



2010 JANUARY TERM ABROAD

Mathematics and Architecture of Incas in Peru

January 2 - 24, 2010

Itinerary

Orientation at University of St. Thomas	11/21	Cusco/Agua Calientes	01/17
Twin Cities/Lima	01/02	Agua Calientes/Cusco	01/18
Lima/Nazca	01/05	Cusco/Lima	01/19
Nazca/Arequipa	01/07	Lima/Huanchaco Trujillo	01/20
Arequipa/Puno	01/10	Huanchaco Trujillo/Lima	01/23
Puno/Cusco	01/13	Lima/Twin Cities	01/24

T3622

Price: \$4,255*

The Ancient Incas had elaborate mathematics, astronomy, architecture, and communication systems. The purpose of this course is to study their mathematics and see how they incorporated it in their art, architecture, calendar and communication systems. They devised an amazing tool, the quipu, to record numerical data for accounting and for transmitting complex messages with astonishing mathematics which is very similar to the binary codes used in the early versions of computers. Another aspect of their culture filled with mathematics is their architecture that was also enhanced with use of symmetry in their art form. The frieze patterns that occurred on buildings and found on their pottery represent all seven basic types of mathematical frieze patterns. We will visit many of the buildings that were built by the Incas all throughout Peru including the Inca city of Machu Picchu. The gigantic stones used in this city were carved and put together with such precision and mathematical accuracy that to this day one cannot fit a thin knife between stones. The stones are held together not due to mortar but because of pure craftsmanship. We will also visit and study the geometry of the mysterious Nazca Lines, which are a set of zoomorphic, phytomorphic, and geometric figures that appear engraved in the surface of the Nazca desert, a high arid plateau that stretches for 37 miles. They are the most outstanding group of drawings on the ground in the world.

triple rooms, continental breakfast daily, eight lunches, six group dinners and one cultural performance. (subject to change)

Prerequisites: Because this is an upper level Math/Engineering course, a Multivariable Calculus course or course in Linear Algebra/Diff Equations or permission of instructors is required.

Required Readings: M. Ascher, *Ethnomathematics: A multicultural view of mathematical ideas* (Pacific Grove, CA, 1991 – two chapters).
M. Ascher and R. Ascher, *Mathematics of the Incas: code of the Quipu* (Mineola, NY, 1997 – two chapters).
P. Olver and C. Shakiban, *Applied Linear Algebra*, Prentice Hall, 2005 (two chapters – provided at no cost).
C. Shakiban, M. Hennessey and M. Leonard, *Mathematics and Architecture of Incas*, Lecture notes.

Evaluation:

Attendance	10%
Participation in Group Projects	10%
Presentations	15%
Reading	10%
Journals	15%
Quizzes and exams	25%
Final Paper	15%

Comprehensive Fee Includes: Transportation and course arrangements as indicated, hotel accommodations in twin and

*Each home institution may have supplementary fees in addition to the price listed.

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Dr. Shakiban has been a professor of Mathematics for over 25 years. She has done extensive work in the area of mathematical symmetry and its application to arts, architecture, and music. She has given several presentations on this topic and offered several honors seminars on this subject at various professional meetings, colleges and universities. She is the coauthor of the book: *Applied Linear Algebra* that will be used as a reference book for this course. Dr. Cheri Shakiban has led the same UMAIE course in Peru during J-term 2008 and two UMAIE January courses in Spain.



Dr. Hennessey is an associate professor of mechanical engineering at UST (8 years) and has been a professor for the past 13 years. His degrees are in mechanical engineering (MS, PhD) and mathematics (BMath). While Dr. Michael Hennessey has not yet taught an off-campus course, by virtue of being the ASME (American Society of Mechanical Engineers) faculty advisor, he has travelled regularly and successfully with students in our region of the US to attend student conferences. He has also travelled with students and several St. Thomas faculty members to Mali, Africa during J-term 2007 in support of student projects.





UPPER MIDWEST ASSOCIATION FOR INTERCULTURAL EDUCATION

www.umaie.org

RULES AND PROCEDURES

For the forty-fifth consecutive year, UMAIE offers unique opportunities for cross-cultural study during January Term and starting in 2005, May/June Term. UMAIE, a consortium of five colleges and universities, cooperates to provide the educational depth and resources necessary for an intercultural curriculum.

This year UMAIE offers courses in many locations around the world including: The Americas (North, Central and South), Antarctica, Australia, Egypt, Europe (Western, Central, Eastern, Northern and Southern), Hawaii, India, Jordan, New Zealand, Russia, Thailand and Turkey.

APPLICATION AND REQUIRED DOCUMENTS — Applications and required documents are available via the UMAIE website (www.umaie.org). Applications are accepted between **April 15 - October 2, 2009**. When applying for a course, please submit the following to your campus UMAIE Board Member:

- Three copies of your completed application.
- One copy of your valid passport photo & signature page OR if you do not have a passport, a copy of your passport application. (Actual submittal of your passport application to a passport agency is not required until acceptance into a course. Please visit <http://travel.state.gov/passport>.)
- One copy of your January Term Abroad Agreement.
- One copy of your unofficial transcript.
- One deposit check in the amount of **\$400** made payable to **Seminars International, Inc.** (All checks will be cashed upon receipt. Returned checks will be assessed a service charge of **\$50**.)

***UST students please see your study abroad website (www.stthomas.edu/studyabroad) for application procedures.**

No application will be considered without **ALL** the required signed documents, copies and deposit as listed above. If you have any questions please contact your campus UMAIE Board Member.

SELECTION PROCESS FOR APPLICANTS — Faculty Directors will screen each application to ensure all prerequisites are met, and that equal access is given to students from all consortium schools. **For applications received by April 15th, the UMAIE Secretariat will notify each participant via e-mail by May 8, 2009**, to inform if applicant is: **1) accepted into the course; 2) on a waiting list; 3) not accepted into the course.** Please be aware that if you are placed on a waiting list, your deposit check will still be cashed upon receipt. In the event a course is filled or cancelled due to low enrollment, students are contacted regarding a second choice. Students who choose not to transfer to another course will receive a full refund. **LATE APPLICATIONS WILL BE CONSIDERED ONLY ON A SPACE AVAILABLE BASIS AND LATE FEES WILL LIKELY BE APPLIED.**

PASSPORTS, VISAS AND IMMUNIZATIONS — All applicants must send a copy of a valid and signed passport to their campus UMAIE Board Member upon acceptance into a UMAIE course (if one was not turned in with application). This is not required for students travelling to Hawaii. **Passports must be valid at least six (6) months beyond your return date.**

If your course requires a visa it will be stated in the course description. A country specific visa application will be sent to you 1-2 months prior to departure.

Information regarding recommended and/or needed immunizations can be found at the CDC website: www.cdc.gov/travel/. If you are traveling to a destination that requires an immunization, the UMAIE Secretariat will inform you in a timely manner. Additional information regarding passports, visas and immunizations is available from your campus UMAIE Board Member.

COMPREHENSIVE FEE — Costs listed are based on planned enrollments for each course. Every effort is made to operate the program at the stated price. However, if fewer students enroll, costs may be increased or the course cancelled. **NOTE:** UMAIE reserves the right to adjust fees due to dollar devaluation, fuel surcharges and general inflation.

The comprehensive fee includes round-trip air transportation from Minneapolis-St. Paul to the course location; airport transfers; visas (where required for U.S. citizens who meet the visa application deadline and have the correct accompanying documentation); transportation to most course activities while abroad; lodging, primarily in twin or triple rooms in hotels, pensions, university dormitories, or family homes (where indicated); continental breakfast daily (exceptions noted on individual course descriptions) and other meals as indicated; tickets for required cultural performances; planned excursions; and administrative costs (however, individual institutions may assess additional charges). When rail passes or entrance fees are included, they are based on the utilization of youth rates (25 years or under). Any additional amount incurred will be the participant's responsibility.

EXCLUSIONS — Expenses and items not specifically mentioned herein are not covered, including but not limited to: passport fees; airline checked and/or excess luggage fees; local subway, bus and tram fares (if not included in course price); departure taxes (except U.S.); optional entertainment and excursions; beverages; individual room service charges; travel insurance; porter's fees; laundry and cleaning; telephone and fax; personal gratuities; transportation to and from point of course departure.

FINAL PAYMENT — Accepted applicants are notified of the final price during the last week of October. Students at Gustavus Adolphus College will bring their final payment to their International Education Office on or before Tuesday, November 3. Students from Elmhurst College will bring their final payment to their Student Accounts Office before Tuesday, November 3. Students from all other institutions will have their fees billed to their student account.

WITHDRAWALS AND REFUNDS

- No cancellation fee for students withdrawing on or before **September 14, 2009**.
- A **\$100** cancellation fee is withheld for students who withdraw between **September 15 and October 2, 2009**.
- Beginning **October 3, 2009** the course deposit of **\$400** is non-refundable.
- A refund for cancellations occurring after **November 3, 2009** is based upon recoverable costs. The **ENTIRE COURSE COST** may be forfeited.
- **If cancellation occurs 30 days or less prior to departure, there will be no refund. Trip cancellation insurance is recommended for students with pre-existing medical conditions.** This insurance must be purchased at the time of registration. Please discuss this with your UMAIE Campus Board Member.
- If a course price increases by more than 6% (due to general inflation or lower enrollment) a student may cancel without penalty.
- No refund is given to students who wish to omit portions of the course.
- **NOTICE OF CANCELLATION MUST BE SUBMITTED IN WRITING TO YOUR CAMPUS UMAIE BOARD MEMBER.**

TRAVEL ARRANGEMENTS — are secured by Seminars International, Inc., 33 West Monroe Street, Suite 1160, Chicago, IL 60603-5303, (800) 541-7506, TRAVEL@semint.com. Applications are processed by the Minnesota office, 21530 Vernon Avenue, Prior Lake, MN 55372, (952) 440-1338, kathy@semint.com. Participants desiring additional information may contact Seminars International Inc., or visit their website - www.semint.com.

ORIENTATION SESSION—Will be held **Saturday, November 21, 2009** at the University of St. Thomas. **ALL MUST ATTEND.**

DEVIATIONS — Course prices are based on group air arrangements and the air carrier may assess a service fee. Not all airlines allow deviations on group reservations. In addition to the airline service fee(s), an additional fee must be paid to Seminars International, Inc. as follows: before **October 2, 2009 the charge is \$75; from October 3, 2009 until November 3, 2009 the charge is \$125. After November 3, 2009, no deviations will be accepted.** Deviation requests must be made in writing to the Chicago Seminars International office via fax (312) 332-5509 or email TRAVEL@semint.com. Once the deviation has been booked, any changes may incur additional costs. Students who deviate are responsible for providing their own transportation to or from the actual course location abroad. **Faculty Directors are not expected to provide assistance. Students from Augustana College and Elmhurst College will receive further information on course flights upon acceptance.**

CAMPUS UMAIE BOARD MEMBERS

Augustana College, Nancy Wright, (605) 274-5417 • Elmhurst College, Wally Lagerwey, (630) 617-3604

Gustavus Adolphus College, Center for International and Cultural Education, (507) 933-7546

St. Catherine University (formerly College of St. Catherine), Global Studies Office, (651) 690-6031

University of St. Thomas, International Education Office, (651) 962-6450

UMAIE SECRETARIAT: Kathy Willemsen, (952) 440-1338, email: kathy@semint.com