Instructor: Christopher Dostal  
Time: Tuesday and Thursday, 9:35am- 10:50am  
Location: Anthropology 108  
Office: Anthropology 102A  
Office Hours: Tuesday and Thursday 11-1pm  
Contact: dostalc@tamu.edu  

Prerequisites: Anthropology 202: Introduction to Archaeology  
Class website: http://nautarch.tamu.edu/class/anth489/501/Analyticalmethods/index.html  

Textbook:  
Scientific Methods and Cultural Heritage: An introduction to the application of materials science to archaeometry and conservation science by Gilberto Artioli (2009)  
*Other readings will be distributed as PDFs by the instructor  

Course Description  
This course is designed to introduce students to a variety of analytical methods used in archaeology and archaeological conservation. The class is separated into two sections: artifact material analysis, and artifact documentation. Material analysis is the way that we study artifacts, both in structure and elemental composition. Classifying an artifact by use is often only just the beginning of an archaeological study; knowing that a projectile point is a projectile point can only tell us so much, but knowing what that point is made of can often tell us where it is from and can suggest trade routes and habitation patterns. Artifact documentation is one of the most important aspects to any archaeological project, but doubly so in archaeological conservation. Proper documentation can allow for studies to be completed without demanding that the artifacts be present, and often details not readily observable become apparent during the documentation process. This class will cover the traditional methods of artifact documentation, photography and sketches, as well as 3D computer modeling and digitization of artifacts and 3D printing. Though this course will emphasize existing equipment and techniques used in the anthropology department, capabilities available elsewhere on campus, like neutron activation analysis and scanning electron microscopes, will be included.  

Learning Outcomes  
Upon completing the course, students will be able to:  
1. Identify which analytical methods are appropriate for studies on a variety of artifacts.  
2. Demonstrate a basic understanding of portable X-Ray fluorescence operations and be able to produce usable, calibrated data  
3. Describe the basic goals of archaeological artifact documentation  
4. Produce 3D models of artifacts with 3 different techniques
Class Format

Class meets for 75 minutes twice a week on Tuesday and Thursday. Each class will be a combination of lecturing accompanied by PowerPoint and hands-on demonstrations of the equipment being discussed that day. Students will be responsible for all material covered in the text, in the supplementary assigned readings, and all material covered in the lectures.

Grading

There will be 2 exams and a final, each worth 20% of your grade. The final will be non-cumulative. There will be an analysis project and an associated report worth 25% of the total grade. There will also be a critical response paper worth 15% of your grade.

Exams (3) – 60%
Analysis Project and Report -25%
Critical Response - 15% of Grade

Grading Scale
90-100%   A
80-89%     B
70-79%     C
60-69%     D
0-59%      F

Exams

Each exam is worth 20% of your final grade. Each exam will consist of 20 multiple choice questions worth 2 points each, and 15 short answer questions worth 4 points each. I will provide the exams, you do not need to buy a blue book. Exams are non-cumulative.

Exam 1: February 23rd
Exam 2: March 24th
Final Exam: May 5th, 12:30-2:30pm

Analysis Project and Report (25% of Grade) – Due May 3rd at the start of class

Each student will choose one of the provided ‘artifacts’ and analyze it with a variety of the methods learned in class. You can bring an artifact to analyze, but we will have to review it beforehand to be sure that it will fit the objectives of the project. Each student will individually analyze their artifact with the XRF and optical microscope, the artifact will need to be photographed and drawn, and then it will be scanned with the FARO arm, the NextEngine 3D laser scanner, and it will be modelled using photogrammetry. The FARO arm model and the photogrammetry model will then be 3D printed and compared to each other and the original.
Along with the images and files, a project report will be handed in, describing the techniques used and weighing in on the benefits of using one or the other for this particular object. More information about this project can be found on the class website here.

Critical Response (15% of Grade) – Due March 1st at 5:00pm

Each student will write a 5 page critical response to one of the pre-selected academic papers provided. The review should include a brief summary of the article, your thoughts on the strengths and weaknesses of the study, how the study could be improved, and suggestions for future work. All sources should be cited in text, and the format of the citation should be stated on the bottom of the first page. (e.g. ‘This paper follows the APA citation format’). Papers MUST use Times New Roman, 12pt, double spaced, with 1” margins. Papers need to be submitted as a .doc file.

Last day to drop classes on Howdy is Friday January 25th at 5pm. The last day to Q-drop is April 19th at 5pm.

Academic Honor:
“An Aggie does not lie, cheat, or steal or tolerate those who do.”
Find the Student Honor Council rules and procedures at this web address:
http://aggiehonor.tamu.edu

Americans with Disabilities Act (ADA) Policy:
The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, currently located in the Disability Services building at the Student Services at White Creek complex on west campus or call 979-845-1637. For additional information, visit http://disability.tamu.edu.

Plagiarism Statement
(From http://writingcenter.tamu.edu/Faculty/Teaching-Writing-or-Public-Speaking/Developing-Your-Method-of-Instruction/Citation-Documentation Accessed 9/8/15)

According to the Texas A&M University Definitions of Academic Misconduct, plagiarism is the appropriation of another person's ideas, processes, results or words without giving appropriate credit (aggiehonor.tamu.edu). You should credit your use of anyone else's words, graphic images, or ideas using standard citation styles. If I should discover that you have failed to properly credit sources or have used a paper written by someone else, I will recommend that you receive an F in this course. The Aggie Honor System Office processes for adjudication and appeals can be found at http://aggiehonor.tamu.edu
Attendance
Texas A&M views class attendance as an individual student responsibility. Students should attend all classes and complete all assignments if they wish to make a good grade. Please refer to Student Rule #7 for details concerning reasons for excused absences and protocols for making up work missed during excused absences (http://student-rules.tamu.edu/rule07).

Anthropology Department Diversity Statement
Respect for cultural and human biological diversity are core concepts of Anthropology. In this course, each voice in the classroom has something of value to contribute to class discussion. Please respect the different experiences, beliefs and values expressed by your fellow students and instructor, and refrain from derogatory comments about other individuals, cultures, groups, or viewpoints. The Anthropology Department supports the Texas A&M University commitment to Diversity, and welcomes individuals of all ages, backgrounds, citizenships, disabilities, education, ethnicities, family statuses, genders, gender identities, geographical locations, languages, military experience, political views, races, religions, sexual orientations, socioeconomic statuses, and work experiences (See http://diversity.tamu.edu/).

Safety Precautions
During this course, students will be expected to adhere to strict safety protocols while in the presence of equipment that produces X-Rays. The policy in this class is to keep exposure ‘As Low as Reasonably Allowed’ (ALARA). All students will be required to complete the General Radiation Producing Device Training (Online) at https://ehsd.tamu.edu/Pages/EHS_Training.aspx

Students will only work with X-Ray producing equipment under the direct supervision of the instructor of this course.
Schedule

Readings assigned are to be read prior to class.

Week 1
Class 1 – January 19th
   Introduction, Description, and Syllabus

Class 2 – January 21st
   Part I. Material Analysis – What do we look for?
      Distribution of ‘artifacts’ for project and the articles to be reviewed.
      Read Artioli p. 1-15

Week 2
Class 3 – January 26th
   Optical and SEM Microscopy
      Read Artioli p. 56-68

Class 4 – January 28th
   Optical and SEM Microscopy II – Photography and Image Processing

Week 3
Class 5 – February 2nd
   X-Ray Fluorescence I - Fundamentals
      Read Artioli p. 29-37
      Read PDF of Moens et al. (2000). X-Ray Fluorescence in Modern Analytical Methods in Art and Archaeology

Class 6 – February 4th
   X-Ray Fluorescence II – Calibration and Interpretation of Data
      Read PDF of Ferguson (2012). X-Ray Fluorescence of Obsidian: Approaches to Calibration and the analysis of small samples

Week 4
Class 7 – February 9th
   X-Ray Fluorescence III – Hands on with the XRF
      Read: Bruker’s X-Ray Radiation Safety: Manual for Operator Training

Class 8 – February 11th
   X-Ray Fluorescence IV – Building a Calibration Table
Week 5
Class 9 – February 16th
X-Ray Fluorescence V – Sourcing material with GAUSS
Read the PDF of Josh Keene’s tutorial on using GAUSS

Class 10 – February 18th
Film: NOVA – *Ancient Computer* and Review for Exam I

Week 6
Class 11 – February 23rd
*****Exam I*****

Class 12 – February 25th
Neutron Activation Analysis, X-Ray Diffraction, and Mass Spectroscopy
Read Artioli p. 50-52, 178-180, 214-216

Week 7
Class 13 – March 1st
*TENTATIVE* Tour of reactor and processing of a NAA sample – If not possible, then NAA lecture
Read Neff (2000) *Neutron Activation Analysis for Provenance Determination in Archaeology*

**Critical Response Paper Due**

Class 14 – March 3rd
Part II. Artifact Documentation
Importance and methods
Read: TBD

Week 8
Class 15 – March 8th
X-Ray Radiography – Practical in CRL
Read English Heritage: *The Guidelines on the X-radiography of archaeological metalwork*

Class 16 – March 10th
Artifact photography – Guest lecture from Dr. Wayne Smith
Read Smith (2009): *Surefire Techniques for Archaeological Photography in Dark Places*
And Smith (2010): *Expanded Spectrum Photography and Archaeological Conservation*

Spring Break – March 14th - 18th
Week 9
Class 17 – March 22nd
Artifact Sketching

Class 18 – March 24th
***** Exam II *****

Week 10
Class 19 – March 29th
3D Modelling I – Using documentation to recreate an artifact

Class 20 – March 31st
3D Modelling II – Introduction to Autodesk Maya
Read: Rajapakse et al. (2011) Virtual Reconstruction and Visualization of Pre and Proto Historic Landscapes in Sri Lanka

Week 11
Class 21 – April 5th
3D Digitization using the FARO Arm I

Class 22 – April 7th
3D Digitization using the FARO Arm II

Week 12
Class 23 – April 12th
3D Digitization using the NextEngine HD

Class 24 – April 14th
3D Digitization using Photogrammetry I

Week 13
Class 25 – April 19th
3D Digitization using Photogrammetry II
Last day to Q-Drop
And Cyber Archaeologists Rebuild Destroyed Artifacts from NPR
http://www.npr.org/sections/alltechconsidered/2015/06/01/41138497/cyber-archaeologists-rebuild-destroyed-artifacts
Class 26 – April 21st
  3D Digitization: Interpreting artifact condition vs. design intent

Week 14
Class 27 – April 26th
  Publication of 3D models – Animation, Sketchfab, and 123D Catch
  3D Printing

Class 28 – April 28th
  3D Printing II – printing personal artifacts

Final reports, 3D models, and prints due at the beginning of class.

Final Exam: May 5th 12:30 – 2:30pm

Photogrammetry model of a conserved carronade from the USS Shark.
Model by Chris Dostal