Title: Syllabus for Fire Chemistry

Revision: October 2019

Section I - Course Information

Course Title: Fire Chemistry

Course Number(s): BFST/FFP/ATPC2111

Class Days/Time: If being taught at the Florida State Fire College Campus 11655 NW Gainesville Road, Ocala, FL 34482 Bldg. C – Classrooms – Monday - Friday 8 a.m.- 5 p.m. Additional coursework outside the classroom totaling five (5) hours of work may be assigned.

Section II - Points of Contact

Training Supervisor:
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Section III – Course Description

This course is designed to show the fire officer and arson investigator the different forms of matter and energy, common substances, and how they relate to fires. the chemical formulas of flammable and combustible substances, their bondings and separations, as well as the different chemical reactions related to fire and oxidation are covered. Particular emphasis is placed on the specific substances used by arsonists to ignite and accelerate burnings.

Section IV - Course Materials, Grading, and Attendance

Recommended Book: *Fire Dynamics, Second Edition* (2016) Brady Publishing ISBN:13:978-0-13-384270-8

Prerequisite(s): None

Contact Hours: This class has 45 contact hours: Fire Code Administrator, Fire Safety Inspector I, Instructor I, II, III

Continuing Educations Units (CEU's): 45 hours towards

Pre-Course Assignment: None

Required Materials: Paper, pens, USB portable storage device (thumb drive)

Grading: Students must achieve a minimum cumulative score of 70% to pass this course. Course grades are determined from assignments and activities including, homework, projects, quizzes, exams, and presentations. Below is the breakdown of the final accumulative grading:

- Individual Exercises 20 points
- Group Exercises 20 points
- Final Group project 30 points
- Final Written Exam 30 points

Attendance: Students are required to attend all sessions of the course.

- Excused absences - Students are permitted excused absences totaling no more than 10% of class (4.5 hours maximum); the instructor shall be the sole determining authority in the determination of an excused absence and may assign supplemental work to make up for missed class time.
- Unexcused absences - The instructor shall be the sole determining authority in the determination of an unexcused absence (i.e. "no call, no show"). The instructor has no obligation to offer the student an opportunity to make up assignments, including quizzes and/or exams, but may do so at his/her discretion.

Section V - Instructor Qualifications

As per Rule 69A-37.065, *Programs of Study and Vocational Courses*, instructors must meet the following qualifications to be authorized to teach this course:

Rule: 69A-37.065 Instructor Qualifications:

a. An Instructor I must hold a certificate of competency as a Fire Safety Inspector II.
b. Instructor II or III may teach provided he or she has successfully completed the course.

Rule: 69A-37.065 Instructor Quailifications:

3. Instructor Qualifications. An instructor providing training under this paragraph (4)(b), must be qualified and approved by the Bureau of Fire Standards and Training for each course. All instructors shall submit an Instructor Approval Request Form, DFS-K4-2168, at the following link: https://floridastatefirecollege.org/public/pb_provider_app1.asp. This form is incorporated by reference in

subsection 69A-37.039(2), F.A.C, and can be obtained as specified in subsection 69A-37.039(1), F.A.C. Approval by the Bureau of Fire Standards and Training is required prior to the first day of the course.
a. Unless additional qualifications are required pursuant to sub-subparagraph (4)(b)3.c., for all courses listed under subparagraph (4)(b)1., qualified instructors are:
(I) Instructors with requisite faculty credentials for the academic institution that is registered in the Florida Department of Education Statewide Course Numbering System to teach the course; or
(II) Instructors with requisite faculty credentials as determined by the United States Fire Administration – National Fire Academy; or
(III) Instructors with requisite faculty credentials as determined by the respective regionally accredited or nationally accredited university or college as outlined in subsections 69A-37.084(5) and (6), F.A.C.; or
(IV) Instructors who hold an active Single Course Exemption Certification issued by the Division as outlined in subsection 69A-37.059(4), F.A.C.; or
(V) Instructors who hold an active Fire Investigator Certificate of Competency issued by the Division and an active Instructor III Certification issued by the Division; or
(VI) Instructors who hold an active Fire Investigator II Certificate of Competency issued by the Division and an active Instructor III Certification issued by the Division (this instructor qualification expires on December 31, 2017).
b. In regard to the courses "Fire Chemistry," "Fire Origin and Cause," "Fire Protection Systems," and "Building Construction," individuals who hold an active Fire Investigator I Certificate of Competency issued by the Division and an active Instructor III Certification issued by the Division shall be considered qualified instructors (this instructor qualification expires on December 31, 2017).

Section VI – Job Performance Requirements

Given information from discussion and reading materials, the student will satisfy the Job Performance Requirements (JPR) of the applicable National Fire Protection Association (NFPA) standards, any applicable skill sheets, and the applicable Fire and Life Safety Initiatives of the National Fallen Firefighters Foundation *Everyone Goes Home* program.

FESHE Outcomes, Fire Behavior and Combustion (C0276) May 2019

1. Develop an understanding of why chemistry is important and how it relates to arson investigation and the fire service.

2. Identify the physical properties of the three states of matter.

3. Develop a basic understanding of chemical compounds and explain the physical and chemical properties of fire.

4. Develop an understanding of the basic terms associated with chemistry, the dynamics of fire, and laws of matter, energy, density, temperature and heat, pressure, expansion of gases and liquids, the general properties of the gaseous state.

5. Develop basic skills necessary for metric conversion and calculations, calculation concerning the density, energy, pressure and expansion of chemical materials.

6. Identify the differences between the chemical forms of matter and be able to relate to elements by their place on the Periodic table.

7. Demonstrate the basic calculations necessary for understanding chemical compounds and their reactions using both the English and Metric systems.

8. Categorize the components of fire.

9. Explain the effects and dangers of air movement on the combustion process.

10. Discuss various materials and their relationship to fire as fuel.

NFPA 1072, *Hazardous Materials/Weapons of Mass Destruction*
Emergency Response Personnel Professional Qualifications, 2017 Edition

4.2 Recognition and Identification

4.2.1 Recognize and identify the hazardous materials/WMD and hazards involved in the hazardous materials/WMD incident, given a hazardous materials/WMD incident, and approved reference sources, so that the presence of hazardous materials/WMD is recognized and the materials and their hazards are identified.

(A) Requisite Knowledge. What hazardous materials and WMD are; basic hazards associated with classes and divisions; indicators to the presence of hazardous materials, including container shapes, NFPA 704 markings, globally harmonized system (GHS) markings, placards, labels, shipping papers with emergency response information, and other indicators; accessing information from the Emergency Response Guidebook (ERG) (current edition) using name of the material, UN/NA identification number placard applied, or container information charts; and types of hazard information available from the ERG, safety data sheets (SDS), shipping papers with emergency response information, and other approved reference sources.

(B) Requisite Skills. Recognizing indicators to the presence of hazardous materials/WMD; identifying hazardous materials/WMD by name, UN/NA identification number, placard applied, or container information charts; and using the ERG, SDS, shipping papers with emergency response information, and other approved reference sources to identify hazardous materials/WMD and their potential fire, explosion, and health hazards.

5.2 Identify Potential Hazards

5.2.1 Identify the scope of the problem at a hazardous materials/WMD incident, given a hazardous materials/WMD incident, an assignment, policies and procedures, and approved reference sources, so that container types, materials, and location of any release, and the surrounding conditions are identified, hazard information I collected, the potential behavior of the material and its container is identified, and the potential hazards, harm, and outcomes associated with the behavior are identified.

(A) Requisite Knowledge. Definitions of hazard classes and divisions; types of containers; container identification markings, including pipeline and pipeline markings and contacting information; types of information to be collected during the hazardous materials/WMD incident survey; availability of shipping papers in transportation and of safety data sheets at facilities; types of hazard information available from and how to contact CHEMTREC, CANUTEC, and SETIQ, governmental authorities, and manufacturers, shippers, and carriers; how to communicate with carrier representatives to reduce impact from a release; basic physical and chemical properties, including boiling point, chemical reactivity, corrosivity, (pH), flammable (explosive) range [LFL, (LEL), and (UFL) UEL], flash point, ignition (autoignition) temperature, particle size, persistence, physical state (solid, liquid, gas), radiation (ionizing and nonionizing), specific gravity, toxic products of combustion, vapor density, vapor pressure, and water solubility; how to identify the behavior of the material and its container based on the material's physical and chemical properties and the hazards associated with the identified behavior; examples of potential criminal and terrorist targets; indicators of possible criminal or terrorist activities for each of the following: chemical agents, biological agents, radiological agents, illicit laboratories (i.e., clandestine laboratories, weapons labs, ricin labs), and explosives; additional hazards associated with terrorist or criminal activities, such as secondary devices; and how to determine the likely harm and outcomes associated with the identified behavior and the surrounding conditions.

(B) Requisite Skills. Identifying container types, materials, location of release, and surrounding conditions at a hazardous materials/WMD incident; collecting hazard information; communicating with pipeline operators and carrier representatives; describing the likely behavior of the hazardous materials or WMD and its container; and describing the potential hazards, harm, and outcomes associated with that behavior and the surrounding conditions.

6.5 Evidence Preservation and Public Safety Sampling

6.5.1 Perform evidence preservation and public safety sampling at a hazardous materials/WMD incident, given a hazardous materials/WMD incident involving potential violations of criminal statutes or governmental regulations, including suspicious letters and packages, illicit laboratories, a release/attack with a WMD agent, and environmental crimes; an assignment in an IAP; scope of the problem; policies and procedures; tools, equipment, and PPE; and access to a hazardous materials technician, an allied professional, including law enforcement personnel or others with similar authority, an emergency response plan, r standard operating procedures, so that under the guidance of a hazardous materials technician, an allied professional, an emergency response plan or standard operating procedures, hazardous materials/WMD incidents with a potential violation criminal statutes or governmental regulations are identified; notify agency/agencies have investigative jurisdiction and hazardous explosive device responsibility for the type of incident are notified; approved PPE is selected and used; exposures and personnel are protected; safety procedures are followed; hazards are avoided or minimized; evidence is identified and preserved; public safety samples are collected, and packaged, and the outside packaging is decontaminated; and evidence preservation and public safety sampling operations are reported and documented.

(A) Requisite Knowledge. Types of PPE and the hazards for which they are used; importance of working under the guidance of a hazardous materials technician, an allied professional including law enforcement personnel or others with similar authority an emergency response plan, or standard operating procedures; unique aspects of a suspicious letter, a suspicious package or device, an illicit laboratories, or the release/attack with a WMD agent; potential violations of criminal statutes or governmental regulations; agencies having response authority to collect evidence and public safety samples; agencies having investigative law enforcement authority to collect evidence or public safety samples; notification procedures for agencies having investigative law enforcement authority and hazardous explosive responsibility; chain of custody procedures; securing, characterization, and preservation of the scene and potential forensic evidence; approved documentation procedures' types of evidence; use and limitations of equipment to conduct field screening of samples to screen for corrosivity, flammability, oxidizers, radioactivity, volatile organic compounds (VOC), and fluorides for admission into the Laboratory Response Network or other forensic laboratory system; use of collection kits; collection and packaging of public safety samples; decontamination of outside packaging; prevention of secondary contamination; protection and transportation requirements for sample packaging; and requirements for reporting and documenting evidence preservation and public safety sampling operations.

(B) Requisite Skills. Identifying incidents with a potential violation of criminal statutes or governmental regulations; identifying the agency having investigative jurisdiction over an incident that s potentially criminal in nature or a violation of governmental regulations; operating field screening and sampling equipment to screen for corrosivity, flammability, oxidizers, radioactivity, volatile organic compounds (VOC), and fluorides; securing, characterizing, and preserving the scene; identifying and protecting potential evidence until it can be collected by an agency with investigative authority; following chain-of-custody procedures; characterizing hazards; performing protocols for field screening samples for admission into the Laboratory Response Network or other forensic laboratory system; protecting evidence from secondary contamination; determining agency having response authority to collect public safety samples; collecting public safety samples; packaging and labeling samples; decontaminating samples; determining agency having investigative law enforcement authority to collect evidence and public safety samples; decontaminating outside sample packaging; preparing samples for protection and transportation to a laboratory; and completing required reports and supporting documentation for evidence preservation and public safety sampling operations.

6.7 Detection, Monitoring, and Sampling.

6.7.1 Perform detection, monitoring, and sampling at a hazardous materials/WMD incident, given a hazardous materials/WMD incident; an assignment in an IAP; scope of the problem; policies and procedures; approved resources; detection, monitoring, and sampling equipment; PPE; and access to a hazardous materials technician, an allied professional, an emergency response plan, or standard operating procedures, so that under the guidance of a hazardous materials technician, an allied professional, an emergency response plan, or standard operating procedures, detection, monitoring, and sampling methods are selected; approved equipment is selected for detection, monitoring, or sampling of solid, liquid, or gaseous hazardous

materials/WMD; approved PPE is selected and used; exposures and personnel are protected; safety procedures are followed; hazards are avoided or minimized; detection, monitoring, and sampling operations are implemented as needed; results of detection, monitoring, and sampling are read, interpreted, recorded, and communicated; personnel and their equipment are decontaminated; detection, monitoring, and sampling equipment is maintained; and detection, monitoring, and sampling operations are reported and documented.

(A) Requisite Knowledge. Types of PPE and the hazards for which they are used; capabilities and limitations of approved PPE; importance of working under the guidance of a hazardous materials technician, an allied professional, an emergency response plan, or standard operating procedures; approved detection, monitoring, and sampling equipment; policies and procedures for detection, monitoring, and sampling; process for selection of detection, monitoring, and sampling equipment for an assigned task; operation of approved detection, monitoring, and sampling equipment; capabilities, limitations, and local monitoring procedures, including action levels and field testing; how to read and interpret results; methods for decontaminating detection, monitoring, and sampling equipment according to manufacturers' recommendations or AHJ policies and procedures; maintenance procedures for detection, monitoring, and sampling equipment according to manufacturers' recommendations or AHJ policies and procedures; and requirements for reporting and documenting detection, monitoring, and sampling operations.

(B) Requisite Skills. Selecting and using PPE; field testing and operating approved detection, monitoring, and sampling equipment; reading, interpreting, and documenting the readings from detection, monitoring, and sampling equipment; communicating results of detection, monitoring, and sampling; decontaminating detection, monitoring, and sampling equipment; maintaining detection, monitoring, and sampling equipment according to manufacturers' specifications or AHJ policies and procedures; and completing required reports and supporting documentation for detection, monitoring, and sampling operations.

NFPA 921, *Guide for Fire and Explosion Investigations, 2017 Edition*

5.2 Fire Chemistry

5.2.2.1 Phase changes most relevant in fire are melting and vaporization. In melting, the material changes from a solid to a liquid with no change in the chemical structure of the material (e.g., melting candle wax). In evaporation, the material changes from a liquid to a vapor with no change in the chemical structure (e.g., evaporization of molten candle wax on the wick to form the vapor that burns in the candle flame). Phase changes are reversible events, that is, cooling vapors will return to the liquid state and liquids will solidify.

5.2.2.2 Thermal decomposition involves the irreversible changes in the chemical structure of a material due to effects of heat (pyrolysis). Thermal decomposition of a solid or liquid most often results in the production of gases. Wood decomposes to create char and vapors, some of which are flammable. Under vigorous heating, flexible polyurethane decomposes to form a liquid and

flammable gases. At more moderate heating conditions, flexible polyurethane decomposes to a char and flammable gases or vapors.

Table 5.5.5.3.3 Conversions Between the Various Temperature Scales

To convert between the Fahrenheit, Celsius, Rankine, and Kelvin temperature scales, the following formulae are used:	
To convert from Fahrenheit to Celsius	°C = 5/9 (F-32)
To convert from Celsius to Fahrenheit	° F = (9/5 C) + 32
To convert from Fahrenheit to Rankine	R = ° F + 460
To convert from Rankine to Fahrenheit	° F = R - 460
To convert from Fahrenheit to Kelvin	K = 5/9 (° F – 32) - 273
To convert from Kelvin to Fahrenheit	° F = 9/5 (K-273) + 32
To convert from Celsius to Kelvin	K = °C - 273
To convert from Kelvin to Celsius	°C = K + 273
To convert from Celsius to Rankine	R = 9/5° C + 492
To convert from Rankine to Celsius	°C = 5/9 (R - 492
To convert from Rankine to Kelvin	K = 5/9 R
To convert from Kelvin to Rankine	R = /5 K

6.2.4 Char

6.2.4.1 Introduction. Charred material is likely to be found in nearly all structural fires. When exposed to elevated temperatures, wood undergoes pyrolysis, a chemical decomposition that drives off gases, water vapor, and various pyrolysis products such as smoke. The solid residue that remains is mainly carbon. Char shrinks as it forms and develops cracks and blisters.

6.2.5 Spalling. Spalling is characterized by the loss of surface material resulting cracking, breaking, and chipping or in formation of craters on concrete, masonry, rock, or brick.

6.2.6 Oxidation. Oxidation is the basic chemical process associated with combustion. Oxidation of some non-combustible materials can produce lines of demarcation and fire patterns of use to fire investigators. For these purposes, oxidation can be defined as a combination of oxygen with substances such has metals, rock, or soil, that is brought about by high temperatures. Deposition of smoke aerosols containing acidic compounds may lead to the oxidation of material surfaces and discernable fire patterns. Surfaces may also be oxidized due to deposition od fire suppression agents such as dry or wet chemicals.

NFPA 1033, *Standard for Professional Qualifications for Fire Investigator, 2017 Edition*

4.1.2 The fire investigator shall employ all elements of the scientific method as the operating analytical process throughout the investigation and for the drawing of conclusions.

4.1.4 The fire investigator shall maintain necessary liaison with other interested professionals and entities.

4.2.2 Conduct an exterior survey, given standard equipment and tools, so that evidence is Identified and preserved, fire damage is interpreted, hazards are identified to avoid injuries, accessibility to the property is determined, and all potential means of ingress and egress are discovered.

(A) Requisite Knowledge. The types of building construction and the effects of fire on construction materials, types of evidence commonly found in the perimeter, evidence preservation methods, the effects of fire suppression, fire behavior and spread, fire patterns, and a basic awareness of the dangers of
hazardous materials.

(B) Requisite Skills. Ability to assess fire ground and structural condition, observe the damage from and effects of the fire, and interpret fire patterns.

4.4.2 Locate, document, collect, label, package, and store evidence, given standard or special tools and equipment and evidence collection materials, so that it is properly identified, preserved, collected, packaged, and stored for use in testing, legal, or other proceedings and examinations, ensuring cross contamination and investigator-inflicted damage to evidentiary items is avoided and the chain of custody is established.

(A) Requisite Knowledge. Types of evidence, authority requirements, impact of removing evidentiary items on civil or criminal proceedings (exclusionary or fire-cause supportive evidence), types, capabilities, and limitations of standard and special tools used to locate evidence, types of laboratory tests available, packaging techniques and materials, and impact of evidence collection on the investigation.

(B) Requisite Skills. Ability to recognize different types of evidence and determine whether evidence is critical to the investigation.

Section VII –Plan of Instruction

The following is the plan of instruction used during course offerings held at the Florida State Fire College. It also serves as the suggested instructional block format for other approved training providers who use the recommended text book. All class offerings **must** satisfy the JPRs listed in *Section VI – Job Performance Requirements* regardless of textbook used.

Day/Date	Chapters	Activities	Time
Day 1	**Class Introductions and Orientation** Chapter Chapter **Group/Individual Project Discussion and Assignment**	• Student/Instructor Intros • FSFC Facility Rules • Class process (lunch, participation, breaks, homework, etc.	1 hour
	Video # 1 – Part 1 of 7: Fire Dynamics in the 21st Century (8:26) **Chapter 1 –** Introduction to the Fire Dynamics **Video # 2** – NIST & UL Research on Fire Behavior (13:32)	• Out of Class assignment – Fire Dynamics Case Study (1 hour)	1.5 hours
	Chapter 2 – Fire Basics **Video # 3** NIST & UL Research – Fire Dynamics (27:43)	•	2.5 hours
	Chapter 3 – Math Review	•	2.5 hours
Day 2	**Quiz # 1**	•	• 1 hour
	Video # 4 – NIST & UL Research – Case Studies (31:30)	•	• .75 hour
	Chapter 4 – Fires from Gas Phase Fuels	•	• 3 hours
	Chapter 5 – Fires from Liquid Phase Fuels	•	• 2 hours
	Chapter 6 – Fires from Solid Phase Fuels	• Out of Class assignment – Fire Dynamics Case Study (2 hours)	• 2 hours
Day 3	**Quiz # 2**	•	• 1 hour
	Chapter 7 – Heat Release Rate	•	• 2.5 hours
	Chapter 8 – Ignition	•	• 2.5 hours
	Chapter 9 – Fire Dynamics	• Out of Class assignment – Fire Dynamics Case Study (1 hour)	• 2.5 hours
Day 4	**Quiz # 3**	•	• 1 hour

	Video # 6 – NIST & UL Research – Fire Behavior (48:03)	•	• 1 hour
	Chapter 10 - Extinguishment	•	• 2.5 hours
	Chapter 11 - Explosions **Video # 7 –** CSB Safety Video: Reactive Hazards (20:21)	• Out of Class assignment – Fire Dynamics Case Study (2 hours)	• 2.5 hours
Day 5	Make up any lectures not completed from previous days	•	• 1.5 hours
	Video # 8 – NIST & UL Research – Live Fire Tests (19:41) Chapter 12 – Fire Modeling	•	• 3 hours
	Final Project Presentations	•	• 2 hours
	Final Exam Course Completion	•	• 1 hour

Section VIII – Final Presentation and Grading Rubric (See sample below)

Description of Assignment:

The final project for this class involves a group presentation or individual presentation depending on the number students in the class. There are three parts to the project. All members are expected to contribute equally.

The final project consists of the following;

Each student or group shall obtain an *NFPA Investigation Report from NFPA.org.* (A list is provided in the instructor packet). The report should identify an improvement in the body of knowledge for the fire service or fire protection industry regarding the overarching concept of Fire Dynamics that resulted from the incident investigated. Many provisions of model fire and building code were created or improved because of a catastrophic or tragic loss due to fire, explosion, natural disaster, or manufacturing defect. In essence, good can come from harm.

Part 1

Each student or group will prepare a five-page, double-spaced (not counting the title page and reference page), type-written research project in APA format. Regarding references, the student(s) should use information found in order books or articles addressing the same issues (findings) in the chosen NFPA report (e.g., wind-driven fire; egress doors swinging inward, wall coverings, etc.). The final paper should contain the following sections (follow this order)

- Abstract

- Introduction with Problem Statement
- Overview of Incident Investigation Report)
- Findings
- Recommendations
- Conclusion
- References

Part 2

Each student or group will provide a 10-15-minute presentation about their research project. Much of the presentation should be dedicated to the critical issues and points identified in your research effort. Power point slides should be used, and handouts are optional. Be prepared to field questions from your instructor and peers.

Part 3

Each student will complete a Peer Evaluation worksheet for each presentation and provide the completed worksheet to the student or groups presenter(s). The path to improvement is founded on peer investment, and unconditional high regard from others within the industry.

Format and Grading of Assignment:

The evaluation criteria are as follows;

Rating	Demonstrated Proficiency
5	Outstanding comprehension and presentation demonstrated
4	Very Good comprehension and presentation demonstrated
3	Good comprehension and presentation demonstrated
2	Some comprehension and presentation demonstrated
1	Poor comprehension and presentation demonstrated

Section VIII – Final Presentation and Grading Rubric (Student Handout0

Description of Assignment:

The final project for this class involves a group presentation or individual presentation depending on the number students in the class. There are three parts to the project. All members are expected to contribute equally. The final project consists of the following;

Each student or group shall obtain an *NFPA Investigation Report from NFPA.org.* (A list is provided in the instructor packet). The report should identify an improvement in the body of knowledge for the fire service or fire protection industry regarding the overarching concept of Fire Dynamics that resulted from the incident investigated. Many provisions of model fire and building code were created or improved because of a catastrophic or tragic loss due to fire, explosion, natural disaster, or manufacturing defect. In essence, good can come from harm.

Part 1 - Each student or group will prepare a five-page, double-spaced (not counting the title page and reference page), type-written research project in APA format. Regarding references, the student(s) should use information found in order books or articles addressing the same issues (findings) in the chosen NFPA report (e.g., wind-driven fire; egress doors swinging inward, wall coverings, etc.). The final paper should contain the following sections (follow this order)

- Abstract
- Introduction with Problem Statement
- Overview of Incident Investigation Report)
- Findings
- Recommendations
- Conclusion
- References

Part 2 - Each student or group will provide a 10-15-minute presentation about their research project. Much of the presentation should be dedicated to the critical issues and points identified in your research effort. Power point slides should be used, and handouts are optional. Be prepared to field questions from your instructor and peers.

Part 3 - Each student will complete a Peer Evaluation worksheet for each presentation and provide the completed worksheet to the student or groups presenter(s). The path to improvement is founded on peer investment, and unconditional high regard from others within the industry.

The evaluation criteria are as follows;

Rating	Demonstrated Proficiency
5	Outstanding comprehension and presentation demonstrated
4	Very Good comprehension and presentation demonstrated
3	Good comprehension and presentation demonstrated
2	Some comprehension and presentation demonstrated
1	Poor comprehension and presentation demonstrated

Section IX – Review Date and Author

Date:	**Author:**
August 14, 2019	Frank Ennist
October 19, 2016	Michael Swartz