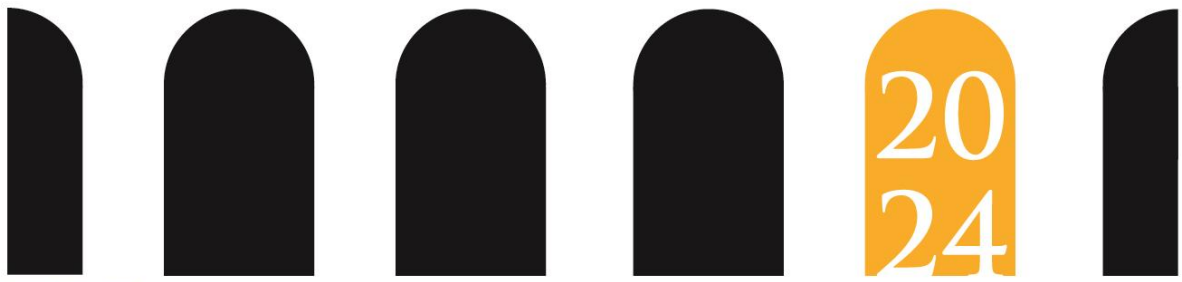


ENGINEERING  
ROME



**W** UNIVERSITY *of* WASHINGTON

**A University of Washington Study Abroad Exploration Seminar**

Program directors:

Steve Muench, Tom and Marilyn Draeger | The Beavers Charitable Trust  
Professor, Civil & Environmental Engineering  
Rachel Pearson, Graduate Student, Civil & Environmental Engineering

**W** UNIVERSITY *of* WASHINGTON

### Program Information

<b>Location:</b>	Rome, Italy and Seattle, Washington
<b>Department:</b>	Civil and Environmental Engineering
<b>Classroom Dates:</b>	Spring Quarter 2023 (1.5 hrs. per week)
<b>Dates in Rome:</b>	26 August – 20 September 2024
<b>Estimated Program Fee:</b>	\$5,500
<b>Course</b>	CEE 409/509 Engineering Rome
<b>Credits:</b>	5
<b>Program Director:</b>	Steve Muench, Professor Civil and Environmental Engineering
<b>Application Deadline:</b>	15 February 2024
<b>Information Sessions:</b>	To be scheduled

### About Engineering Rome

Engineering Rome is a *UW Exploration Seminar* that covers Roman and Italian engineering over a range of 3,000 years from Ancient Rome to the present day. It consists of one 5-credit course, CEE 409/509 Engineering Rome, which takes place in Rome, Italy at the UW Rome Center for three+ weeks during the Summer-Fall quarter break. There is also a once-per-week orientation session that meets the preceding spring quarter.

### UW Catalog Description: CEE 409 Engineering Rome

Engineering-focused Exploration Seminar that covers Roman civil engineering over 3,000 years from Ancient Rome to the present day. Introduction to civil engineering topics reinforced by practical engineering calculations, local experts and site visits. Provides international and historical perspective on engineering and the contributions of engineers to infrastructure and society.

### **Who Can Take the Class**

**Anyone enrolled at the University of Washington.** The class is open to all undergraduate and graduate students. You do not need to be a Civil and Environmental Engineering major, or even an Engineering major. You just need an interest in the subject. Keep in mind that we will be doing engineering analysis in the class so that type of activity should be something you are okay with doing and able to do. If you have had math education up to, but not including, calculus you should be just fine.

### **More information**

**Information sessions:** Follow Engineering Rome on Instagram for notification of sessions.

**Course website:** [www.engineeringrome.org](http://www.engineeringrome.org)

**Instagram:** <http://www.instagram.com/engineeringrome>

**E-mail:** ask Professor Steve Muench at: [stmuench@uw.edu](mailto:stmuench@uw.edu)

### **Applying for Engineering Rome**

Once the UW Study Abroad program approves the 2024 slate of Exploration Seminars (likely towards the end of 2023) you will be directed to sign up through the [UW Study Abroad website](#). Keep in mind that until this slate of courses is approved, UW Study Abroad will not have information on Engineering Rome. If you want to keep up to date and informed, like us on Instagram.

### **What Will it Cost?**

The Engineering Rome program fee is \$5,500. This covers a shared apartment (with other students) in Rome, and all course costs (including the trip to Venice, all museum entry fees, fees to tour guides, soccer match ticket price, 3-4 group dinners, etc.). It does NOT cover airfare to get to/from Rome, passport/visa costs, healthcare coverage (\$50 separate fee), and other living costs (e.g., most meals, things you do on your own time, etc.). We suggest budgeting \$8,500 to \$9,500 for the entire experience depending upon your tastes and the exchange rate.

### **Program Content**

This program explores over 3,000 years of the world's best engineering in the heart of Rome. It provides engineering students and those interested in engineering a unique international and historical perspective on engineering practice and its contributions to society. Rome is one of the richest sites in the world for exploring engineering through the ages from ancient Roman aqueducts, to Baroque basilicas, to sustainable life in a massive modern city. Students will interact with local experts, and will develop skills that allow them to analyze and evaluate civil infrastructure of all ages. Skills will be put to practice with classroom engineering analysis, expert lectures, and site visits guided by Roman experts in the engineering aspects of these sites (both modern and ancient).

Course Learning Objectives

Upon successful completion of this course, the student will be able to:

- Communicate engineering ideas in a clear, concise and effective format both in oral presentation and written report.
- Discuss the major civil infrastructure of Rome including how it was built and the engineering principles governing its function to include, masonry arches, water supply, sewers, foundations, passive solar, roads, urban development, and sustainability.
- Explain and analyze the function of select civil infrastructure using engineering principles, equations, and technical description. To include masonry arches, aqueducts, and transportation systems.
- Write the equivalent of a 10-20 page paper in an online Wiki format to include photos, videos, maps, a literature review, personal observations and conclusions.

What we do at UW (in the Spring Quarter before you go)

Class meets once per week. The schedule is not final, but will look something like the table below. The goal is to get to know one another, set expectations, and learn a bit about Rome.

Date	Topic
Week 1	No meeting (get familiar with your other classes)
Week 2	General introduction and questions
Week 3	International Programs Office
Week 4	Setting Expectations
Week 5	About Rome
Week 6	Roman Engineering History
Week 7	Course and travel expectations
Week 8	How to use Wordpress
Week 9	Roman History/Culture
Week 10	No meeting (do well on finals)

What we do in Rome

We spend time in the classroom, out in the City/Countryside seeing things, and participating in cultural activities. By the numbers:

Total time in CEE 409	600 hours	Fraction
Total course engaged hours	125 hours	21%
Classroom time	20 hours	
Individual/group work	30 hours	
Outside in Rome, Venice, and surrounding area	75 hours	
Sleep time (assuming you are an average sleeper)	192 hours	32%
Your time (awake time not scheduled for class activities)	283 hours	47%

### A Typical Schedule (Subject to Change)

The specific activities of each Engineering Rome differ based on what we have available.

You must arrive at the UW Rome Center on the day that the course starts and you must depart the UW Rome Center on the day that the course ends. Of course, you can stay in Rome (or elsewhere) on your own before or after the course.

We provide the 2022 schedule as an example.

# DETAILED SCHEDULE

Updated: 28-Aug-2022

	Date	Day	Type	Event	Leader	Location	Time	RS Class?	Nav (note1)
	25-Aug-2022	Thursday		Steve arrives - Delta to Amsterdam, KLM to Rome		Fiumicino Airport	16:35		
	26-Aug-2022	Friday		Student check-in @ Rome Center	Rome Center	Rome Center	All Day		
			Dinner	Elyse arrives - Trenitalia FR 9535, Firenze to Roma		Termini	15:49		
				Hosteria Ponte Sisto	Steve Muench	Meet at Rome Center	19:30-21:00		
	27-Aug-2022	Saturday	Class	Rome orientation	Steve/Elyse	Rome Center	10:00-11:00	Classroom	
	28-Aug-2022	Sunday							
Week 1	29-Aug-2022	Monday	Class	Italian Class	Federica Bianchi	Rome Center	9:30-11:30	Classroom	
			Class	Rome orientation	RC Director	Rome Center	11:30-13:00	Classroom	
			Class	Course orientation	Elyse Lewis	Rome Center	14:00-15:00	Classroom	
			Dinner	Group Dinner - Street Pasta (Pasta Imperiale or equivalent)	Steve Muench	Meet at Rome Center	19:00-21:00		Steve/Elyse
	30-Aug-2022	Tuesday	Class	Italian lesson	Federica Bianchi	Rome Center	9:30-11:30	Classroom	
			Class	Transportation	Elyse Lewis	Rome Center	11:30-12:30	Classroom	
			Class	Roman Construction	Steve Muench	Rome Center	13:30-15:00	Classroom	
			On-site	Soccer game: AS Roma vs. Monza	Steve Muench	Meet at Rome Center	19:30-24:00		Marescotti
	31-Aug-2022	Wednesday	Class	Project Brainstorm Activity	Elyse Lewis	Rome Center	11:30-13:00	Classroom	
			Class	Sustainable Rome	Tom Rankin	Rome Center	14:00-16:00	Classroom	
			On-site	Roman Neighborhoods	Tom Rankin	Roma	16:00-18:00		
			Eataly	Dinner at Eataly	Steve Muench	Eataly	18:00-20:00		
	1-Sep-2022	Thursday	Class	Water	Steve Muench	Rome Center	11:00-12:30	Classroom	
			Class	Structures (Materials & Geotech)	Elyse Lewis	Rome Center	13:30-14:30	Classroom	
		Class	Italian lesson	Federica Bianchi	Rome Center	15:00-17:00	Classroom		
		On-site	Baths of Caracalla	Steve Muench	Baths of Caracalla	17:00-19:00		Masi	
2-Sep-2022	Friday	On-site	Parco degli Acquedotti	Steve Muench	Parco d. Acquedotti	10:00-14:00		Marescotti	
		On-site	Forum/Colosseum Tour	????	Rome Center	16:00-18:30		Grottapinta	
3-Sep-2022	Saturday								
Week 2	4-Sep-2022	Sunday	Optional	Via Appia Antica bikes	Steve Muench	Meet at Rome Center	9:00-13:00		Steve/Elyse
	5-Sep-2022	Monday							
	6-Sep-2022	Tuesday	On-site	Venezia - Transit	Steve Muench	Meet at Rome Center	9:50 depart		Masi
			Dinner	Group Dinner - Il Giardenetto	Steve Muench	Meet at Hotel	19:00-21:00		Grottapinta
	7-Sep-2022	Wednesday	on-site	Venezia Tour	Urban Safari	Meet at Hotel	9:00-12:00		Marescotti
	8-Sep-2022	Thursday	on-site	Kayak Tour	Venice Kayak	Meet at Hotel	9:00-12:00		Masi
			On-site	Venezia - Return		Meet at Venezia S. Lucia	16:25 depart		
9-Sep-2022	Friday	Class	Underground Rome	Roma Sotterranea	Rome Center	17:00-19:00	Classroom		
		Dinner	Da Pancrazio (with RS)	Steve Muench	Meet at Rome Center	19:30			
10-Sep-2022	Saturday	On-site	Antichi Acquedotti di Vicovaro	Roma Sotterranea	Meet at Rome Center	8:00-16:00		Grottapinta	
Week 3	11-Sep-2022	Sunday							
	12-Sep-2022	Monday	On-site	Metro Linea C TBM	Roma Metro	TBD	10:00		Marescotti
	13-Sep-2022	Tuesday	On-site	San Pancrazio / Monteverde	Roma Sotterranea	San Pancrazio	9:30-15:00		Masi
	14-Sep-2022	Wednesday	On-site	San Clemente tour (Rome center to buy tickets in advance)	Roma Sotterranea	Meet at Rome Center	14:30-16:00		Grottapinta
			On-site	Cooking Class with Sandra (at her home in Via San Fabiano 15, on her terrace)	Sandra Cianci	Meet at Rome Center	18:00-22:00		Marescotti
	15-Sep-2022	Thursday	On-site	Ostia Antica	Tom Rankin	Porta San Paolo	9:00-14:00		Masi
	16-Sep-2022	Friday	On-Site	Pacifici Cava / Villa D'Este (have not heard back from Pacifici yet)	Steve Muench	Meet at Rome Center	9:00-16:00		
17-Sep-2022	Saturday								
Week 4	18-Sep-2022	Sunday							
	19-Sep-2022	Monday		Final Exam, Evaluations, Reflection	Steve Muench	Rome Center	15:00-16:00	Classroom	
			Dinner	Final Dinner -	Steve Muench	Roma	19:00-22:00		
20-Sep-2022	Tuesday	Depature							

## Course Organization

The course is roughly organized into 6 topics.

1. **Structures.** The ancient Roman arch and concrete, and infrastructure from all eras.
2. **Water.** Water supply, conveyance, use and disposal.
3. **Sustainability.** How a city has survived continuously for 2,500 years.
4. **Culture.** Language, food, sport and living in the city.
5. **Reporting your experience.** Tell us how you experience and see Rome.
6. **Final project.** Create a web page on an engineering topic of your choice.

Topics usually consist of 1-3 classroom lectures, several field experiences, and assignments that ask you to do, find and interpret in the field using your newfound knowledge.

## Tentative Graded Work

### Tentative Assignments (30% of Grade)

1. Basic Italian.
2. Masonry arches and their varied uses.
3. Water use, flow (open channel flow) and importance.
4. Transportation in modern Rome.
5. Cultural treasure hunt.

### Photo Journal, Reflections, and Class Participation (20% of grade)

Students will report their experiences through an online photo journal, weekly written reflections on their experiences, and by taking an active role in class discussions and site visits.

### Final Project: Online article (40% of grade)

Each student picks an engineering subject that has a relationship to Rome (or Venice) in some manner. Most topics are acceptable after consulting with the instructors. Upon approval of the subject by the instructor, the student will assemble an online article in [engineeringrome.org](http://engineeringrome.org) that is the equivalent of a 10-20 page report (including pictures). Each report shall include the following features:

- Literature review
- Personal field observations from in and around Rome (the student is expected to go observe the subject in the field if possible...and take pictures/video)
- Photographs and/or videos taken by the student (minimum 10)
- Map(s) (minimum 1)
- Engineering commentary and/or analysis

## Exams (10% of Grade)

- Final. We will have one but it is impossible to study for it. 😊

## More Program Information

### Rome on your own and socializing

There will be ample time for students to explore Rome and its engineering on their own. This serves as independent study and contributes substantially to your experience and the final project. We will also try to interact with the other UW students studying at the Rome Center while we are there.

### The UW Rome Center (<https://www.washington.edu/rome>)

The UW operates its own center right in the middle of Rome! Located in Palazzo Pio, the Rome Center provides a unique scholarly work place in Rome's historic center, offering outstanding facilities for academic programs. This will serve as our focal point for our time in Rome.

## Instructors/Contacts

### Program Director

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<https://www.washington.edu/rome>



If you would like to read about Rome and engineering, we have assembled a list. You may also draw on this list when writing your final article.

### Featured Reading (the best of the best articles)

- Berechman, J. (2003). Transportation – economic aspects of Roman highway development: the case of Via Appia. *Transportation Research Part A*, 37, pp. 453-478. Excellent overview of road construction, reasons for construction, estimated costs, and economic benefits of roads.
- Jones, M.W. (2000). Genesis and Mimesis: The Design of the Arch of Constantine in Rome. *Journal of the Society of Architectural Historians*, 59(1). pp. 50-77. How was this arch designed – presents a “most likely” scenario. Also provides dimensions for this arch and Titus arch.
- Jones, M.W. (2009). The Pantheon and the Phasing of its Construction. Gerd Graßhoff and Michael Heinzelmann and Markus Wäfler, eds. *The Pantheon in Rome*. Contributions to the Conference Bern, November 9-12, 2006, Bern: Bern Studies. Available from *The Bern Digital Pantheon Project*. <http://www.digitalpantheon.ch>. Timing of the Pantheon construction including the buttress structure to the south.
- Lancaster, Lynn C. (2009). Materials and Construction of the Pantheon in Relation to the Developments in Vaulting in Antiquity. Gerd Graßhoff and Michael Heinzelmann and Markus Wäfler, eds. *The Pantheon in Rome*. Contributions to the Conference Bern, November 9-12, 2006, Bern: Bern Studies. Available from *The Bern Digital Pantheon Project*. <http://www.digitalpantheon.ch>. Best discussion of purpose and techniques of relieving arches.
- Macaulay, D. (1974). *City; a story of Roman planning and construction*. Houghton Mifflin Company, Boston, MA. Quick read with bunches of illustrations. Does well to introduce Roman technology and what was contained in a typical city, how it was built, and how it functioned.
- Macchi, G. (2001). Diagnosis of the façade of St. Peter’s Basilica in Rome. *Historical Constructions*, P.B. Lourenco and P. Roca (Eds.), Guimaraes.
- Ring, J.W. (1996). Windows, Baths, and Solar Energy in the Roman Empire. *American Journal of Archaeology*, 100(4), pp. 717-724. You can heat a tepidarium with sun alone.
- Wilson, A. (2006). The Economic Impact of Technological Advances in the Roman Construction Industry. *Innovazione tecnica e progresso economico*.

### Other Reading

- Adams, J.P. (1994). *Roman Building: Materials and Techniques*. Mathews, A. (translation). Routledge, Oxon, UK. Most detailed descriptions about materials and techniques such as mining, wall building, masonry, arches, vaults, etc. Many drawings and B&W pictures. Great descriptions. Few, if any, calculations.
- Adembri, B. (2000). *Hadrian’s Villa*. Mondadori Electa S.p.A., Milano, Italia. Mostly a tour guide.

- Aicher, P.J. (1995). *Guide to the Aqueducts of Ancient Rome*. Bolchazy-Carducci Publishers, Inc., Wauconda, IL. An excellent tour guide of what you can see today around Rome with precise directions. Also has informative maps and histories.
- Albuerne, A. and Williams, M. (20XX). The Deformation of the Barrel Vaults of the Basilica of Maxentius. *35<sup>th</sup> Annual Symposium of IABSE / 52<sup>nd</sup> Annual Symposium of IASS / 6<sup>th</sup> International Conference on Space Structures*, London, September 2011. Shows how vaults have deformed from construction and over time under loads.
- Albuerne, A.; Williams, M. and DeLaine, J. (2012). *On the As-Built Geometry of the Vaults of the Basilica of Maxentius*. In press somewhere.
- Aldrete, G.S. (2004). *Daily Life in the Roman City: Rome, Pompeii, and Ostia*. University of Oklahoma Press, Norman, OK. Great survey of life in ancient Rome. There is a chapter on infrastructure and specific chapters on Ostia, Pompeii.
- Barisi, I. (2004). *Guide to Villa d'Este*. De Luca Editori d'Arte, Roma, Italia. Good section on the hydraulics of the place.
- Betts, R.J. (1993). Structural Innovation and Structural Design in Renaissance Architecture. *Journal of the Society of Architectural Historians*, 52(1), pp. 5-25. Good review of basic church design in the renaissance.
- Blackman, D.R. (1978). The volume of Water Delivered by the Four Great Aqueducts of Rome. *Papers of the British School at Rome*, 46, pp. 52-72.
- Blackman, D.R. (1979). The Length of the Four Great Aqueducts of Rome. *Papers of the British School at Rome*, 47, pp. 12-18.
- Boothby, T.E. (2001). Analysis of masonry arches and vaults. *Progress in Structural Engineering and Materials*, 3(3), pp. 246-256. How to analyze an arch in detail.
- Boothby, T.E. and Anderson Jr., A.K. (1995). The Masonry Arch Reconsidered. *Journal of Architectural Engineering*, 1(1), pp. 25-36.
- Chanson, H. (2000). Hydraulics of Roman Aqueducts: Steep Chutes, Cascades, and Dropshafts. *American Journal of Archaeology*, 104(1), pp. 47-52.
- Chanson, H. (2002). Hydraulics of Large Culvert beneath Roman Aqueduct of Nimes. *Journal of Irrigation and Drainage Engineering*, 128(5), 326-330.
- Cicconi, D. (April 2008). Unearthing Rome. *Travel + Leisure*, 38(4), pp. 148-152. Short piece about the Metro C line and building around archeology.
- DeLaine, J. (1997). The Baths of Caracalla in Rome: a study in the design, construction and economics of large-scale building projects in imperial Rome, *Journal of Roman Archeology*, Supplement 25.
- DeLaine, J. (2000). Building the Eternal City: the building industry of imperial Rome, J. Coulston and H. Dodge (eds.) *Ancient Rome: the Archaeology of the Eternal City*. pp. 119-141.

- Frunzio, G.; Monaco, M. and Gesualdo, A. (2001). 3D F.E.M. analysis of a Roman arch bridge. *Historical Constructions*, P.B. Lourenco, P. Roca (Eds.), Guimaraes.
- Gallieo, S. (2000). *Guide to the Excavations of Ostia Antica with a section about the Renaissance Borgo*. Ats Italia Editrice srl, Roma, Italia. Good detail describing the site.
- Gest, A.P. (1963). Engineering. In: *Our debt to Greece and Rome*, G.D. Hadzsits and D.M. Robinson, eds. Cooper Square Publishers, Inc., New York. Chapters 5 and 6 on aqueducts and roads overview. No technical information.
- Gotti, E.; Oleson, J.P.; Bottalico, L.; Brandon, C.; Cucitore, R. and Hohlfelder, R.L. (2008). A Comparison of the Chemical and Engineering Characteristics of Ancient Roman Hydraulic Concrete with a Modern Reproduction of Vitruvian Hydraulic Concrete. *Archaeometry*, 50(4), pp. 576-590.
- Gowers, E. (1995). The Anatomy of Rome from Capitol to Cloaca *The Journal of Roman Studies.*, 85, pp. 23-32. Non-engineering aspects of the Cloaca Maxima.
- History Channel, The. (2007). *History Channel Presents Rome – Engineering an Empire*. DVD. A&E Home Video. Mostly a superficial story about Rome using infrastructure as the plot line. No actual engineering. Can see much of this in short YouTube segments.
- Hodge, A.T. (2002). *Roman Aqueducts & Water Supply*. Gerald Duckworth & Co., Ltd., London, UK. Incredibly detailed and a bit wordy. Best end-to-end coverage of aqueducts anywhere. Few engineering calculations.
- Jackson, M.D.; Logan, J.M.; Scheetz, B.E.; Deocampo, D.M.; Cawood, C.G.; Marra, F.; Vitti, M. and Ungaro, L. (2009). Assessment of material characteristics of ancient concretes, Grande Aula, Markets of Trajan, Rome. *Journal of Archaeological Science*, 36, pp. 2481-2492.
- Jackson, M.D.; Marra, F.; Hay, R.L.; Cawood, C. and Winkler, E.M. (2005). The Judicious Selection and Preservation of Tuff and Travertine Building Stone in Ancient Rome. *Archaeometry* 47, 3. Pp. 485-510. How and what Romans knew about building materials around Rome. Good maps of soils/materials around Rome.
- Litman, T. (2011). *London Congestion Pricing: Implications for Other Cities*. Victoria Transport Policy Institute, Victoria, B.C.
- Martines, G. (2009). The Structure of the Dome. Gerd Graßhoff and Michael Heinzelmann and Markus Wäfler, eds. *The Pantheon in Rome*. Contributions to the Conference Bern, November 9-12, 2006, Bern: Bern Studies. Available from *The Bern Digital Pantheon Project*. <http://www.digitalpantheon.ch>.
- Moore, D. (1995). *The Roman Pantheon: The Triumph of Concrete*. Self-published by David Moore, Mangilao, Guam. [www.romanconcrete.com](http://www.romanconcrete.com). Excellent source book for Pantheon and concrete/brick making in ancient Rome. More about concrete than Pantheon structure.
- Nardo, D. (2001). *Roman Roads and Aqueducts*. Lucent Books, Inc., San Diego, CA. Basic 9<sup>th</sup>-grade-like text that tells a good story of the aqueducts and roads. A few insights. Quick read.

- Oleson, J.P., ed. (2008). *The Oxford Handbook of Engineering and Technology in the Classical World*. Oxford University Press, Oxford, UK. Huge scope, academically referenced (so you can find other related sources). No calculations. Mostly describes methods.
- Parsons, W.B. (1939). *Engineers and Engineering in the Renaissance*. The MIT Press, Cambridge, MA. Extensive but quite wordy. Really a collection of stories about engineering. Few engineering details, more engineering as subject. Does, however, cover the Renaissance.
- Rankin, T. (2012). *Tom Rankin's Still Sustainable city BLOG: Rome*. Weblog. <http://sustainablerome.wordpress.com>. Accessed 13 February 2012.
- Rinne, K.W. (2010). *The Waters of Rome*. Yale University Press, New Haven, CT. Very detailed description of Papal Rome's use, creation, expansion, etc. of water supply. Includes chapter on streets too. Incredibly detailed.
- Roman Roads. (n.d.). In *Wikipedia*. [http://en.wikipedia.org/wiki/Roman\\_roads](http://en.wikipedia.org/wiki/Roman_roads). Accessed 13 February 2012.
- Sabbgioni, C.; Zappia, G.; Riontino, C.; Blanco-Varela, M.T.; Aguilera, J.; Puertas, F.; Van Balen, K. and Toumbakari, E.E. (2001). Atmospheric deterioration of ancient and modern hydraulic mortars. *Atmospheric Environment*, 35, pp. 539-548. How Roman concrete deteriorates over time.
- Science Channel, The. (2005). *What the Ancients Knew: The Romans*. DVD. Superficial treatment of engineering. Some references to civil engineering in Rome.
- Seemungal, M. (17 September 2009). Rome tunnels through ancient relics to build a subway. *Worldfocus*. <http://worldfocus.org/blog/2009/09/17/rome-tunnels-through-ancient-relics-to-build-a-subway/7312>. Accessed 13 February 2012.
- Sprague de Camp, L. (1963). *The Ancient Engineers*. Doubleday & Co., Inc., Garden City, NY. Chapters 6 and 7 are about Romans. General overview. Of minimal value.
- Staccioli, R.A. (2003). *The Roads of the Romans*. The J. Paul Getty Museum, Los Angeles, CA. Good book for color pictures of roads. Detailed discussions about types of roads, building techniques, locations, etc. Great descriptions of bridges, construction techniques, reasons for doing things.
- The Bern Digital Pantheon Project*. Online digital repository of pictures/articles. Topoi cluster of excellence, Berlin, Germany. <http://www.digitalpantheon.ch>. Excellent source of technical detail on the Pantheon.
- Via Appia: The Ancient Roman Road*. (2003). Palombi Editori, Roma, Italia. Shallow, not much information beyond the tourist minimum.
- White, K.D. (1984). *Greek and Roman Technology*. Thames and Hudson Ltd., London, UK. Good general overview of a lot of different aspects of Roman technology. Talks about innovations during Greek and Roman times (e.g., mining, health, pumps, etc.). Chapter on power generation (human, horses, water, etc.). Specific chapter on Civil Engineering.

30 September 2023

Williams, M.S.; Albuerne, A.; Lawson, V. and Yip, F. (2012). Model Scale Shaking Table Tests on Masonry Barrel and Cross Vaults. *15<sup>th</sup> World Conference on Earthquake Engineering*, 24-28 September 2012, Lisboa, Portugal.

### **About Us**

Muench, S.T.; Thompson, A.A. and Brandalik, S. (2015). Engineering Rome: Assessing outcomes from a study abroad program designed to overcome barriers to participation. *ASEE Annual Conference and Exposition, Conference Proceedings*, 122<sup>nd</sup> ASEE Annual Conference and Exposition: Making Value for Society. Seattle, WA.