

**SENG 422/677**  
**Fire Protection Engineering Concepts for Industrial Facilities**  
**Spring Semester – 2015**

**Course Instructors**

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**Office Hours**

By appointment only

**Course Description**

Fire Protection design concepts and considerations for chemical, petrochemical, and hydrocarbon processing facilities. Special attention given to fire hazard analysis, fire risk assessment, fire protection features, and emergency response. Specific Fire Protection design considerations are studied for the various types of facilities and processes.

**Prerequisite(s):** Approval from Instructor.

**Required Textbook:**

*Guidelines for Fire Protection in Chemical, Petrochemical, and Hydrocarbon Processing Facilities*, American Institute of Chemical Engineers (Wiley Publishing, ISBN 0-8169-0898-2)

**Course Goal**

This course is intended to provide engineering students with an overview of important Fire Protection Engineering concepts and features as they relate to industrial chemical, petrochemical, and hydrocarbon processing facilities.

**Course Objectives**

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

- Recognize hazards requiring fire protection attention.
- Discuss the function of fire protection design features.
- Compare and contrast passive and active fire protection systems.
- Assess the strengths and weaknesses of fire protection features as it relates to facility/process protection.
- Explain the steps in Fire Hazard Analysis and Fire Risk Assessment and relate the importance for both to fire protection design.
- Relate the importance of Fire Protection Engineering concepts to safety of facility and individuals.

**Credit Hours:** 3 Hours

**Course Format**

Lectures will take place at Brayton Fire Training Field, Henry D. Smith Building room 122C & D on Tuesdays from 5:30pm to 9:00pm. Hands-on activities will occur primarily at the Brayton Fire Field but will also include field trips to various industrial facilities.

**Course Delivery**

- Lecture: Course delivery will include lecture using a wide variety of guest presenters from within the profession.
- Hands-on: These activities will take place at the Brayton Fire Field/local facilities and include:
- Fixed Systems Design and Inspection
  - Fire extinguishers (extinguish a fire)
  - Field trips to facility(s) to highlight fire protection design features

**Grading and Course Requirements**

You determine your grade by the number of points you accumulate during the semester.

Assignment	Total Points	Due Date	Grading Scale:
Attendance	10	N/A	A= 90-100%
Midterm Exam	30	<u>3/10</u>	B= 80-89.9%
Final Exam	30	<u>5/7</u>	C= 70-79.9%
Applied Project	30	<u>4/28</u>	D= 60-69.9%
Total	100	N/A	F= 59.9% and lower

**Attendance/Participation (10%)**

Attendance in this class is important since the group activities and labs rely on every member being present and make-up of labs and field trips will be difficult. If you must be absent, you are still responsible for the work due. Weekly assignments, homework, and in-class activities will be included as part of this grade.

**The expectation is that you “visibly participate”** throughout the term. Participation is defined as active and positive contributions to the learning process. Participation is different from attendance. Participation consists of responding to questions and actively engaging in responding to your classmates.

This Engineering course counts for 3 credit hours over a 16 week period. Therefore, you should be actively participating (ie. Reading, studying, testing) 6-8 hours each week. A tentative course calendar has been provided. When you do not participate you and your classmates miss out on many opportunities for learning.

We understand that life happens and you may need to miss a class. If at any time you must miss a class session, you are required to notify us prior to your absence via email. In the event of an emergency, you should contact (email or phone) us as soon as possible.

**Applied Project**

**Fire Protection Feature/System Presentation Project (30%) (SENG 422 Students Only)**

This project will require you to team with one or two other students to develop a 30-45-minute professional briefing for senior managers within a petrochemical manufacturing facility, a petrochemical storage facility, or other facility approved by the instructor. The intended audience is to the senior

management team within your organization (i.e. plant manager, EH&S director/manager, vice president etc.) unless otherwise approved before **February 24, 2015**. The presentation must consist of the following:

- 1) Identification and description of a specific fire hazard within the facility, including the process used to conduct the facility hazard/ risk analysis for your group’s chosen facility.
- 2) A thorough description of feature or system the group proposes to mitigate the identified hazards, including the design, installation, and training of personnel to operate and maintain your group’s proposed fire protection feature/system.

*Be creative and be brief but do cover the essentials.*

Your presentation will be evaluated on three specific areas: a) Thoroughness of the content (including notes); b) Presentation appropriateness and appearance; c) Clarity and conciseness of the presentation:

We are looking for clear evidence that demonstrates the following:

- 1) You have conducted research that provides insight into the specific hazard(s) and mitigation of the hazard in general.
- 2) You understand the issue and solution. Therefore, you must provide a clear description of the facility setting and hazard/risk you are addressing as well as a detailed description of the fire protection feature/system you have chosen to employ.
- 3) You have developed a formal briefing, including presentation slides (e.g. PowerPoint, Keynote etc.) and a briefing summary that you would use were you actually presenting this to the intended audience. You are limited to two (2) pages single spaced, but use white space to enhance readability. Be concise and accurate. The briefing sheet is not intended to be your speaking notes, but they must have enough information for us to clearly understand where you are going with this. As you formulate your presentation, you are expected to properly research and cite the sources of your claims. Opinions and conjecture should not be the basis of your report. ***Wikipedia is not an acceptable source of authoritative information and should not be cited.***
- 4) Finally, **we are looking for clear evidence that you have internalized what you have been reading during the semester. Specifically, you should be able to provide your bosses with timely and accurate information so that they can make an informed decision about the preparedness efforts.**

ACTIVITY	Exemplary	Proficient	Partially Proficient	Incomplete
<b>Thoroughness of Content</b>	15 to 11 pts  Briefing clearly demonstrates a command of the integration of the content	10 - 6 pts  Briefing gets main points, but fails to demonstrate a strong command on the concepts.	5 - 2 pts  Briefing hits most of the main points, but is few on the details	1 pt  Briefing is based on conjecture and opinion and does not provide any of the main points of the question

<p><b>Clarity and conciseness of thought</b></p>	<p>15 to 11 pts</p> <p>The content is written clearly for the intended audience and concisely with a logical progression of ideas and supporting information.</p> <p>Information is accurate, current</p>	<p>10 - 6 pts</p> <p>The content is written with a logical progression of ideas and supporting information.</p> <p>Includes persuasive information</p>	<p>5 - 2 pts</p> <p>The content is vague in conveying a point of view and does not create a strong sense of purpose.</p> <p>Includes some persuasive information with few facts.</p>	<p>1 pt</p> <p>The content lacks a clear point of view and logical sequence of information.</p>
<p><b>Briefing Construction</b></p>	<p>10 to 7 pts</p> <p>Content is appropriate in length and person for the target audience and to the point. Headings and subheading are used appropriately to contribute to the flow of the content.</p> <p>The text is written with no errors in grammar, capitalization, punctuation, citations and spelling.</p>	<p>6 - 5 pts</p> <p>Content is appropriate in length. Minor inconsistency in person and / or tense</p> <p>The text is clearly written with little or no editing required for grammar, punctuation, citations and spelling.</p>	<p>4 - 2 pts</p> <p>Overall readability is difficult with lengthy paragraphs, too many different fonts, dark or busy background, overuse of bold or lack of appropriate indentations of text. The layout shows some structure. Spelling, punctuation, and grammar errors distract or impair readability.</p>	<p>1 pt</p> <p>The text is extremely difficult to read. Poor use of headings, subheadings, indentations, or other formatting. The flow of information is confusing and does not use spacing, headings and subheadings to enhance the readability. Errors in spelling, capitalization, punctuation, usage and grammar repeatedly distract the reader and major editing and revision is required.</p>

**Fire Protection Feature/System Research Paper (30%) (SENG 677 Students Only)**

This project will require you to select an active or passive fire protection feature/system and research its origin, development over time, current status, and future/potential. Your paper will be evaluated on three specific areas: 1) Thoroughness of the content; 2) Clarity and consciousness of thought; 3) Paper construction:

We are looking for clear evidence that demonstrates the following:

- 1) You have a solid grasp of current research on the hazard / risk you are addressing.
- 2) You have conducted research that provides insight into the selected fire protection feature/system that shows relevance and identifies a significant problem in regards to fire protection in an industrial setting.

- 3) You are able to construct and support a logical argument using empirical research.
- 4) Finally, **we are looking for clear evidence that you have internalized the material provided to you throughout the course. Specifically, you should be able to demonstrate a thorough understanding of the selected feature/system and provide clear and concise implications for the field of fire protection engineering.**

The rubric below outlines the grading criterion for the paper

### **SENG 677 Paper Grading Criteria**

Each area will be evaluated using the criterion below and rated according to the following scale:  
**1 = Very low; 2 = Low; 3 = Moderate; 4 = High; 5 = Very high**

**Total possible points = 35**

#### **Significance of the problem**

When reviewing the submission, please consider the following to identify successes and gaps:

- Did the author describe a compelling practical problem
- Is this a timely problem for safety engineering practice and/or research?
- Did the author provide a clear description of the practice, setting, and organizational need linked to the problem issue?
- How can the author improve the description of the problem?

#### **Relevance and thoroughness of literature review**

When reviewing the submission, please consider the following to identify successes and gaps:

- Did the author clearly demonstrate that a systematic literature review was conducted?
- Does the literature review include relevant and current literature?
- Did the author provide an adequate description of the practice that allowed for testing of existing and appropriate research and theory?
- Is the conceptual framework supported by the extant literature?
- How can the author improve the literature review / conceptual framework?

#### **Clarity of safety engineering problem**

When reviewing the submission, please consider the following to identify successes and gaps:

- Did the author clearly describe the safety engineering problem to be addressed?
- Did the author clearly explain the results of the Fire Hazard Analysis?
- Did the author clearly explain the results of the Fire Risk Analysis?
- Do the results of the FHS and FRA clearly support the safety engineering problem being addressed?
- How can the author improve the clarity of the safety engineering problem?

#### **Appropriateness and justification of the fire protection engineering system or appliance**

When reviewing the submission, please consider the following to identify successes and gaps:

- Did the author clearly and adequately describe the recommended fire protection system or appliance?
- Did the author provide a comprehensive justification for the recommended fire protection system or appliance?
- Did the author clearly describe how the fire protection engineering system or appliance design addressed organizational need and incorporated existing theory and/or research?
- How can the author improve the reporting of appropriateness and justification of the fire protection

engineering system or appliance?

### Quality of reporting of results and discussion

When reviewing the submission, please consider the following to identify successes and gaps:

- Did the author clearly report the results of the research?
- Did the author provide a clear and concise description of practice outcomes, with metrics where appropriate?
- Did the author incorporate lessons learned from practice?
- How can the author improve their reporting of the results?
- How can the author improve the discussion?

### Appropriateness of conclusions and/or implications for future research, practice and theory

When reviewing the submission, please consider the following to identify successes and gaps:

- Are the conclusions and / or recommendations adequate for the results and reported discussion?
- Did the author identify conclusions and / or recommendations that are logically supported from the reported results and discussion?
- How can the author improve the conclusions / implications for future research, practice and theory?

### Overall clarity and quality of writing

When reviewing the submission, please consider the following to identify successes and gaps:

- Did the author write the paper in a clear and logical structure?
- Is the submission generally free from grammatical errors?
- Did the author adequately and consistently cite references in text in accordance with APA 6h Edition Guidelines?
- Did the author provide an appropriate bibliography that supports the in text citations?

### Midterm Examination (30%)

The midterm examination will cover all of the material covered up to the examination (Chapter 1-6). The Exam will consist of multiple choice, short answer and essay questions.

### Final Examination (30%)

The final exam will be administered on **May 7, 2015** unless otherwise notified. The final exam will be comprehensive and will consist of multiple choice, short answer and essay questions.

## Lecture/Lab Schedule

WK	Date	Topic	Assignments	Speaker
1	1/20	Introduction/Overview Fire Protection Engineering Management Overview Fire Protection Strategy	Chapter 1 Chapter 2 Chapter 3	Jason Loyd Jason Moats
2	1/27	Understanding Fires Fire Hazard Analysis Portable fire extinguishers	Appendix B Chapter 5	Harvie Cheshire Jason Moats
3	2/3	Portable Fire Extinguishers**	Fire Field	Jason Moats Tony Crites*
4	2/10	Overview of Fire Prevention Elements	Chapter 4	Gerald Burnett
5	2/17	Fire Risk Assessment	Chapter 6	Bobby Fischer*
6	2/24	Preparing your presentation/writing a paper <b>Presentation / Paper topics due</b>		Jason Moats
7	3/3	Fire Protection Systems Midterm Exam Review	Chapter 7	Howard Meek*
8	3/10	(Chem. Eng. Bldg 386 lobby) <b>Midterm Exam (Chapters 1 – 6)</b>		James Rainer Jason Loyd
<b>3/17 – Spring Break</b>				
9	3/24	Fire Protection Fundamentals & Active Systems <b>Presentation / Paper outlines due</b>	Chapter 7	Howard Meek*
10	4/7	Field Trip/Tour (TBD)**		Jason Moats
11	4/14	Specific Design Guidance Vapor Dispersion, Prop 66**	Chapter 8	Jason Moats Gordon Lohmeyer*
12	4/21	Installation of Fire Protection Systems Inspecting, Testing, and Maintenance	Chapter 9 Chapter 10	Rick Lewis*
13	4/28	<b><u>Presentations due to instructors</u></b> <b><u>Draft papers due to instructors</u></b>		
14	5/5	Fire Emergency Response Final Exam Review	Chapter 11	Jason Loyd Jason Moats
	5/7	<b>Final Exam</b>		Jason Loyd
	5/18	Final Grades Due		

\* Guest Speaker confirmed

\*\* Participation requires closed toed shoes, long pants and shirts with sleeves – No exceptions!

\*\*\*Course schedule is subject to change

**Meeting Information:**

Thursdays from 5:30pm to 9:00pm  
Brayton Fire Training Field  
Henry D. Smith Building room 122C  
1595 Nuclear Science Road  
College Station, TX

## Expectations of Student Performance and Course Policies:

### Academic Honesty:

It is important that you act with the utmost of integrity. Texas A&M University imposes serious consequences for those who violate the Aggie (Texas A&M University) Honor Code. See <http://www.tamu.edu/aggiehonor> for more information about the Aggie Honor Code and the Aggie Honor Council's rules and procedures.

The TAMU Honor System Office states the following:

*Misconduct in research or scholarship includes fabrication, falsification, or plagiarism in proposing, performing, reviewing, or reporting research. It does not include honest error or honest differences in interpretations or judgments of data. Texas A&M University students are responsible for authenticating all work submitted to an instructor. If asked, students must be able to produce proof that the item submitted is indeed the work of that student. Students must keep appropriate records at all times. The inability to authenticate one's work, should the instructor request it, is sufficient grounds to initiate an academic dishonesty case.*

As an Aggie, there is an expectation that we aspire to excellence in all that we do in and out of the classroom. Therefore, it is important that you act with the utmost of integrity in all facets of your career. Plagiarism and cheating will not be tolerated in this course. The Aggie Code of Honor, "**An Aggie does not lie, cheat or steal, or tolerate those who do**", demands that we hold each other accountable.

Texas A&M University has a license agreement with Turnitin.com, a service that helps prevent plagiarism from internet resources. All written assignments in this course may be submitted through and reviewed by Turnitin.com.

### E-mail:

Our primary means of communication with you will be through the use of e-mail ([Jason.Loyd@teex.tamu.edu](mailto:Jason.Loyd@teex.tamu.edu) or [Jason.Moats@teex.tamu.edu](mailto:Jason.Moats@teex.tamu.edu)). Messages may include notice of class cancellation, changes to the syllabus and/or other course related matters. You must regularly check your University e-mail account in order to receive this information. It is our policy that we will only use your official Texas A&M University e-mail addresses; **this includes your submissions of assignments**. If students experience difficulty accessing their TAMU e-mail account, the TAMU CIS Customer Service Help Desk will be able to assist you. ([http://cis.tamu.edu/Services/Login\\_Accounts/NetID/index.php](http://cis.tamu.edu/Services/Login_Accounts/NetID/index.php))

### Lateness:

Professional life is fraught with deadlines. Therefore, occasional deadlines (< 3 during the course) missed by students is understandable. However, students who frequently fail to meet assignment deadlines will be counseled and will see the result reflected in the student's Participation/ Attendance grade- which will in turn affect their final course grade.

### Missed Examinations:

Students should make every effort to be present for scheduled examinations. In the rare event that a documented illness or other personal emergency prevents a student from sitting for the Exam, a "make

up” examination may be arranged at the discretion of the instructor. Students who are not present for the Final Exam may receive an incomplete grade for the course.

### **Out-of-Class Assignments:**

Periodically, web links relating to course topics will be posted on VNET. In addition to the assigned text readings, students are to carefully review and critically analyze this web-based material prior to class. In addition, discussion questions will be posted on Moodle for students’ consideration. Students are expected to thoughtfully contribute to these on-line discussions and should be aware that the quality of their submissions will be reflected in their Attendance/ Participation grade. Lastly, field site visits may be arranged as additional learning opportunities as they become available. These ‘real world’ experiences constitute an important component of your education in this course by exposing you to the practical application of concepts discussed in class.

### **Other Helpful Information**

#### **Library**

The Texas A&M University Libraries in College Station, Texas are ready to serve you with online access 24/7. As the hub of the academic universe at Texas A&M, the libraries provide resources locally and globally. The five campus libraries and the digital library offer you the best in general and special collections with over 400,000 e-books, as well as digitized theses and dissertations. Visit the library online anytime or come into one of our five campus libraries. <http://Library.tamu.edu>

#### **Technical Help Desk Information**

Texas A&M University (TAMU) Central Helpdesk (open 24/7, 365 days a year):

Phone: Toll-free at 866.857.4112 or 979.845.8300

Email: [helpdesk@tamu.edu](mailto:helpdesk@tamu.edu)

#### **Americans with Disabilities Act (ADA) Policy Statement**

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 the Department of Student Life, Services for Students with Disabilities at 979-845-1637 by phone or at [disability@tamu.edu](mailto:disability@tamu.edu) by email. The office is located in Room B118 of Cain Hall.

#### **Caveat**

The schedule and procedures in this course are subject to change in the event of extenuating circumstances.