<td>lecture hrs</td>
<td>lab or studio</td>
</tr>
</tbody>
</table>

**Description for catalog:** Introduction to concrete durability, serviceability and life cycle assessment; physical and chemical mechanisms of concrete degradation; corrosion of steel reinforcement in concrete; materials selection, specification

**Additional Attributes:** Check all that apply.

- Crosslisting (between WSU departments)*
- Conjoint listing (400/500):
- Variable credit: 
- Repeat credit (cum. max. hrs):
- Special Grading: □ S, F; □ A, S, F (PEACT only); □ S, M, F (VET MED only); □ H, S, F (PHARMACY, PHARDSCI only)
- Cooperative with UI
- Other (please list request):

**The following items require prior submission to other committees/depts. (SEE INSTRUCTIONS.)**

- Request to meet Writing in the Major [M] requirement (Must have All-University Writing Committee Approval.)
- Request to meet UCORE in (Must have UCORE Committee Approval) See instructions.
- Special Course Fee (Must submit request to University Receivables.)

**Contact:** Brooke Whiting

**Phone number:** 335-1219

**Email:** bwhiting@wsu.edu

**Instructor, if different:** Xianming Shi

**Chair/date:**

**Dean/date:**

**All-University Writing Com / date:**

**Chair (if crosslisted/interdisciplinary)*:**

**Dean (if crosslisted/interdisciplinary)*:**

**UCORE Committee Approval Date:**

**Catalog Subcommittee Approval Date:**

**GSC or AAC Approval Date:**

**Faculty Senate Approval Date:**

*If the proposed change impacts or involves collaboration with other units, use the additional signature lines provided for each impacted unit and college.*
Rationale for the Requested CE 508 New Course

Currently, the graduate students in the CEE department typically focus their coursework in a specific concentration area. Yet, the civil and environmental engineering challenges in field practice can be crosscutting and require broader perspectives and solutions that are not restrained by conventional disciplines. As such, this course is designed to break the conventional boundaries between transportation (pavement) engineering and structural (bridge) engineering concentration areas, to promote holistic perspectives towards the design, construction and management of concrete pavements and bridges, and to supplement current curriculum (mainly stress/strain-focused) with topics of practical relevance (e.g., materials-related distresses in concrete and chemical deterioration mechanisms of concrete infrastructure).

How this impacts other units in Pullman and other branches

This new course has been designed to supplement existing graduate courses in CEE department and should positively impact other units in Pullman and other branches. Specifically, graduate students with their concentration area in transportation engineering and structural engineering may be the main audience. This course could be offered remotely for online access, once it is tested for one semester; as such it would benefit other WSU branches as well.
1. Course number and title: CE 508 Concrete Durability

2. Credits: 3
   a. Prerequisites or co-requisites
      Major in C E
   b. Catalog description
      Introduction to concrete durability, serviceability and life cycle assessment; physical and chemical mechanisms of concrete degradation; corrosion of steel reinforcement in concrete; materials selection, specification, proportioning, and construction for durable concrete; testing and appraisal for durable concrete; and repair and rehabilitation of concrete structures.
   c. Current semester & year: Fall 2016

3. Meeting Schedule: two 75-minute classes per week; Tu/Th 1:25-2:40 PM; Room: TBD

4. Expectations for Student Effort: At least three hours per week required outside of the class times.

5. Instructor's or course coordinator's name: Xianming Shi, Ph.D., P.E.; Email: Xianming.Sh@s.wsu.edu;
   Phone: 509-335-7088.
   Office Hours: Tu/Th 2:45-4:00 PM or by appointment (preferred by email); Room: Sloan 35

   Plus a combination of lectures and interactive discussion.
   a. Other Supplemental Materials:
7. Week-to-Week Course Outline

Note: There are 15 weeks of instruction in a semester. As such, the outline below includes 2 class sessions (Tuesday/Thursday) per week, totaling 30 sessions.

<table>
<thead>
<tr>
<th>TOPICS COVERED</th>
<th>REQUIRED READING</th>
<th>ADDITIONAL READING (Handouts only*)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sessions 1, 2, &amp; 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sessions 4, 5, &amp; 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sessions 7, 8, &amp; 9; Review session 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sessions 12, 13, &amp; 14; Review session 2 (Session 15); Mid-term exam (Session 16)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Materials Selection for Durable Concrete
(Cement, aggregates, admixtures, fibers)
Sessions 17 & 18
Ch. 5.1-5.6 Dyer + Ch. 2 Taylor

Specification, Proportioning and Construction of Durable Concrete
Sessions 19 & 20; Review session 3 (Session 21)
Ch. 5.7-5.9 Dyer + Chs. 3 & 5 Taylor;
Ch. 6.1-6.4 Dyer + Ch. 4 Taylor
1st mini-review due at Session 19 (10th week); Lee, H.S., et al.
ACI Mater J 105(6), 541.
Homework #5 due at Session 22 (11th week).

Testing and Appraisal for Durable Concrete
Sessions 22, 23, & 24
Ch. 7.4 & 7.5 Dyer + Ch. 6 Taylor;
Ch. 7.3 & 7.6 Dyer
Homework #6 due at Session 25 (13th week)

Repair and Rehabilitation of Concrete Structures (e.g.,
electrochemical rehabilitation techniques, migrating corrosion inhibitors)
Sessions 25, 26, & 27; Review session 4 (Session 28)
Ch. 7.7 & 7.8 Dyer
2nd mini-review due at Session 27 (14th week); Sánchez,
Session 29 (15th week).

Case Studies of Concrete Durability
Sessions 29 & 30
Ch. 7 Taylor
Villain, G., et al. (2012). CBM 37,
(2011). Struct Infrastr Engnr 7(9),
701.

* The instructor reserves the right to update this list of handouts without advance notice.

8. Specific goals for the course
   a. Outcomes of instruction

3
1. To integrate mechanistic understanding of concrete degradation with engineering practices and case studies of preparing durable concrete.
2. To develop a more complete understanding of achieving concrete durability throughout the life cycle of materials selection/proportioning, construction, testing and appraisal, and repair and rehabilitation.
3. To establish an awareness of concrete durability issues and to identify effective practices, methods, and technologies that promote durability of concrete components and structures.
4. To develop an appreciation for historical achievements, recent advances, and remaining challenges related to the durability of concrete.
5. To improve critical thinking and written and oral technical communication skills.

### b. Student outcomes addressed by this course:

<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
<th>Course Topics/Dates</th>
<th>Evaluation of Outcome:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>At the end of this course, students should be able to:</strong></td>
<td><strong>The following topic(s)/dates(s) will address this outcome:</strong></td>
<td><strong>This outcome will be evaluated primarily by:</strong></td>
</tr>
<tr>
<td>Define terms and concepts in concrete durability and achieve mechanistic understanding of concrete degradation</td>
<td>Physical Mechanisms of Concrete Degradation (Sessions 4, 5, &amp; 6); Chemical Mechanisms of Concrete Degradation (Sessions 7, 8, &amp; 9); Corrosion of Steel Reinforcement in Concrete (Sessions 12, 13 &amp; 14)</td>
<td>Reading assignments, lecture, and quizzes; and: Homework assignments #2, #3, and #4.</td>
</tr>
<tr>
<td>Identify, formulate, and solve civil engineering problems: engineering practices and case studies of preparing durable concrete</td>
<td>Materials Selection for Durable Concrete (Sessions 17 &amp; 18); Specification, Proportioning and Construction of Durable Concrete (Sessions 19 &amp; 20); Testing and Appraisal for Durable Concrete (Sessions 22, 23, &amp; 24); Repair and Rehabilitation of Concrete Structures (Sessions 25, 26, &amp; 27); Case Studies of Concrete Durability (Sessions 29 &amp; 30)</td>
<td>Reading assignments, lecture, and quizzes; and: Homework assignments #5, #6, and #7.</td>
</tr>
<tr>
<td>Describe and differentiate the contemporary issues and best practices in concrete durability</td>
<td>All lectures</td>
<td>Reading assignments, lecture, and quizzes; and the two mini-reviews. The students will be required to synthesize the most relevant and recent publications. This task is open-ended, requiring logic, creativity, and teamwork.</td>
</tr>
<tr>
<td>The ability to think logically, critically, and creatively</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recognize the societal benefits and risks associated with scientific and technological advances.</td>
<td>Introduction to Concrete Durability, Serviceability and Life Cycle Assessment (Sessions 1, 2, &amp; 3)</td>
<td>Reading assignments, lecture, and quizzes; and: Homework assignments #1.</td>
</tr>
<tr>
<td>Locate, categorize, critique, and evaluate sources of scientific information related to concrete durability</td>
<td>All lectures</td>
<td>Reading assignments, lecture, and quizzes.</td>
</tr>
<tr>
<td>Integrate and synthesize knowledge from multiple sources; understand diverse viewpoints</td>
<td></td>
<td>The two mini-reviews. The mini-review task will challenge the students to communicate with clear logic.</td>
</tr>
<tr>
<td>Communicate effectively in written and graphical forms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recognition of the importance of life-long learning and the benefits of being active in professional societies such as ASCE</td>
<td></td>
<td>The lectures will highlight recent advances and in some cases issues that remain unclear and are still actively researched. ASCE and TRB publications will be assigned to facilitate homework where suitable.</td>
</tr>
</tbody>
</table>

9. **Student Progress Assessment**

Grading will reflect performance on two exams and several assignments, including two short technical reviews, one lecture proposal (the student will choose a topic shown in the course outline and/or a more specific one that is relevant), one lecture and lecture notes, seven homework assignments, as well as class participation.

**Grade Breakdown**

- Technical Reviews: two seminal papers in lecture topic: 
  15% × 2
- Midterm Exam: 15%
- Lecture slides and presentation: 15% As assigned
- Lecture notes: 5% To be turned in on day of lecture and revised based on feedback
- Final Exam (open-book): 15%
- Homework assignments: 7%
- Class participation: 5% (this will be assessed based on the quantity and quality of your contributions in class discussions)
- Credit for in-class quizzes: 8% (eight quizzes distributed among the 30 sessions in a relatively uniform yet random manner)

Final exams are scheduled the last week of the semester; the Registrar will send out an e-mail informing students of the day/time for your exam.

Students are encouraged to refer to the academic calendar often to be aware of critical deadlines throughout the semester. The academic calendar can be found at [www.registrar.wsu.edu/Registrar/Apps/AcadCal.ASPX](http://www.registrar.wsu.edu/Registrar/Apps/AcadCal.ASPX).

*For emergency weather closure policy, see: [http://alert.wsu.edu/](http://alert.wsu.edu/).*

5
Grading Scale
A   94—100%
A-  90—93.9%
B+  87—89.9%
B   84—86.9%
B-  80—83.9%
C+  77—79.9%
C   74—76.9%
C-  70—73.9%
D+  67—69.9%
D   64—66.9%
F   Below 64%

Class Participation & Attendance
To successfully complete this class, you must faithfully attend class and complete all assignments. Some specifics:
* For each absence, you will receive a deduction of 1 point out of the overall 110 points available for this course. In addition, after seven absences you will fail the class.
* You are required to sign your name for attendance, within the first 10 minutes of class. Please be in class before that time. If you enter the room afterwards, you will be marked “tardy.” Three tardies make up one absence.
* Planned absences must be discussed and approved by the instructor prior to the absence.
* Planned absences count in the total of absences.
* Absences due to University business (athletic commitments, academic conferences etc.) can be excused. You will need to supply a letter on official letterhead from your supervisor clearly mentioning the dates and purpose of your absences.
* Late work will receive a deduction of half a letter grade for each day past the deadline. Work turned in later than one week past the original due date will receive an automatic grade of F.
* The student must inform the instructor at least 48 hours prior to the exam for the absence from any exam. Official documentation (e.g., a doctor’s certificate) will be required to support any excused absence from exam, before a make-up exam can be arranged. An unexcused exam will be assigned 0 points.

Students with Disabilities
Students with Disabilities: Reasonable accommodations are available for students with a documented disability. If you have a disability and need accommodations to fully participate in this class, please either visit or call the Access Center (Washington Building 217; 509-335-3417) to schedule an appointment with an Access Advisor. All accommodations MUST be approved through the Access Center.

Safety Statement
Washington State University is committed to enhancing the safety of the students, faculty, staff, and visitors. It is highly recommended that you review the Campus Safety Plan (http://safetyplan.wsu.edu/) and visit the Office of Emergency Management website (http://oem.wsu.edu/) for a comprehensive listing of university policies, procedures, statistics, and information related to campus safety, emergency management, and the health and welfare of the campus community.
**Academic Integrity**

Academic integrity is the cornerstone of the university. You assume full responsibility for the content and integrity of the academic work you submit. You may collaborate with classmates on assignments, with the instructor’s permission. However, the guiding principle of academic integrity shall be that your submitted work, examinations, reports, and projects must be your own work. Cheating and academic misconduct are defined in the Standards for Student Conduct WAC 504-26-010, which can be found here: http://conduct.wsu.edu/default.asp?PageID=5024. It is your responsibility to read and understand these definitions. Lack of knowledge is not an excuse for academic misconduct. One of the common violations is plagiarism, which is misappropriation of intellectual property without giving due credit to the author. Instructor may use Turnitin (www.turnitin.com), a software application that is specifically designed to detect plagiarism.

Anyone who violates WSU’s Standards of Conduct for Students will be reported to the Office of Student Affairs. When academic misconduct charges are brought against a student, she or he no longer has the option of withdrawing from the class, and can be retroactively re-enrolled in the class.

Copying is a form of academic dishonesty and will not be tolerated. Do not copy or allow others to steal or copy from your work. When two or more students are found to turn in identical or overly similar work, all students will receive equal punishment. If a student steals or copies your work against your will, you should report the incident immediately to your instructor.

The penalty for a violation of WSU’s Standards of Conduct for Students is a zero on the assignment or test without an option to make up the points lost. In addition, a full letter-grade will be deducted from the final grade earned in the class. Penalty ranges from this minimum to an F in the course. Instructors may consider mitigating circumstances and have some latitude in assigning sanctions. In addition, the Office of Student Standards and Accountability may impose other punishments, including expulsion from the University.