Course Description
This course focuses on materials science topics relevant to the application of nonconventional materials in design and engineering. This course addresses the broad range of nonconventional materials falling into three categories: i) advanced engineering materials; ii) ‘traditional’ and vernacular materials such as earth-based materials and bamboo; and, iii) historic materials.

Learning Objectives
To develop an awareness of use of nonconventional materials in design and engineering. On successful completion of the course, students will be able to demonstrate an ability to:

1. Identify, formulate, and solve complex engineering problems by applying principles of design, engineering, science, and mathematics.
2. Apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. Communicate effectively with a range of audiences.
4. Recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6. Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7. Acquire and apply new knowledge as needed, using appropriate learning strategies.

Course Notes
This is a research-driven course. Lectures are designed to provide the tools required to extend the study of materials and materials science to nonconventional materials. Assignments will require independent thought and to clearly communicate their findings/hypotheses/research. The course is divided into two primary segments: the toolbox and material specific lectures.

Class notes will be posted on the course website.

Required Readings and Supplementary Materials
Readings will be accessed through the library and course website. No textbook required.

3. Additional supplemental material will be provided on Course Website.
Description and Assessment of Assignments
The primary assignment will be a Final Project Report introducing a nonconventional material or method selected by the student. Written assignments (requiring some research) will be based on the “Toolbox” portion of the course.

Grading:

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Percentage</th>
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</thead>
<tbody>
<tr>
<td>Final Project</td>
<td>40%</td>
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<tr>
<td>Final Report</td>
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<tr>
<td>Presentation</td>
<td>10%</td>
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<tr>
<td>Toolbox Assignments</td>
<td>50%</td>
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</table>

Assignments (50%)

Assignments are listed in the attached course schedule. Additional information will be provided. The goal of the assignments is to provide practical experience in design, detailing, materials methodology, etc. based on the course learning objectives. The assignments will generally include written summaries, calculations and drawings. Assignments will be submitted on the course website. Late assignments will receive partial credit based on the time they are turned in.

Final Project Report (40%) and Final Presentation (10%)

Each student will select a topic appropriate to the course. Typically, this will be a ‘nonconventional material’ but other topics that are not material specific will be considered. Topics must be approved by no later than Week 4. Each student shall submit a single paragraph abstract of the topic they expect to address, as well as an outline of the final report for feedback, which will be part of the final grade.

The final project will reflect the compilation of the semester's studies. The report will introduce the topic selected, provide background on the applications in design and engineering, as well as a critical discussion of the use of the material/method in the built environment and if the selection contributes to or mitigates climate change. The final project report will include sketches and drawings, photos, analysis of research, charts and graphs, etc. Each student will make a presentation to the class in which feedback will be provided. The feedback can be then incorporated in the final report. Each student will submit a digital copy of their presentation and project for grading. No late submission will be accepted.

Grading Scale

The grading breakdown is by percentage of total points.
A 100 - 90% Work exceeds expectations, student always attends class.
B 80 - 89% Very good work, almost always attends class.
C 70 - 79% Good work, good attendance
D 60 - 69% Late, incomplete or sloppy work, infrequent attendance
F 59% or less Missing or poor work, poor attendance.

Assignment Submission Policy

All assignments submitted through the course website. No late submissions will be accepted.

Additional Policies

Course Notes
1. Students will be required to attend all lectures, complete all reading assignments, participate in the discussion relating to each week’s lectures and activities. See attached course outline for details.
2. Students will be expected to perform as if they are an employee of an architecture / engineering design firm and will participate in classroom discussions and will communicate with their classmates as if in an office setting where working as a team is always expected.
3. Absences can be excused with prior approval in writing via email. Two absences will result in a reduction of the final class grade.
4. All electronic devices shall be turned to silent mode during class and texting and phone calls are not appropriate.
Course Schedule: A Weekly Breakdown

1. A class schedule broken down into weekly assignments will be provided. Weekly breakdown of reading and assignments to follow and will be updated on a regular basis as needed.

2. For each unit of in-class contact time, the university expects two hours of out of class student work per week over a semester.

<table>
<thead>
<tr>
<th>Date</th>
<th>Topics/Daily Activities</th>
<th>Readings and Homework</th>
<th>Deliverable/Due Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Toolbox: Introduction; materials families; matching materials to design</td>
<td>Ashby et al. Chap. 1-3</td>
<td></td>
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<tr>
<td>2</td>
<td>Toolbox: Stiffness and strength limited design</td>
<td>Ashby et al. Chap. 4-7</td>
<td>Assignment 1</td>
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<tr>
<td>3</td>
<td>Toolbox: Fracture and fatigue limited design</td>
<td>Ashby et al. Chap. 8-10</td>
<td>Final Project Approval</td>
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<tr>
<td>4</td>
<td>Toolbox: Thermal, tribologic and other properties</td>
<td>Ashby et al. Chap. 11-13, 15-17</td>
<td>Assignment 2</td>
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<tr>
<td>5</td>
<td>Toolbox: Durability</td>
<td>Ashby et al. Chap. 14</td>
<td>Assignment 3</td>
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<tr>
<td>6</td>
<td>Toolbox: Materials and Sustainability</td>
<td>Ashby et al. Chap. 20</td>
<td>Assignment 4</td>
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<tr>
<td>7</td>
<td>Toolbox: Manufacture and Processing</td>
<td>Ashby et al. Chap. 18-19</td>
<td>Final Project Report Abstract</td>
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<td>8</td>
<td>Conventional Materials</td>
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<tr>
<td>9</td>
<td>Nonconventional Design: Steel</td>
<td>TBC</td>
<td>Assignment 5</td>
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<tr>
<td>10</td>
<td>Conventional Materials</td>
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<td>11</td>
<td>Nonconventional Design: Masonry</td>
<td>TBC</td>
<td>Assignment 6</td>
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<td>12</td>
<td>Nonconventional Materials: Fibre Reinforced Composites</td>
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<td>13</td>
<td>Nonconventional Materials: Bamboo</td>
<td>TBC</td>
<td>Final Project Report Outline</td>
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<tr>
<td>14</td>
<td>Nonconventional Materials: Wood</td>
<td>TBC</td>
<td></td>
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<tr>
<td>15</td>
<td>Nonconventional Materials: Other</td>
<td>TBC</td>
<td></td>
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<tr>
<td>16</td>
<td>Final Project Presentations</td>
<td></td>
<td>Final Project Presentations</td>
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<td></td>
<td>FINAL EXAMINATION PERIOD</td>
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<td>Final Project Report Due</td>
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Statement on Academic Conduct and Support Systems

Academic Conduct:
Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in SCampus in Part B, Section 11, “Behavior Violating University Standards” policy.usc.edu/scampus-part-b. Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on scientific misconduct, http://policy.usc.edu/scientific-misconduct

Support Systems:

USC Student Health is available through the single phone number 213-740-9355 (WELL)—including all services 24/7.
https://studenthealth.usc.edu/

Counseling and Mental Health Services, a division of the Department of Psychiatry and Behavioral Sciences, Keck School of Medicine of USC

Medical Services, with providers on clinical faculty of the Departments of Family Medicine, Obstetrics and Gynecology, Dermatology, Orthopaedic Surgery, Keck School of Medicine of USC; and professional affiliations with the USC Chan Division of Occupational Science and Occupational Therapy, the USC School of Pharmacy, and the Division of Physical Therapy and Biokinesiology.

Relationship and Sexual Violence Prevention and Services, with counselors who are clinical faculty of the Department of Psychiatry and Behavioral Sciences, Keck School of Medicine of USC
A nurse (for medical concerns) or licensed counselor (for mental health concerns) is available 24 hours a day, even when the student health centers are closed and during university closures.

Students in crisis may walk-in for urgent mental health services at the health centers (Engemann Student Health Center on UPC or Eric Cohen Student Health Center at HSC) during operational hours without an appointment; this may include urgent matters involving a death in the family, suicide concern, crime/sexual assault survivor counseling, or other high-risk matters.

Urgent “sick” appointments for medical care are available “same-day” for students needing care during operational hours.

The evening operators of the 24/7 phone service line can connect to USC Student Health services when an urgent matter presents itself.

Sexual assault survivors requiring transportation to a SART center can ask RSVP to call a Lyft ride (an “on-call” staff advocates program to accompany survivors is currently staffing operations and will be activated this fall).

MySHR (the student health record portal) shows all available regular appointment times; many appointments can be made within 24-48 hours.

Campus incident post-ventions are regularly provided by Counseling and Mental Health Services on campus for students; departments are encouraged to contact us to learn more or to make arrangements.

National Suicide Prevention Lifeline – 1 (800) 273-8255
www.suicidepreventionlifeline.org
Provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week.
Information about how to get help or help a survivor of harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants. The university prohibits discrimination or harassment based on the following protected characteristics: race, color, national origin, ancestry, religion, sex, gender, gender identity, gender expression, sexual orientation, age, physical disability, medical condition, mental disability, marital status, pregnancy, veteran status, genetic information, and any other characteristic which may be specified in applicable laws and governmental regulations.

Bias Assessment Response and Support - (213) 821-8298
https://campussupport.usc.edu/trojans-care-4-trojans/
Avenue to report incidents of bias, hate crimes, and microaggressions for appropriate investigation and response.

The Office of Disability Services and Programs - (213) 740-0776
dsp.usc.edu
Support and accommodations for students with disabilities. Services include assistance in providing readers/notetakers/interpreters, special accommodations for test taking needs, assistance with architectural barriers, assistive technology, and support for individual needs.

USC Campus Support & Intervention - (213) 821-4710
https://campussupport.usc.edu/
Assists students, faculty, and staff in navigating complex issues.

Diversity at USC - (213) 740-2101
diversity.usc.edu
Information on events, programs and training, the Provost’s Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

USC Emergency - UPC: (213) 740-4321 – 24/7 on call
dps.usc.edu, emergency.usc.edu
Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

USC Department of Public Safety - UPC: (213) 740-6000 - 24/7 on call
dps.usc.edu
Non-emergency assistance or information.