CIE 723/823 Bituminous Materials and Mixtures (a.k.a. Asphalt Mixtures and Construction)
Course Syllabus and Policies
University of New Hampshire
Lecture: 8:10AM- 9:30PM TR, Kingsbury N113

Instructor: Eshan V. Dave (eshan.dave@unh.edu)
Office: W173 Kingsbury Hall, Phone: 603-862-5268
Office Hours: 10:00 – 12:00 pm, Thursday, or by appointment

Course Website: Canvas (mycourses.unh.edu)

Course Description:
Specification of asphalt cements, aggregates and proportioning of mixture constituents for paving applications. Asphalt mixture design methods, production, construction, and quality control are discussed. Current and new material production and construction technologies are introduced

Prerequisites: CIE 622 (Engineering Materials).

Course Objectives:
To gain knowledge on the topic of asphalt mixtures with focus on manufacture of asphalt binder, volumetric mix design process, mineral aggregate properties as they apply to asphalt properties, use of binder additives and modifiers, asphalt production and placement technologies, quality control and quality assurance, durability and maintenance and specialty products.

Course Credit and Workload:

CIE 723: 3 Credits, CIE 823: 3 Credits

Students primarily seeking undergraduate degree should enroll in this course at 700 level. Students seeking graduate degree should enroll at 800 level. For students enrolled in 800 level section the course requirement includes a research project (technical paper), which will be due at the end of the semester.

Reading and review assignments are allocated for each lecture (from week two onwards), and the reading must be completed before the beginning of the next lecture. It is expected that students will spend approximately six hours each week on preparing for the course (reading assignments, homework and projects).

Course Philosophy and Responsibilities:

My obligations as the instructor include: (a) being knowledgeable and current on the subject matter and industry needs; (b) providing clear explanations and examples; (c) helping assess your abilities and areas of growth; (d) soliciting and sharing your inputs and experiences with the entire class; (e) providing relevant and challenging homework, in-class exercises, quizzes, and exams; (f) maximizing the potential for learning by giving useful, timely feedback on the exercises mentioned in 'e'; (g) starting and finishing class on time, and; (h) helping to maintain a positive, collegial classroom climate.

Your responsibilities as the student include: (a) completing assignments on time and to the best of your ability; (b) contributing to classroom discussions actively and positively; (c) arriving to class on time and maintaining an excellent attendance record; (d) communicating ideas, questions, and concerns to the instructor as they arise, and; (e) preparing for the class by completing reading assignments.

Course Syllabus (Tentative Schedule):

Week	Date	Topic	Required Reading
1	26-Jan	1. Introduction, Policies and Pavement Failures	NCHRP 673 p. 4-12
	28-Jan	1. Historical Perspective, Terminology, Refining	PI-Asphalt Refining, Asphalt Binders TRB2000
2	2-Feb	2. Asphalt Emulsions and Cutbacks	TRB E-Circular 102
	4-Feb	3. Asphalt Binder Specifications – Older Systems	NCHRP 673 p. 15-17, AASHTO M226
3	9-Feb	3. Asphalt Binder Specifications – Superpave-1	NCHRP 673 p. 17-26, SHRP-A410 p. 13-39
	11-Feb	3. Asphalt Binder Specifications – Superpave-2	AASHTO M320 and R29
4	16-Feb	4. Mineral Aggregates – Manufacture	PI-AggManufacture
	18-Feb	4. Mineral Aggregates – Gravity and Gradation	NCHRP 673 p. 28-38
5	23-Feb	4. Mineral Aggregates – Source and Consensus Prop.	NCHRP 673 p. 38-45
	25-Feb	4. Mineral Aggregates – Blending	Assigned Reading
6	1-Mar	5. Mix Design – Phase Diagram and volumetric calc.	NCHRP 673 p. 46-63, AASHTO R35 Section 1-4
	3-Mar	5. Mix Design – Design controls and Lab Tests	AASHTO M323 Section 1-7, NCHRP 673 p. 91-98
7	8-Mar	Make-up / Review	---
	10-Mar	**Exam-1**	
14-Mar to 18-Mar, SPRING BREAK			
8	22-Mar	5. Mix Design – Lab Tests and Process	AASHTO R35 Section 5-13, NCHRP 673 p. 101-128
	24-Mar	5. Mix Design – Process and Intro. To Bailey Method	NCHRP 673 p. 128-147, TRB E-Circular 044
9	29-Mar	5. Mix Design – RAP/RAS/Other Additives	AASHTO M323 Section X1-X2, R35 Section X2
	31-Mar	6. Production – Plant Types	Asphalt Paving Handbook p. 41-60
10	5-Apr	6. Production – Plant Operations and Controls	Asphalt Paving Handbook p. 67-95
	7-Apr	7. Construction – Transportation and Paving	Asphalt Paving Handbook p. 115-174
11	12-Apr	7. Construction – Compaction	Asphalt Paving Handbook p. 175-212
	14-Apr	Make-up / Review	---
12	**19-Apr**	**Exam-2**	
	21-Apr	8. Quality Assurance and Inspection	NCHRP 673 p. 207-223
13	26-Apr	8. Durability and Mechanical Testing	Assigned Reading
	28-Apr	9. New Technology and Research	Assigned Reading
14	3-May	9. New Technology and Research	Assigned Reading
	5-May	Wrap up / Review	---
	12-May	**FINAL EXAM (8:00 - 10:00 am)**	

Lecture Recordings: From few instances recorded lectures will be posted in-lieu of in-class lectures.

Classroom Etiquette and Conduct:

Classroom lectures and exercises will be informal to the extent that you are encouraged to ask questions and offer discussion at any time you wish. However, side discussions between students are distracting to other students during lectures and formal demonstrations and will be highly frowned upon. You must always show respect to other students, **as maintaining a positive and collegial climate is of utmost importance to me.** Other important conduct issues include: coming to all classes and being on-time; not reading the newspaper or doing other tasks during class time; turning off cell phones and not sending text messages; etc.

To insure a climate of learning for all, disruptive or inappropriate behavior (repeated outbursts, disrespect for the ideas of others, etc.) may result in exclusion (removal) from this class. As a reminder, cell phone/pda, etc. use, including text messaging, is not permitted in this class by Faculty Senate rule unless by instructor permission. Disruptive classroom behavior that substantially or repeatedly interrupts either the instructor's ability to teach, or student learning, is prohibited.

Remember, while there are no specific grades assigned to good classroom etiquette, making a favorable or unfavorable impression through your classroom conduct could influence a borderline grade. Appropriate classroom conduct promotes an environment of academic achievement and integrity. Students are expected adhere to UNH's Student Code of Conduct:
http://www.unh.edu/student-life/handbook/student-code-conduct-and-conduct-process

Attendance:

Students are expected to attend all scheduled class meetings. It is the responsibility of students to plan their schedules to avoid excessive conflict with course requirements. However, there are legitimate and verifiable circumstances that lead to excused student absence from the classroom. These are subpoenas, jury duty, military duty, religious observances, illness, bereavement for immediate family, and NCAA varsity intercollegiate athletics. Please contact the instructor within the first two weeks of classes to make necessary homework/lab/exam arrangements for team travel time. Policies cannot be made during the day of an exam.

Academic Integrity:

Students are expected and encouraged to get ideas and information from articles and books that you read, and from discussions and other electronic media such as internet, but that work must be used responsibly. If you use ideas obtained from another source (whether it is print, electronic, film or another person), you must give clear credit in your submission (regardless of whether it is an electronic source, another person(s) or in printed version) in the form of an appropriate attribution. If you use the words of one of these sources--whether a phrase, a sentence, a paragraph or more--those works must be appropriately punctuated and attributed to their sources, so as to distinguish them from your own. This is also true of paraphrasing another's words. Failure to do so is plagiarism. It is unethical to submit the same paper for more than one course--don't do it! Cheating on assignments or examinations, plagiarizing, or any other act which violates the rights of another student in academic work or that involves misrepresentation of your own work will result in grade reduction on the assignment/quiz/test or a grade reduction in the class (including the possibility of failing the class and a permanent record on your student transcript).

Students are expected to follow the **University of New Hampshire's Academic Honesty** policy (http://www.unh.edu/student-life/handbook/academic-honesty). In particular, this means that the student assumes responsibility for every problem, quiz, and exam s/he submits. The policy is contained in the "Student's Rights, Rules and Responsibilities" published by the University.

Please review an online tutorial on plagiarism here: http://cola.unh.edu/plagiarism-tutorial-0

Disabilities and Emotional or Mental Health Distress:

The University is committed to providing students with documented disabilities equal access to all university programs and facilities. If you think you have a disability requiring accommodations, you must register with Disability Services for Students (DSS). Contact DSS at (603) 862-2607 or www.unh.edu/disabilityservices/clockwork or disability.office@unh.edu.

If you have received an accommodation letter for this class, please contact me immediately so we can discuss the necessary arrangements. Please note that individual student policies cannot be accommodated during the day of an exam.

Your academic success in this course is very important to me. If, during the semester, you find emotional or mental health issues are affecting that success, please contact the University's Counseling Center (3rd Floor, Smith Hall; 603 862-2090/TTY: 7-1-1), which provides counseling appointments and other mental health services (http://www.unh.edu/counseling-center/consultation-and-outreach)

Grading:

The performance of students enrolled in CIE 723 will be assessed using the following scoring system:

Homework assignments……..30%
Quizzes……..10%
Exam 1……..20%
Exam 2……..20%
Final exam……20%

Total……100%

The performance of students enrolled in CIE 823 will be assessed using the following scoring system:

Homework assignments…….. 27.5%
Quizzes……...10%
Graduate Project……..10%
Exam 1……..17.5%
Exam 2……..17.5%
Final exam……17.5%

Total……100%

Final grades will be based upon a curve; however, final grade cutoffs will not exceed the following:
A = 94%; A- = 90.0%; B+ = 88%; B = 86.5%; B- = 83.5%; C+ = 80%, C = 75%, C- = 70%, etc… If grading is conducted using curve, seperate grade brackets will be generated for students enrolled in CIE 723 and CIE 823.

Homework Assignments:

All assigned homework are due at the **beginning** of the class for the prescribed due date (usually 1 week from date of assignment, unless otherwise indicated). Assignments turned in after this time will be considered late. Late assignments will be accepted with a 20% penalty within 24 hours. After 24 hours, no delinquent homework will be accepted for credit. Rare exception to late homework policy will be made for valid excuse. Arrangements should be made ahead of the due date, if applicable.

There is no required format for assignments, but students should devise a coherent presentation that can be easily followed by the instructor. Beware of the error, particularly in computer assignments, of including too much material. Not all computer printout is important in communicating what you have done.

You may complete assignments in pencil or prepare them on computer. Computer output may be physically cut out and pasted onto pages where appropriate. You may wish to digitally copy and paste Excel cells into a word processing document to present your discussion. Or you may make notations by hand on computer output sheets. Use your common sense to formulate a neatly laid out, legible response. All plots should be generated using computer software (Excel, Matlab etc.). Plots drawn on plain sheet of paper or engineering paper will not be graded.

For handwritten work you must write only on one side of the sheets, number your sheets, use pencil and either erase or neatly cross-out mistakes, write neatly/consistently/ and give some consideration to page layout (e.g., don't cram your work). Please box or underline your answers! Neatness and organization counts: if we cannot read or interpret your solution, then points will be deducted. Show all work done for the assignment (perhaps as an attachment or appendix), not just the answer. Make sure there is a section where your answer is clearly indicated, don't leave it to the interpretation of the reader to understand what your answer is. Don't be ambiguous, you have only one answer. Provide a sentence or two discussing the answer, is it reasonable, is it unreasonable, what are reasonable values, does this value impose any problems that you can determine etc. Number each page of the homework assignment.

I permit and encourage intellectual collaboration on assignments. The objective of homework assignments is *learning*, and I recognize that working together is an excellent way of doing that. However, I expect that each student will write their own answers to questions in their own words. Identical approaches to a problem are to be expected, but word-for-word identical responses are not acceptable. In particular, on assignments requiring use of computer software, I expect that each person will prepare his/her own file to solve the problems. If you consulted with anyone (student, TA, professor, etc.) on the solution of the problem, such consultation should also be explicitly acknowledged in writing.

Quizzes:

During the course of the semester a number of quizzes will be administered. The quizzes will typically be 10 minutes long and administered at the beginning or end of the lecture. The quizzes will be based on the reading assignment allocated for that lecture (refer the schedule table above). No make-up quizzes will be offered. The lowest scoring quiz will be dropped from the calculation of final course grade.

Graduate Project (CIE 823):

A variety of potential research topics will be presented to students enrolled in CIE 823 within first four weeks of the semester. Students will be expected to prepare abstract for the topic as well as outline of the technical paper that they will prepare over the course of semester. The abstracts and outlines will be due no later than March 24th. The complete paper will be due at the end of the semester. Research topic should be related to the course and should have necessary research and development contribution. More information on this will be discussed in class.

Resources and References:

Required Reading Resources:

All required reading resources are already posted on the course portal on Canvas under "Required_Reading" .

(1) NCHRP Report 673: A Manual for Design of Hot Mix Asphalt with Commentary (NCHRP 673)

(2) Asphalt Binders: Dave Anderson, Jack Youtcheff, Mike Zupanick, Transportation Research Board (Asphalt binders TRB2000)

(3) Hot-Mix Asphalt Paving Handbook 2000, US Army Corps of Engineers (Asphalt Paving Handbook)

(4) AASHTO Standards and Specifications:

   a. AASHTO M226

   b. AASHTO M320

   c. AASHTO M323

   d. AASHTO R29

   e. AASHTO R35

(5) Pavement Interactive Topics on Asphalt Refining and Aggregate Manufacture (PI-AsphaltRefining and PI-AggManufacture)

(6) Transportation Research Board Electronic Circulars

   a. E-Circular 044 Bailey Method

   b. E-Circular 102 Asphalt Emulsions

(7) SHRP Report A-410: Superior Performing Asphalt Pavements (SHRP-A-410)

Recommended Texts and References:

(1) Hot Mix Asphalt Materials, Mixture Design and Construction - Third Edition (E. Ray Brown et al.), 2009, ISBN: 978-0914313021

(2) MS-4: The Asphalt Handbook - 7th Edition, Asphalt Institute, ISBN 978-1-934154-27-4

(3) Materials for Civil and Construction Engineers (3rd Edition), ISBN: 0136110584 / 0-13-611058-4. Authors: Michael S. Mamlouk, John P. Zaniewski

(4) Annual Book of ASTM Standards, ASTM International