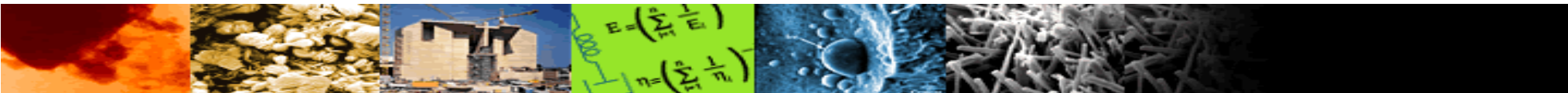


GUIDE

to Concrete Materials Specialization Program



CONCRETE MATERIALS PROGRAM @ CU





Going through the **GUIDE.....**

Civil Engineering at Clemson

Faculty Advisor-Concrete Materials

Graduate Student Enrollment- At Present

**Typical Courses Taken by Students of
Concrete Materials focus area**

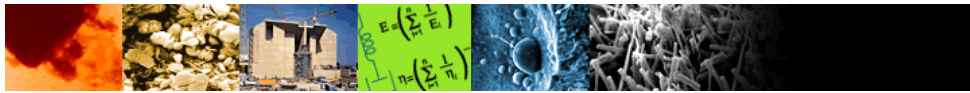
Ongoing Research

Upcoming Potential Research

Funding/Financial Assistantship

Research Facilities

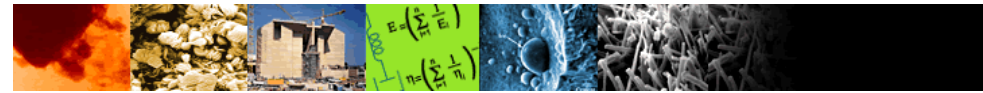
Past Recruiters of our Graduates



Civil Engineering at Clemson

Civil engineering has been taught at Clemson since the University was founded in 1889. Civil engineering became a department in 1932 at the same time the Engineering Department became the School of Engineering.

Today, the Department of Civil Engineering offers undergraduate course work in all major fields of civil engineering. Our Program Educational Objectives are evaluated on a regular basis to meet the needs of our constituents. The department offers graduate degree programs leading to the Master of Science and Doctor of Philosophy degrees with specializations in Applied Fluid Mechanics, Construction Engineering and Management, Construction Materials, Geotechnical Engineering, Structural Engineering, and Transportation Systems. Current enrollments are about 250 undergraduate and 100 graduate students. Student organizations include the American Society of Civil Engineers (ASCE), the Institute of Transportation Engineers (ITE) and the Chi Epsilon Honor Society.



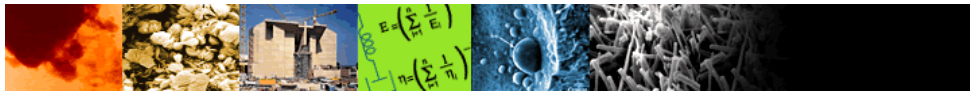
Faculty Advisor Concrete Materials Specialization

Prasad Rangaraju, Ph.D., P.E.
Assistant Professor

220, Lowry Hall
Department of Civil Engineering
Phone: (864) 656-1241
Email: prangar@clemson.edu

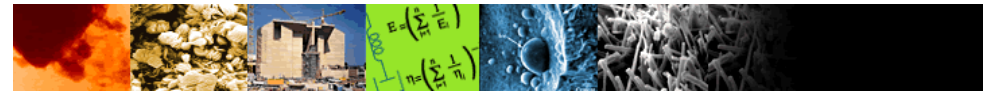


Dr. Prasad Rangaraju is an Assistant Professor at the Department of Civil Engineering in Clemson University. He received his Ph.D. from Purdue University, M.S from Iowa State University and Bachelor's from JNT University in India, in Civil Engineering. He is Professional Engineer. He is a member of ACI (American Concrete Institute), TRB (Transportation Research Board), ISCP (International Society for Concrete Pavements), and ASTM (American Society for Testing and Materials). His research interests include Cement, Concrete, Aggregates and Supplementary Materials, Microscopy and Petrography of Cement based Composites, Repair Materials, Durability of Cementitious Systems, and Concrete Pavements: Design, Construction and Rehabilitation.



Graduate Student Enrollment -At Present

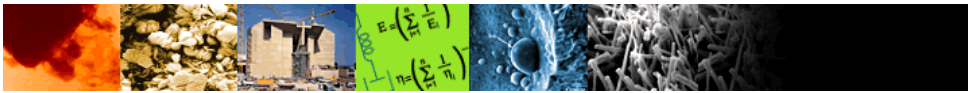
The current graduate student enrollment specializing in Concrete Materials stands at 10, of which, **4 students are pursuing PhD** program, and **6 students are pursuing M.S degree.**



Courses Taken by Students of the Concrete Materials Focus Area

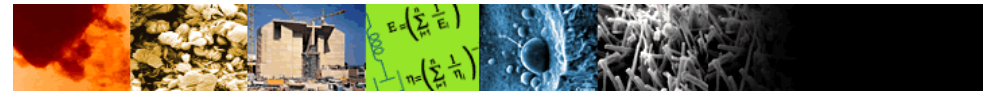
- Properties of Concrete
- Special Cement, Admixtures and Concretes
- Repair and Rehabilitation of Concrete Structures
- *Structural Concrete Materials (New Course)*
- Reinforced Concrete Design
- Prestressed Concrete Design
- Pavement Design
- *Pavement Management Systems (New Course)*
- Asphalt Materials
- Experimental Statistics
- Geosynthetics





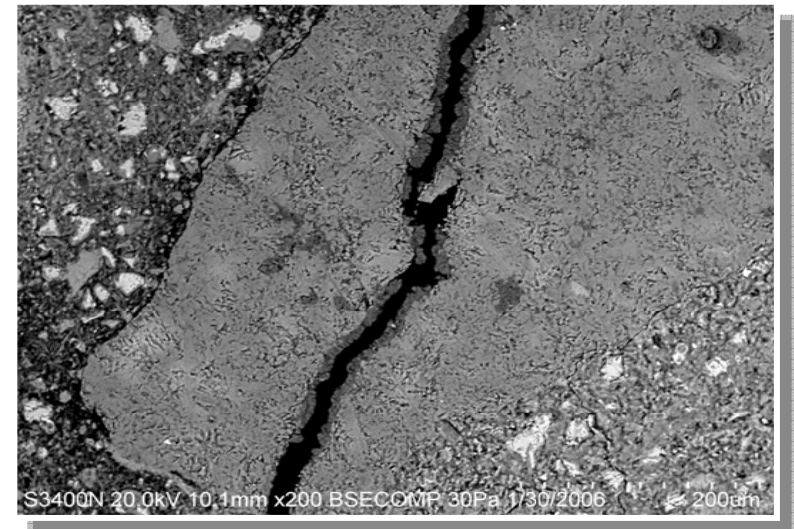
Ongoing Research Projects

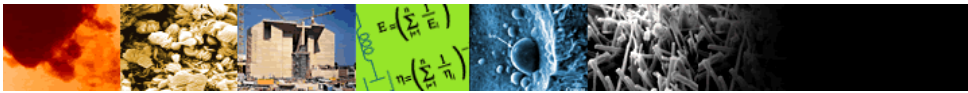
- Influence of Deicing Chemicals on Alkali-Silica Reaction (ASR) in Concrete
- Evaluation of ASR Mitigation Measures in Presence of Deicing Chemicals
- Rapid Set Patching Materials for Portland Cement Concrete
- Evaluation of Lithium Compounds for Mitigation of ASR Caused by Deicing Chemicals
- Life Cycle Cost Analysis for Pavement Selection
- Evaluation of Concrete Maturity and Temperature Match-Cure Technologies for QA/QC Applications.
- Influence of Crumb Rubber Particles Characteristics on Selected Properties of Portland Cement Mortars
- Evaluation of Dilatometer to Study ASR Caused by Deicing Chemicals



Upcoming Potential Research

- Modeling of Distress Induced by ASR in Concrete Using Finite-Element Analysis Techniques.
- New Experimental Method for Assessing the Physical Effects of ASR in Concrete Test Specimens.





Funding -Financial Assistantships

All graduate students are currently funded through either a research assistantship and/or a teaching assistantship. Opportunities exist in the University for a Department/College/University/Industry sponsored fellowships for outstanding students.



Research Sponsors

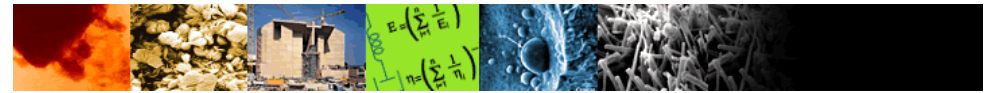
Research Projects are funded through grants from agencies such as

- U.S. Department of Transportation
- South Carolina Department of Transportation
- Federal Aviation Administration
- Federal Highway Administration
- Private Industries
- University Grants.



Recruiters of our Graduate Students during Last Two Years

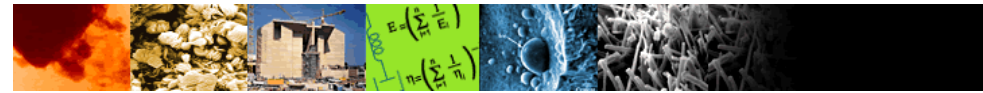
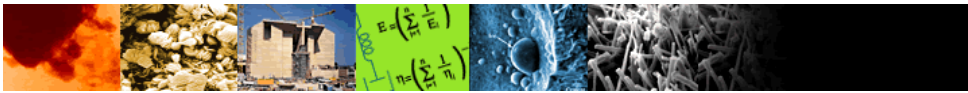
- **S&ME Inc.**
- **WPC Engineering, Inc.**
- **Carasquillo Associates, Inc.**
- **Kimley-Horn & Associates Inc.**



Research Facilities

Equipment and facilities for conducting concrete materials research at Clemson University include following: (number of units of equipment indicated in parentheses):

1. Badger Aggregate Crusher (1)
2. Bico Aggregate Pulverizer (1)
3. Aggregate Sieving Equipment
 - a. Gilson Testing Screen (1)
 - b. Ro-Tap Sieve Shakers (3)
4. Aggregate Sample Splitters
5. Gilson LA Abrasion Testing Machine (1)
6. Gilson Micro-Deval Abrasion Testing Machine (1)
7. Gilson Sulfate Soundness Testing Apparatus (1)
8. 5-qt. Hobart Mixers (5)
9. 30-qt. Hobart Mixer (1)
10. Gilson 6 ft³ Drum Concrete Mixer (1)
11. Vibrating Table (1)
12. Concrete Curing Room measuring 8 ft (w) x 15 ft (d) x 15 ft (h).
13. Sample Molds for Mortar Bars, dual-gang type (20)
14. Sample Molds for Concrete Prisms, single-sample (10)
15. 2-in Cube Brass Molds (16)
16. 6in. x 12 in.; 4 in. x 8 in.; 3 in. x 6 in. Cylinder Molds (several)
17. 6 in. x 6in. x 21 in. Beam Molds (several)
18. 27 ft³ - Despatch Forced Convection Ovens (4)
19. 38°C Constant Temperature Room Measuring 10 ft.(w) x 8 ft.(d) x 8 ft. (h) (1)
20. Caron Environmental Chamber (Constant Temp-RH), Model 6030. (1)
21. Humboldt Comparator for Length-Change Measurements (2)
22. Custom-Built Concrete Pore Solution Expression Die (1)
23. Grindo-Sonic MK5 unit (based on impulse excitation technique) for Dynamic Modulus Determination (1)



Notes

Research Facilities (cont'd)

25. Pundit Ultrasonic Pulse Velocity Meter (1)
26. Proceq Dyna Pull-Off Tester (1)
27. RLC Rapid Chloride Ion Permeability Apparatus (1)
28. Test-Mark Compression Testing Machine – 300,000 lb capacity (1)
29. Masonry Saw (for slabing concrete specimens) (1)
30. Trim Saw (for obtaining sections for lapping and polishing) (1)
31. Allied Hi-Tech Slow Speed Diamond Saw (for preparing samples for SEM Examination) (1)
32. Diamond-Pacific Lapping Machine for Polishing Concrete Specimens (1)
33. Vicat Apparatus (for consistency and setting time measurement of cement pastes) (1)
34. Acme Mortar Penetrometer (for setting time measurement of mortars) (1)
35. Flow Table (1)
36. Nikon SMZ1000 Stereo Microscope with SPOT Insight Color Camera and Software for Petrographic Examination of Test Specimens (1)
37. Scanning Electron Microscope (Advanced Materials Characterization Labs)
38. TGA/DTA/DSC/Mercury Intrusion Porosimetry/XRD/ICP/AA/XRF (Other labs on campus)