Academic Program Review

Department of Chemistry and Industrial Hygiene

Academic Programs Reviewed

Chemistry and Industrial Hygiene

Department Chair

Part I
Departmental Assessment

The University of North Alabama is committed to a process of ongoing and integrated planning and evaluation. To this end, each department engages in a five-year review to ensure that departmental goals, strategies, and projected outcomes support the institution's mission, strategic plan, and commitment to academic excellence.

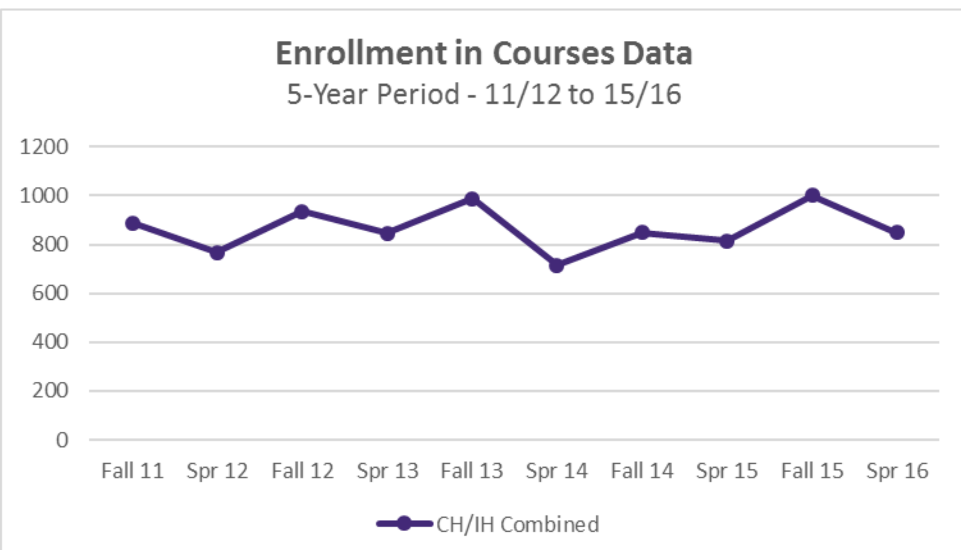
Specifically, all five-year reviews should 1) incorporate a systematic review of institutional mission, goals, and outcomes; 2) review results targeted toward continuing improvement in departmental quality; and 3) document changes have occurred as a result of the review.

1. Assess the department as it relates to students including enrollment and graduation data, and student services:

Enrollment

An analysis of enrollment in chemistry and industrial hygiene courses during the five-year period from Fall 2011 to Spring 2016 is included below in tabular and graphical format. The five-year annual average enrollment for all chemistry and industrial hygiene courses was approximately 1,731 students. During the previous five-year period, the annual average enrollment was 1,410 which represents an approximate 22.8% increase.

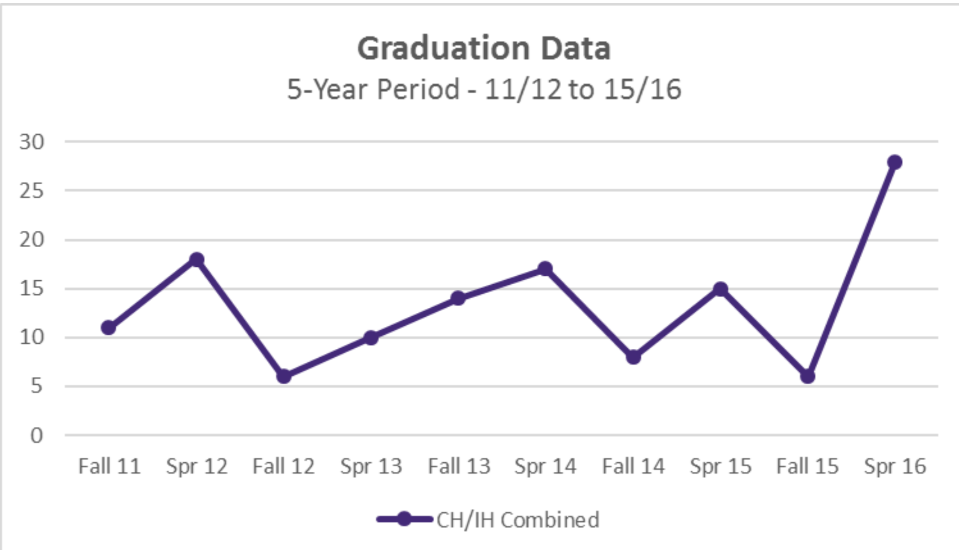
Major	Fall 11	Spr 12	Fall 12	Spr 13	Fall 13	Spr 14	Fall 14	Spr 15	Fall 15	Spr 16
CH/IH Combined	887	768	936	847	987	715	850	816	1001	850



Graduation

An analysis of degrees conferred in chemistry and industrial hygiene during the five-year period from Fall 2011 to Spring 2016 is included below in tabular and graphical format. The total number of degrees awarded during the five-year period was 143. Fall and Spring Semester graduation trends over the five-year period are shown below.

Major	Fall 11	Spr 12	Fall 12	Spr 13	Fall 13	Spr 14	Fall 14	Spr 15	Fall 15	Spr 16
CH/IH Combined	11	18	6	10	14	17	8	15	6	28



Student Services

Chemistry students are encouraged to join and participate in the UNA Student Chapter of the American Chemical Society (SCACS). The activities of this registered student organization (RSO) include social gatherings as the Department's Fall/Homecoming Cookout, invited speakers, and service activities such as participating in UNA Preview Days, Earth Day, our Annual High School Examination Competition, and our Annual Awards Banquet. The SCACS meets approximately once a month during the spring and fall semesters, frequently in conjunction with meetings of the Wilson Dam Section of the American Chemical Society. Currently Dr. Cameron Gren serves as the faculty advisor. Parallel to the SCACS is the UNA Industrial Hygiene Student Association (UNA IHSA). The UNA IHSA promotes participation of all interested students and holds meetings approximately once a month including invited speakers on topics of interest and recruiters from potential employers.

The faculty and staff in the Department work to provide an atmosphere of learning in both the classroom and laboratory. Many of our students enroll and participate in directed research in both chemistry and industrial hygiene. Students are also encouraged to participate in off-campus internships and research experiences. Faculty and Staff continually publicize and promote these opportunities to the students in our classes. Upon graduation, faculty provide recommendations for jobs, and formal recommendation letters for graduate school and other health-related professional programs.

2. Assess the department as it relates to faculty and staff activities throughout the previous reporting period including research, service, and faculty/staff development:

Faculty

Select achievements and highlights in the form of research publications, presentations, and significant areas of service for individual faculty members during the review period are listed below.

Dr. Amanda Coffman

Davenport, Matthew; Coffman, Amanda H. "Dialkoxynaphthalene – Naphthalenediimide Linked Amino Acid Complexes," 91st Annual Meeting of the Alabama Academy of Science, Auburn, AL, March 12-14, **2014**, paper #1.

Shedd, Jacob; Coffman, Amanda H. "Molecular Weight Analysis of Polymer samples via Gel Permeation Chromatography," 91st Annual Meeting of the Alabama Academy of Science, Auburn, AL, March 12-14, **2014**, paper #2.

Seal, Anna.; Coffman, Amanda H. " Progress towards the synthesis of an enhanced donor-acceptor nanotubular assembly " Abstracts, 65th Southeast Regional Meeting of the American Chemical Society, Atlanta, GA, United States, November 12-16, **2013**, SERM-979.

Achard, Monica R.; Coffman, Amanda H. "Progress towards the synthesis of a temperature-responsive polyethylene glycol dendron," Abstracts, 64th Southeast Regional Meeting of the American Chemical Society, Raleigh, NC, United States, November 14-17, **2012**, SERM-848.

Harvey, Leslie; Coffman, Amanda, "Progress Towards the Synthesis of a Donor-Acceptor Complex" Abstracts, 64th Southeast Regional Meeting of the American Chemical Society, Raleigh, NC, United States, November 14-17, **2012**, SERM-846.

Smith, S. A.; Coffman, A. H. "Synthesis and Characterization of Pyridine-2,6-dicarbonyl Based Dendrimers with Cleavable Terminal Groups" 89th Annual Meeting of the Alabama Academy of Science, Tuskegee, AL, February 23, **2012**, paper.

Dr. Coffman serves as program coordinator for chemistry and most recently was selected as Director for the UNA Center for Sustainability. Dr. Coffman was promoted to the rank of Associate Professor during this review period.

Dr. Frank Diaz

Design and synthesis of a series of analogs based on the motualevic acids: Application of a novel, convergent synthesis. **Diaz, F. A**.; Aycock, R. A. 65th SERMACS, Nashville, TN, United States, Nov. 13-16, **2014**.
Studies toward a convergent total synthesis of mutualevic acid analogues. Aycock, R.A; Black, K.M.; **Diaz, F.A**. Abstract of Papers, Annual Meeting of the Alabama Academy of Science, Auburn, Al. 2014.

Studies toward a convergent total synthesis of mutualevic acid analogues. Black, K.M.; Aycock, R.A; **Diaz, F.A**. SE Regional American Chemical Society Poster Session, Atlanta, Ga. 2013.

Studies toward a convergant total synthesis of mutualevic acids A-E featuring an olefin cross metathesis. **Diaz, F. A**.; Williams, C.W. Abstracts of Papers, Annual Meeting of the Alabama Academy of Sciences, Tuskegee, Al, United States, February 24, 2012.

Dr. Frank Diaz was promoted to the rank of Associate Professor during this review period.

Dr. Cameron Gren

Russell, K. L.; Schafer, J. W.; Gren, C. K.; Hampton, S. A.; Cagle, E. C. Attempted syntheses of aryl-substituted N-heterocyclic carbenes: difficulty in veering off the beaten synthetic path. Presented at the Ninety-First Annual Meeting of the Alabama Academy of Science, Auburn, AL, March 2014.

Cagle, E. C.; Gren, C. K. Development of novel chelating N-heterocyclic carbene ligands. *Journal of the Alabama Academy of Science*, **2013**, *84*, 91.

Gren, C.K.; Development of novel complexes with chelating N-heterocyclic carbene ligands for use in organic transformations. 64th Southeast Regional Meeting of the ACS, Raleigh, NC, Nov. 15 2012.

Among other areas of service, Dr. Gren serves as faculty advisor to the UNA Student Chapter of the ACS, and chairs the education committee which serves to administer our annual regional high school examination competition to several hundred students per year.

Dr. Brent Olive

Awards

Outstanding Member – American Chemical Society, Wilson Dam Section: 2012

Publications

Olive, B.S., "Gas-phase Absorption Cross Sections", MPI-Mainz UV/VIS Spectral Atlas, The Max-Planck Institute of Chemistry, Mainz, Germany, **2015.**

- Benzene, 200-265 nm (0.13 nm resolution)
- Benzene, 200-300 nm (0.13 nm resolution)
- Sulfur Dioxide, 190-306 nm (0.13 nm resolution)
- Toluene, 185-225 nm (0.13 nm resolution)

Olive, B.S., "Gas-phase Absorption Cross Sections", MPI-Mainz UV/VIS Spectral Atlas, The Max-Planck Institute of Chemistry, Mainz, Germany, **2011.**

- Carbon Disulfide, 205-320 nm (0.080 nm resolution)
- Naphthalene, 200-230 nm (0.080 nm resolution)
- Nitrogen Dioxide, 200-240 nm (0.080 nm resolution)

Presentations and/or Abstracts

Olive, B.S., "Designing a Fence Line Monitoring Program to Detect Volatile Organic Compounds (VOCs) on a Real-Time Basis" Podium Presentation, Abstracts of Papers, EPA National Environmental Monitoring Conference, Chicago, IL, **2015**.

Crampton, R., Gamiles, D.S., **Olive, B.S.,** "Using Spectral Averaging and Signal Processing to Leverage Existing Short-term Fence Line UV Spectroscopic Data to Retrieve Accurate, Long-term Gas Concentrations to Meet New Monitoring Goals", Abstracts of Papers, EPA National Environmental Monitoring Conference, Chicago, IL, **2015**.

Olive, B.S.; Beasley, T., "Gravimetric Evaluation of Helium Diffusive Sampling (HDS) Personal Air Sampling Devices" Invitation for Podium Presentation, Abstracts of Papers, ASTM International – Biannual Air Quality Meeting, Toronto, Canada, **2014**.

Beasley, T.; **Olive, B.S.,** "Update on Validation of the HDS Personal Sampling Device", Oral Presentation, Alabama AIHA Future of the Profession Conference, Birmingham, AL, **2014**.

Beasley, T.; Murray, B.; **Olive, B.S.,** "Initial Validation of the HDS Personal Sampling Device", Poster Presentation, UNA Research Day, **2013**.

Olive, B.S., "Ambient Air Monitoring Along Shoreline Previously Contaminated by the BP- Deepwater Horizon Oil Spill" Abstracts of Papers, Gulf Oil-Spill and Alternative Energy Symposium, Annual Meeting of the Alabama Academy of Sciences, Tuskegee, AL, **2012**.

Dr. Chong Qiu

Publications

Chong Qiu, A. F. Khalizov, B. Hogan, E. L. Petersen, and R. Zhang, “High Sensitivity of Diesel Soot Morphological and Optical Properties to Combustion Temperature in a Shock Tube”, *Environ. Sci. Technol.*, **2014**, *48*, 6444-6452;

Simon Clegg, **Chong Qiu**, and Renyi Zhang, “The Deliquescence Behaviour, Solubilities, and Densities of Aqueous Solutions of Five Methyl- and Ethyl-Aminium Sulphate Salts”, *Atmospheric Environment* **2013**, *73*, 145-158.;

Chong Qiu, and Renyi Zhang, “Multiphase Chemistry of Atmospheric Amines”, *Physical Chemistry Chemical Physics* **2013**, *15*, 5738-5752;

Alexei F. Khalizov, Yun Lin, **Chong Qiu**, Don Collins, and Renyi Zhang, “The Role of OH-initiated Oxidation of Isoprene in Aging of Combustion Soot”, *Environmental Science&Technology* **2013**, *47*, 2254-2263;

Chong Qiu, Alexei F. Khalizov, and Renyi Zhang, “Soot Aging from OH-Initiated Oxidation of Toluene”, *Environmental Science&Technology* **2012**, *46*, 9464;

Alexei F. Khalizov, Brian Hogan, **Chong Qiu**, Eric Petersen, and Renyi Zhang, “Characterization of Soot Aerosol Produced from Combustion of Propane in a Shock Tube”, *Aerosol Science&Technology* **2012**, 46, 925;

Chong Qiu, and Renyi Zhang, “Physiochemical Properties of Alkylaminium Sulfate: Hygroscopicity, Thermostability and Density”, *Environmental Science&Technology* **2012**, *46*, 4474;

Chong Qiu, Lin Wang, Vinita Lal, Alexei F. Khalizov, and Renyi Zhang, “Heterogeneous Chemistry of Alkylamines on Ammonium Sulfate and Ammonium Bisulfate”, *Environmental Science&Technology* **2011**, *45*, 4748;

Lin Wang, Wen Xu, Alexei F. Khalizov, Jun Zheng, **Chong Qiu**, and Renyi Zhang, “Laboratory Investigation on the Role of Organics in Atmospheric Nanoparticle Growth”, *Journal Physical Chemistry A* **2011**, *115*, 8940;

Hui Yan, Yongtao Zhao, **Chong Qiu**, Hongkai Wu, “Micropatterning of Inorganic Precipitations in Hydrogels with Soft Lithography”, *Sensors and Actuators B: Chemistry*, **2008**, *132*, 20;

Chong Qiu, Meisha Chen, Hui Yan, Hongkai Wu, “Generation of Uniformly-Sized Alginate Microparticles for Cell Encapsulation with Soft Lithographic Approach”, *Advanced Materials* **2007**,*19*,1603.
Presentations

Chong Qiu*, Alexei F. Khalizov, Brian Hogan, Eric L. Petersen, and Renyi Zhang**,** “Soot Formation and Properties from Combustion of Toluene in a Shock Tube”, *The American Meteorological Society Annual Meeting*, New Orleans, LA, January **2016**, Poster;

M. B. Cooper† and Chong Qiu, “Construction of a Microwave Ozone Spectrometer”, *the 1st International Youth Environmental Symposium, EPA Region 4,* Atlanta, GA, Oct **2015**, Poster;

Xiaolong Fan*, Alexei F. Khalizov, **J. N. Dawson†** and Chong Qiu, *the 29th Annual Kinetics and Dynamics Meeting,* Amherst, MA, January **2015**, Oral presentation;

J. N. Dawson[†*] and Chong Qiu, *the 2014 Southwest Regional Meeting of American Chemical Society (ACS),* Nashville, TN, October **2014**, Oral presentation;

Blade Boles[†*] and Chong Qiu, *The 91st Alabama Academy of Science Meeting*, Auburn, AL, March **2014**, Oral presentation.

Joseph N. Dawson[†*] and Chong Qiu, *The 91st Alabama Academy of Science Meeting*, Auburn, AL, March **2014**, Poster presentation.

Chong Qiu,[*] Alexei F. Khalizov, and Renyi Zhang, *The 245th American Chemical Society National Meeting & Exposition*, New Orleans, LA, April **2013**, Oral presentation.

Chong Qiu,[*] Alexei F. Khalizov, and Renyi Zhang, *The American Meteorological Society Annual Meeting*, Austin, TX, January 2013, Oral presentation;

Chong Qiu,[*] Simon Clegg and Renyi Zhang, *The Fourth Atmospheric Chemistry Mechanism Conference*, Davis, CA, December 2012, Oral presentation;

Alexei F. Khalizov, Yun Lin, Chong Qiu,[*] Don Collins, and Renyi Zhang, *The Fourth Atmospheric Chemistry Mechanism Conference*, Davis, CA, December 2012, Poster;

Chong Qiu,[*] and Renyi Zhang, *The American Geophysical Union Fall Meeting*, San Francisco, CA, December 2012, Poster;

Chong Qiu,[*] Brian Hogan, Alexei F. Khalizov, Eric Petersen, and Renyi Zhang, *The American Chemical Society Southwest Regional Meeting*, Baton Rouge, LA, November 2012, Poster presentation;

Chong Qiu,[*] Alexei F. Khalizov, Lin Wang, Vinita Lal, and Renyi Zhang, *The Student Research Week*, Texas A&M University, College Station, TX, March 2012, Poster presentation.

[†] denotes the presenter that is undergraduate student from the University of North Alabama.
[*] denotes the presenter at the meeting or conference.

Dr. Chris Stopera

P. M. Mclaurin , A. J. Privett , C. Stopera , T. V. Grimes , A. Perera , J. A. Morales. In honour of N. Yngve Öhrn: surveying proton cancer therapy reactions with Öhrn's electron nuclear dynamics method. Aqueous clusters radiolysis and DNA-base damage by proton collisions. *Molecular Physics* **2015**, 113, 297–313.

C. J. Stopera, B. Maiti, J. A. Morales. Dynamics $H^+ + NO$ (v_i=0) → $H^+ + NO(v_f = 0 - 2)$ at E_{Lab} = 30 eV with Canonical and Morse Coherent States. *Chemical Physics Letters* **2012**, *551*, 42–49.

C. Stopera, B. Maiti, T. V. Grimes, P. M. McLaurin, J. A. Morales. Dynamics of $H^+ + CO$ at E_{Lab} = 30 eV. *Journal of Chemical Physics* **2012**, *136*, 054304.

C. Stopera, B. Maiti, T. V. Grimes, P. M. McLaurin, J. A. Morales. Dynamics of $H^+ + N_2$ at E_{Lab} = 30 eV. *Journal of Chemical Physics* **2011**, *134*, 224308.

C. J. Stopera, T. V. Grimes, P. M. McLaurin, A. J. Privett, J. A. Morales. Some recent developments in the simplest-level electron nuclear dynamics method: theory, code implementation, and applications to chemical dynamics. *Advances in Quantum Chemistry* **2013**, *66*, 113–194.

J. Yoo, A. Privett, C. Stopera, J. A. Morales. "Electron Nuclear Dynamics Simulations of Proton Collisions with Water in Proton Cancer Therapy." *Bulletin of the American Physical Society*, 58 (**2013**).
R. Pyle, K. Fuson, C. Stopera, R. B. Sutton, J. A. Morales, R. W. Shaw. "Antibiotic resistance in bacteria: Structure of a novel ss-DNA metalloenzyme inhibitor" Poster Presentation: *Experimental Biology 2012*, San Diego, CA, April 21–25, **2012**.

C. J. Stopera, P. M. McLaurin, J. A. Morales. "Application of Coherent States for the Analysis of Scattering Dynamics " Poster Presentation: *11th International Workshop on Quantum Reactive Scattering*, Santa Fe, NM, United States, July 17–21, **2011**.

3. Are facilities and resources adequate to address the goals and objectives of each program within the department? Explain why or why not:

The first classes were taught in the new Science and Engineering Technology building (SET) in the fall of 2015. Our department occupies the entire fourth floor of the four-story building, and has use of classrooms on the first floor as well. Our floor space is approximately 40,000 square feet, excluding the shared classrooms on the first floor. To put this in perspective, we were allotted less than 18,000 square feet, including all classroom space, in Floyd Science Building. Though we did not gain many, if any new "rooms", the spaces where we teach are much larger and accommodating for student movement. We are certainly excited about our new space, and it should be a very effective recruiting tool for us. In terms of new and replacement equipment, we were originally allotted approximately $250,000 for this purpose. Though our console on our NMR had been updated, the magnet was old (and actually a refurbished when purchased in 1999). The magnet "quenched" in 2012, which means it essentially failed because it came up to room temperature, and is normally super cooled with liquid helium and liquid nitrogen. The manufacturer was able to bring the magnet back up to field (funded by the University through a special budget request), but when we discussed moving the instrument to our new building, they did not instill confidence that it would survive the move. We originally earmarked approximately $100,000 of our new equipment budget to purchase a refurbished NMR. This of course was a huge percentage of the $250,000, but we felt we had little choice. Before moving into SET, we secured a $300,000 private donation from a local retired physician who is a graduate of our program from 1951. This allowed not only for acquisition of a new NMR, but also freed up the full amount of our allotted budget for other new equipment purchases.

4. Notable achievements by the department (students, faculty, staff):

Department

As a result of submission of a periodic report to the American Chemical Society (ACS) in 2010, in November of 2011, we received notice that our chemistry program met all of the requirements in the ACS Guidelines and the program was granted "continued approval". ACS approval is a public recognition of excellent chemistry education provided by an institution. In addition, the chair of an ACS-approved program is authorized to "certify" graduating students who complete specific ACS requirements, which in our Department, is our professional chemistry or Option I major. The ACS approval guidelines were revised after the 2010-2011 review. In 2015, the Department submitted a subsequent periodic report to confirm adherence to the revised guidelines. In June of 2016, we were informed that our program was granted "continued approval" until the next periodic cycle (approximately five years).

The Industrial Hygiene major has been accredited by the Applied Science Accreditation Commission (ASAC) of ABET since 2001. Each subsequent review has resulted in continued accreditation for the maximum number of years. A self-study and on-site review was completed in 2014 resulting in positive feedback regarding our continued accreditation. The final decision from ABET was announced in the summer of 2015 and the program was re-accredited. The IH program at UNA is currently one of only four accredited undergraduate programs in the United States. Additionally, the IH program has been awarded a Training Program Grant (TPG) from the National Institute of Occupational Safety and Health (NIOSH). The NIOSH grant provides approximately $200,000 of support over a five-year period and is used to support student scholarships, purchase equipment, and partially offset the salary of the IH Program Director. Annual renewal reports were submitted to NIOSH during this review period resulting in continued grant renewal each year.

Faculty

During the review period, the following faculty were either granted tenure or awarded promotions.

Dr. Amanda Coffman was promoted to the rank of Associate Professor
Dr. Frank Diaz was promoted to the rank of Associate Professor
Dr. Cameron Gren was granted tenure.
Dr. Brent Olive was promoted to the rank of Professor

In addition, two faculty received external grants during the review period:

"Determination of the Chemical Evolution of Oil-Dispersant Systems Via Sea-Air Exchange". Principle Investigator: **Olive, B.S.,** BP – Gulf Research Initiative, 2011: **$28,750**

"Kinetics and Mechanism of Restructuring of Atmospheric Soot and Associated Impact on Light Absorption" Qiu**, Chong,** Co-PI, National Science Foundation Atmospheric and Geophysical Science Division (NSF-AGS) Grant (Award #1463703): Collaborative Research, 2016: **$82,927**

Students

Select achievements and highlights of students during this review period are listed below.

Stephen A. Smith took first place in a technical paper competition at the 89th Annual Alabama Academy of Science meeting in February of 2012. The work entitled "“Synthesis and Characterization of pyridine-2,6-dicarboxamide based Dendrimers with Cleavable Terminal Groups” was directed by Dr. Amanda Coffman, Associate Professor of Chemistry. At the time, Stephen was a graduating senior majoring in professional chemistry. Stephen received offers from Ph.D. programs at the University of Alabama, Georgia Tech, and the University of North Carolina – Chapel Hill.

Hayley Albright (Professional Chemistry 2012) was accepted into UAB ‘s doctoral level Biomedical Science Graduate Program. There were approximately 170 applicants for 8 positions.

Corey Williams (Professional Chemistry 2012) accepted an offer and was fully funded for the Ph.D. program in chemistry at the Georgia Institute of Technology.

Ethan Cagle (Professional Chemistry 2013) was accepted into UAB‘s doctoral level program in chemistry. Like most of our graduates continuing graduate studies in chemistry, Ethan was fully funded which included full tuition fellowship, fees, health insurance, and a $24,000 per year stipend. Ethan was a member of the LaGrange Society and was in the Honors Program here at UNA.

Samuel A. Hampton (General Chemistry 2014) – “Alex” was accepted to University of Mississippi School of Medicine for fall 2014.

Garrett Godsey (Industrial Hygiene 2013) – Garrett was accepted into graduate school at UAB to work towards a Master of Science in Public Health.

Adam Aycock (General Chemistry 2015) – accepted an offer from Emory University (also received offers from University of Alabama, Florida State University, and Vanderbilt University) and entered into their Ph.D. program in chemistry (fully funded)

Kyle Black (Professional Chemistry 2015) – accepted an offer from the University of Alabama (Ph.D. program in chemistry, fully funded)

Joseph Dawson (Professional Chemistry 2015) – accepted an offer from Penn State University (Ph.D. program in chemistry, fully funded)

In each case, the “highlights” or notable achievements focused on awards and/or graduate school acceptances. It should be noted that to the best of my knowledge, all chemistry and industrial hygiene graduates who chose to enter straight into the workforce were offered employment in their field, with many of the offers coming prior to graduation.

5. How has the department addressed recommendations from the previous program review?

The recommendations that come to mind are a result of external program review by the ACS and ABET. In the previous ACS periodic review (2010-2011), the following items were noted that required action on our part:

- **Examinations.** In some cases, the Committee had difficulty evaluating the curriculum because of the lack of detail on course content. If your department continues to use ACS examinations, the Committee requests that you include *additional course materials,* such as problem sets or other assessment tools, with your periodic report package. The course materials you provide should be sufficiently detailed to allow the Committee to understand the rigor of the chemistry curriculum and your expectations for student learning.

- **Course frequency.** According to your annual supplemental information forms, your department did not always teach a minimum of four in-depth courses on an annual basis over the last five years. However, with the transition to the 2008 ACS Guidelines, the definitions of advanced/in-depth course work have changed. In the most recent years, the Committee found that your program is in compliance with the 2008 ACS Guidelines but asked that you *monitor your course offerings* carefully to ensure your program continues to be in compliance with this requirement. If your department is unable to meet this requirement over the next five years, please provide an explanation and proposed solution in your next periodic report.

In response to this feedback, the Department made efforts to collect and make available additional exams and review material for the following periodic review. In terms of course offerings, every effort was made to teach all courses annually. The courses were scheduled annually as required. In one instance, enrollment was not sufficient to teach the course, but it did not adversely affect any student's graduation date (i.e., they took it in their senior year).

Results from the most recent ACS periodic review did not include any items that required action. However, the ACS has on multiple occasions (including the most recent review) encouraged faculty to take advantage of faculty development leave programs (i.e., sabbatical). The ACS realizes that we routinely teach at the maximum number of contact hours they allow, and they want faculty to have time to grow professionally to ensure the quality of the program. Upon receipt of the approval letter with the suggestion, UNA's Faculty Development Leave policy was disseminated to the faculty to increase awareness of the program, and the leave policy was discussed at the first department meeting of the fall 2016 semester.

In terms of response to program review by ABET, most changes have been related to how certain outcomes have been assessed. In one instance, ABET did not view our assessment tool (which was a survey of graduates who had been working in the field for three years or more) for one outcome (the ability to work in interdisciplinary team environments) as applicable, and deemed it to be a "self-assessment" of this particular outcome. We felt that a student who had been working for three years or more should have a good idea of how well they were trained to work in an interdisciplinary environment, nevertheless, we established new exercises in existing classes where a direct assessment of student performance could take place, and this allows us to measure this outcome in a satisfactory manner to ABET. Other examples of addressing recommendations included curriculum changes, such as the addition of the IH Capstone course in order to assure that students meet the requirement of having a culminating experience prior to graduation.

6. Briefly describe the department's vision and how it aligns with the University's strategic plan:

In the case of both programs (chemistry and industrial hygiene), the mission of the department is to produce a graduate that possesses superior technical skills in their field and is "job ready". In order to accomplish this goal, the Department seeks to "Build and Maintain a Student-Centered University", which relates to the University's First "Foundation of Excellence". We seek to serve our students, and center all of our activities and goals around them. Whether it be in the classroom, in the research laboratory, or in serving on committees at various levels and planning student activities, it all comes back to the fact that we are here for our students. We place a strong emphasis on recruitment of new majors both on, and off campus, and seek to retain and graduate the highest percentage possible.

In addition, the Department seeks to provide "an Enriched Academic Experience" for our students by providing education in programs that "Distinguish the University" (relating to the University's second and third Foundations of Excellence). Our external accreditations speak to this fact. We have voluntarily agreed to undergo external periodic review in order to assure the highest quality education for our students. Though there are multiple ACS approved programs, even within our own State, holding this designation assures the student of a quality education even though the institution itself may be small as compared to others. Obtaining and maintaining ABET accreditation of our industrial hygiene program truly creates a distinguishable entity as only four total undergraduate programs in the United States can claim this designation. This means that as students across the country seek to study in this field at the undergraduate level, they will immediately be drawn to our program, and should be impressed not only with the accreditation and the assurance that brings of quality, but also the uniqueness of it leading to a double major in chemistry (likely the only one in existence).

Finally, through service projects, internships, and co-ops, our chemistry and industrial hygiene faculty and students provide technical services to local businesses in our respective areas of expertise, which serves to "Support Regional Development and Outreach" (relating to the University's fifth Foundation of Excellence). These partnerships help those doing business in our region to know that this University is a source of knowledge and expertise they can draw upon as needed. At the same time, our students and faculty grow professionally by being exposed to new challenges and working through problems to provide companies with solutions to fit their needs.

Part II
Academic Program Assessment

Departments should identify expected outcomes for each of their educational programs (graduate and undergraduate). The process below helps to determine whether the program achieves the stated outcomes and provides documented evidence of improvement based on analysis of those results. If a department offers more than one program, each program coordinator should complete this part of the report.

7. Name of Program: Chemistry

8. Coordinator of Program: Dr. Amanda Coffman

9. Mission Statement of Program:

The chemistry program at University of North Alabama has been approved by the American Chemical Society (ACS) since 1973. In keeping with the mission of the ACS, our program seeks to "improve people's lives through the transforming power of chemistry". The program is dedicated to preparing students who are technically competent to fulfill professional duties in chemistry and other chemical related sciences, and who are properly educated to undertake graduate studies in chemistry and related fields.

10. Program Overview:

10.1 Brief overview of program

The Chemistry Program offer two options in the major leading to the Bachelor of Arts or Bachelor of Science degree in chemistry. Option I is referred to as "Professional Chemistry". The professional chemistry option has been certified by the American Chemical Society since 1973 and is designed especially for students who wish to prepare for industrial chemistry or for graduate study in chemistry. Requirements for the professional chemistry option include prescribed ancillary courses in computer science, mathematics and physics. Though some graduates choosing this option enter straight into the workforce as chemists, many decide to pursue graduate studies, and the majority of those that do enter into Ph.D. programs to specialize in one of the five sub-disciplines of chemistry (analytical chemistry, biochemistry, inorganic chemistry, organic chemistry, or physical chemistry). Option II is referred to as "General Chemistry". The general chemistry option is designed for students who wish to take a general major in chemistry or to satisfy pre-professional requirements for medicine, dentistry, medical technology, and similar programs. Requirements for the general chemistry option include prescribed ancillary coursework in computer science, mathematics, and physics. Graduates are employable as chemists/scientists, but as stated earlier, many will pursue advanced degrees in one of the health sciences. The program also offers a minor in chemistry, supporting coursework for other major programs and pre-professional curricula, as well as coursework applicable to physical science requirements in the general studies components. The program also provides the subject field for the preparation of secondary teachers of chemistry offered through the College of Education and Human Sciences.

10.2 Student Learning Outcomes of the program ***(student learning outcomes should identify the broad skill area students should master as a result of the program by the time they graduate. A matrix indicating which courses address each of the outcomes identified may be included)*****.**

Knowledge Based	**Skills Based**
1. Bonding Theory	**1. Gather, Process and Interpret Data**
2. Chemical Kinetics	**2. Communicate Results and Information**
3. Chemical Thermodynamics	**3. Design and Perform an Experiment**
4. Stoichiometry	**4. Perform Synthetic Chemistry**
5. Gas Laws	**5. Develop Critical Thinking Skills**
6. Stereochemistry	
7. Solution Chemistry	
8. Spectroscopy and Structure	

The Department has specified a small set of measureable learning outcomes for chemistry students, both knowledge-based and skills-based, which can be used to assess the Chemistry Program's degree of achievement. These learning outcomes are assessed indirectly with alumni surveys and directly by measuring student performance in specific exam questions or laboratory tasks. The learning outcomes used for this assessment, and the courses where they are measured are:

Knowledge based – Students will be able to:

K.1 - Demonstrate knowledge of bonding theory. (CH 111, CH 312)

K.2 - Apply concepts of chemical kinetics. (CH 341, CH 382)

K.3 - Quantitatively employ chemical thermodynamics. (CH 341, CH 382)

K.4 - Demonstrate the use of stoichiometry. (CH 111, CH 321)

K.5 - Apply gas laws. (CH 341, CH 382)

K.6 - Students will demonstrate an understanding of the three-dimensional nature of molecular structure. (CH 312)

K.7 - Demonstrate knowledge of solution chemistry. (CH 321)

K.8 - Demonstrate ability to understand and interpret spectroscopic data. (CH 312, CH 322, CH 432)

Skills based – Students will be able to:

S.1 - Gather, process and interpret data. (CH 322L, CH 432L)

S.2 - Communicate results and information. (CH 321L, CH 322L, CH 432L)

S.3 - Design and perform an experiment. (CH 341L, CH 381L)

S.4 - Demonstrate the ability to synthesize and characterize chemical compounds.
(CH 312L)

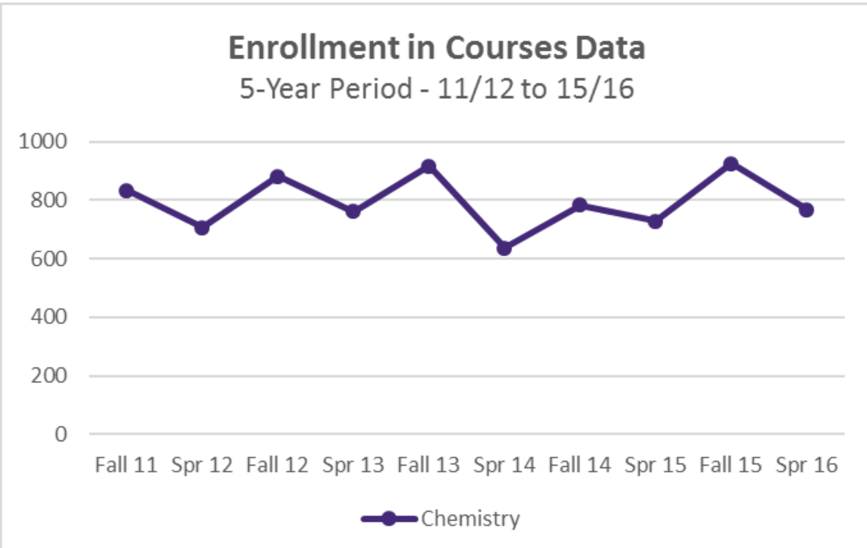
S.5 - Develop critical thinking skills. (CH 341, 381)

10.3 Program productivity to include five-year trends for number of majors, degrees conferred, and other data that demonstrate program growth:

<u>Enrollment</u>

An analysis of enrollment in chemistry courses (fall/spring) during the five-year period from Fall 2011 to Spring 2016 is included below in tabular and graphical format.

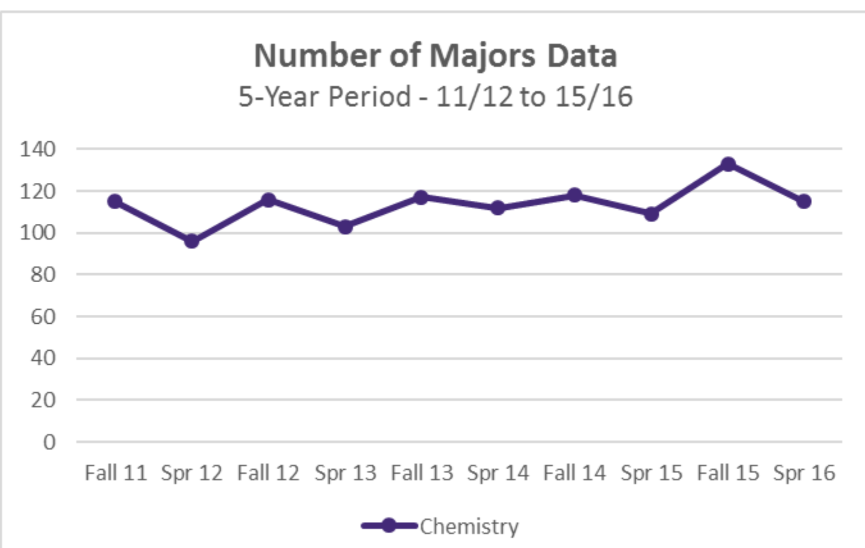
Major	Fall 11	Spr 12	Fall 12	Spr 13	Fall 13	Spr 14	Fall 14	Spr 15	Fall 15	Spr 16
Chemistry	832	707	881	762	917	636	782	728	925	768



<u>Majors</u>

An analysis of the number of chemistry majors during the five-year period from Fall 2011 to Spring 2016 is included below in tabular and graphical format.

Major	Fall 11	Spr 12	Fall 12	Spr 13	Fall 13	Spr 14	Fall 14	Spr 15	Fall 15	Spr 16
Chemistry	115	96	116	103	117	112	118	109	133	115

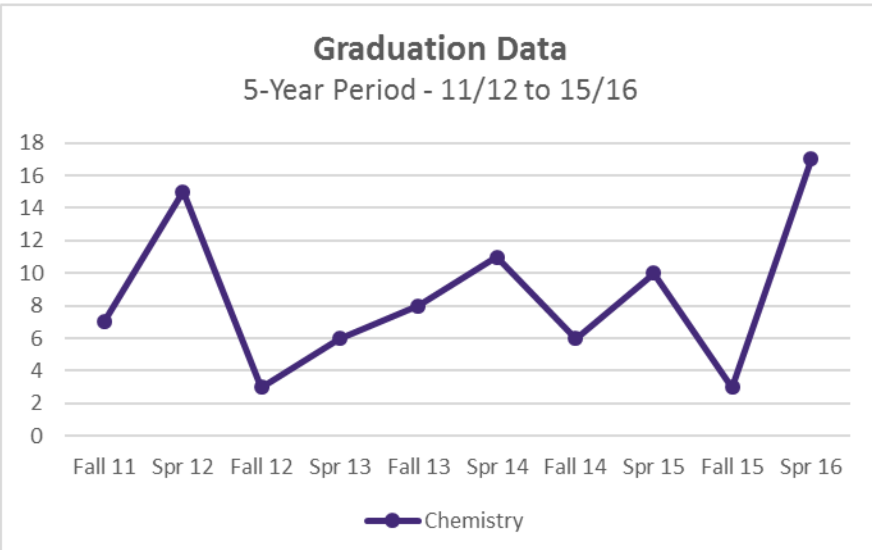


Graduation

An analysis of degrees conferred in chemistry during the five-year period from Fall 2011 to Spring 2016 is included below in tabular and graphical format.

Major	Fall 11	Spr 12	Fall 12	Spr 13	Fall 13	Spr 14	Fall 14	Spr 15	Fall 15	Spr 16
Chemistry	7	15	3	6	8	11	6	10	3	17

In addition to the fall/spring graduations listed above, six additional students graduated at the end of a summer term, bringing the five-year total in chemistry to 92.



10.4 Evaluate the adequacy of library resources available to support your program:

The UNA library's collection of chemistry and related disciplines is extensive. In addition, the library subscribes to over 20,000 e-journals and more than 200 titles are specifically related to the fields of chemistry or industrial hygiene. Subscriptions to key titles in these fields include the American Chemical Society (ACS) publications and Ovid. Both of these resources are fully accessible online through the UNA libraries website

10.5 If you deem existing library resources to be inadequate for your program, identify resources that would improve the level of adequacy:

N/A

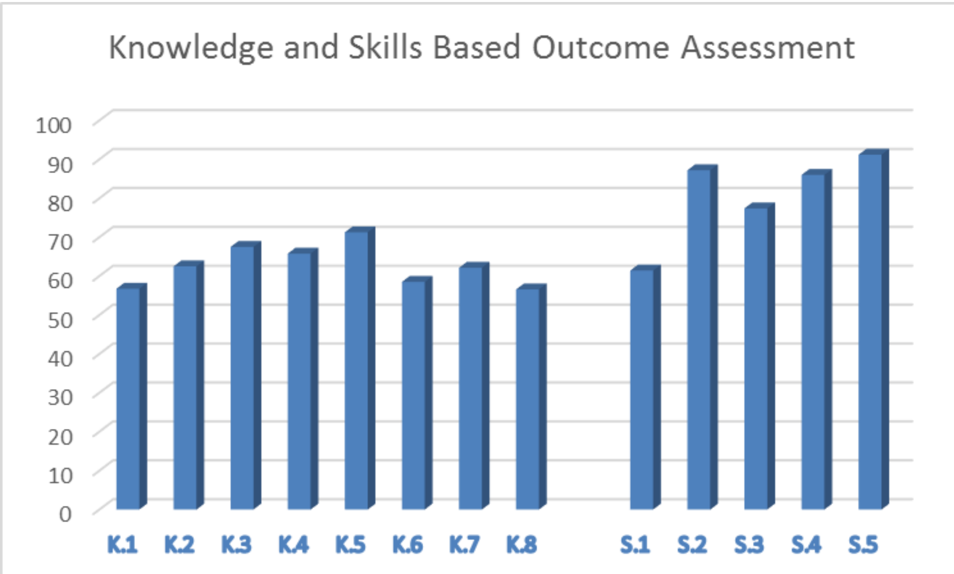
11. Program Evaluation Including Appropriate Documentation

11.1 Means of assessing each Student Learning Outcome:

Student learning outcomes are assessed almost exclusively with direct measures including embedded exam questions (usually on nationally normed exams) and specific laboratory exercise and assignments.

11.2 Summary of the results of the assessment/s for each Student Learning Outcome:

Average results from the review period (2011-2016) for all knowledge based and skill based outcomes are given below in graphical format. The outcomes listed in section 10.2 are listed again for convenience in referencing.



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S.3 - Design and perform an experiment. (CH 341L, CH 381L)
S.4 - Demonstrate the ability to synthesize and characterize chemical compounds. (CH 312L)
S.5 - Develop critical thinking skills. (CH 341, 381)

11.3 Program improvements made as a result of these assessments:

Results from outcome assessment have provided valuable feedback to instructors and aided in identifying areas of weakness. Obviously not all students will successfully demonstrate achievement of all outcomes, but at times, the percentages are lower than expected (sometimes less than 50%, though the averages are all above 50%). When this happens, it shows instructors which subject areas need additional attention in lecture and/or additional student practice. Additional time is almost always beneficial, but not always feasible given the constraints of the semester. In some cases, specific pedagogical approaches have been changed in order to build student skills outside of traditional lecture time. Though we have no online offerings, instructors have started using online demonstration via video to supplement lecture material. Some instructors have created short videos and made them available to students via our learning management system. In this way, additional instruction time is given to areas that need more attention, without taking lecture time away from other subject areas. Online homework is used extensively when available, and we have seen student success increase as a result. Many of our outcomes are assessed by evaluating performance on specific questions on the final exam. In one way this is desirable because the tool itself (i.e., the ACS final) has been thoroughly vetted. There may also be some limitations to this approach as the number of questions for a given outcome may be small, and performance in final exam week on a standardized final may or may not be a good indicator of student knowledge. Not all outcomes are directly assessed in this way, and we will continue to not only monitor the results of the assessments, but also the assessment process itself.

One additional specific change which will hopefully move towards program improvement is implementation of an additional pre-requisite for our foundation general chemistry course (CH 111). Currently, the main pre-requisite is that the student should have had chemistry at some point in high school. The level of preparedness of incoming freshmen varies substantially. As a result, instructors often feel the need to slow down, and or end up spending time on material that technically should be remedial, which in turn takes away from lecture time for other more advanced material. An analysis of ACT score on the math and science subsections versus past student success in CH 111 was conducted. The data showed a substantially greater risk of make a grade below C when the ACT scores in math and science were not at least in the low 20 range. Ultimately, we decided to implement a curriculum change and in the future will require a 22 science ACT score or higher to enter directly into CH 111. Otherwise, a student can take CH 101 Introductory Chemistry. There may be no immediate improvement in any single student outcome, however, over time, this should allow General Chemistry to be taught a bit more thoroughly, and for those proceeding on to upper level courses, this should result in a better prepared student population.

11.4 Appropriate documentation to support the assessment of Student Learning Outcomes as well as the improvements made as a result of these assessments:

Student outcomes are assessed annually, though not necessarily all chemistry outcomes are assessed every year. As an example of documentation used to collect and analyze any given year's assessment, excerpts from spreadsheets used to record select knowledge and skills based outcomes are copied below. In addition, the curriculum change involving CH 111 discussed above is included.

Knowledge Based Outcome #2 **Students will be able to apply concepts of chemical kinetics**

Measured in CH 341 final - form 2005						Measured in CH 382 final - form 2006					% rights
year			n	rights	% rights	year			n	rights	% rights
2011		Question 46.	17	6	35.29412	2012		Question 27.	2	1	50
		Question 47.	17	1	5.882353			Question 28.	2	2	100
		Question 49.	17	13	76.47059			Question 29.	2	2	100
		Average % rights=	39.21569					**Average % rights=**	83.33333		

Knowledge Based Outcome #3 **Students will be able to quantitatively employ chemical thermodynamics**

year			n	rights	% rights		year			n	rights	% rights
2011		Question 15.	17	9	52.94118		2012		Question 4.	2	0	0
		Question 20.	17	10	58.82353				Question 5.	2	2	100
		Question 21.	17	5	29.41176				Question 6.	2	2	100
		Average % rights=	47.05882						**Average % rights=**	66.66667		

Knowledge Based Outcome 5. **Students will be able to apply the gas laws**

Measured in CH 341 final - form 2005												
year			n	rights	% rights		Measured in CH 381 final					
2011		Question 7.	17	15	88.23529		year			n	rights	% rights
		Question 8.	17	17	100		2011		Question 3 part a	2	1	50
		Question 9.	17	8	47.05882							
		Average % rights=	78.43137									

Undergraduate Curriculum Committee
Curriculum Change Proposal Form

College Name: Arts & Sciences **Department Name:** Chemistry and Industrial Hygiene

Item(s) to be considered by the Undergraduate Curriculum Committee: (please check all spaces relevant to this proposed change)

☐	Proposed New Course(s)–attach one page syllabus	☐	Change in Course Description
☐	Addition Of/Change in Course Fee	☐	*New Major/Option/Concentration/Minor
☐	Cross Listing of Course	☐	Revised Major/Option/Concentration/Minor
☐	Inactivation of Course	☐	New/Revised Certificate Program
☐	Merger of Major/Option/Concentration/Minor	☐	Revised Admission Requirement
☒	Revised Course Number/Title/Credit/Prerequisite	☐	Editorial Change
☐	Other	☐	Change to General Education Component

Will this proposal result in the need for a revised Faculty Credentials Certification Form? Yes ☐ No ☒
If yes, for whom: _____

Will the change require additions or deletions to the Major's Course List? Yes ☐ No ☒
List courses that will be added or deleted for EACH major affected by the curriculum change (see current Major's Courses List). Include major, course number, and title (e.g., "Add to Biology and Marine Biology – BI 498 Study of Pelagic Birds.

Brief Description and Rationale – (1) include catalog course prefix, proposed number, credit hours, title, description, prerequisite, if any; (2) include relevant information concerning UNA's mission and goals, student learning opportunities, impact on existing programs and financial implications (you must attach a copy of the current catalog page(s) with all suggested changes made using the *Guidelines and Style Manual*):

Change prerequisite for CH 111 to read: one unit of high school chemistry or CH 101; three units of high school mathematics through Algebra II, or MA 100 as a corequisite AND an ACT Science Reasoning Subtest score of 22 or above (combined SAT of 1030 or above).

Proposed Banner Course Title (30 character maximum): _____
The proposed change(s) will be effective beginning: Fall semester 2016 year
If Addition of/Change in Course Fee, provide justification: _____
List the departments or programs on campus consulted on the issues of duplication, overlap, or impact on program: none.

04/30/2015
Date Approved by Department Curriculum Committee

Brantley S. Olive (signature)
Chair's Signature

_____
Date Approved by College Curriculum Committee**

_____
Academic Dean's Signature**

*Proposals within this category require submission and approval by ACHE. Consult the VPAA Office for additional information.
**Courses that are not specific to an academic department/college must be submitted through the VPAA Office and approved by the Council of Academic Deans prior to submission to the Undergraduate Curriculum Committee.

3-2-15

12. Planning

12.1 Outline program goals over the next five years including, but not limited to, accreditation/re-accreditation, enrollment or expansion, and curriculum:

Certainly one of our primary goals over the next five years is to maintain ACS approval of our program. The ACS has been tweaking their guidelines for each recent review that we have completed including specifying the number of faculty required to be in the program, required sub-disciplines, and course content. Currently, we have expertise in the department covering all of the five major sub-disciplines with the exception of biochemistry (sub-disciplines include analytical, biochemistry, inorganic, organic, and physical). At the time of this report, we have two requests pending that involve "permission to hire". Actually, one position is ready to be advertise, which will be the replacement for our analytical chemist who recently accepted another position. Filling this position with a highly qualified person is critical to the success of our program.

In addition, we have a request to add a "new" faculty line in the department. The position is technically new from the standpoint that we have requested the position to be full-time tenure-track. Currently, we employee a full-time non-tenure track instructor to teach multiple sections and labs of CH 101 Introductory Chemistry. The instructor has announced his impending retirement next year. The Department seeks to hire an individual with expertise in biochemistry. The new hire would be teaching 100 level courses (as most of us do), but would also fill a void in our areas of expertise, and allow us to propose a new biochemistry option within our current chemistry major. Option III – Biochemistry, would serve to prepare students to enter straight into the workforce in biomedical and/or pharmaceutical companies (for example) at the technician level. It would also serve to prepare students for advanced studies in biomedical programs, or other research related fields that rely heavily on a strong biochemistry background.

Finally, in terms of additional expansion of curriculum, there is currently a proposal to begin a forensic science program at UNA, which would be housed in the Department of Politics, Justice, and Law, but would lead to a double major in General Chemistry. While most of the coursework in chemistry would be pulled from existing classes, the addition of at least one specialized course in forensic analysis would be desirable and/or required. Depending on available funding, this could come in the form of a faculty member with a joint appointment in both departments (Chemistry/IH and Politics, Justice, and Law) or in the form of additional training for an existing chemistry faculty member. The new program would likely result in the genesis of a UNA owned and operated forensic/crime laboratory to serve the region. Should this happen, our Department will no doubt be a critical piece in putting together a fully staffed and functional laboratory to provide timely analysis to local law enforcement agencies.

12.2 Outline faculty development goals for the next five years including new faculty, research, and professional development:

As mentioned in the previous section, the Department has identified the need for two new and/or replacement faculty in the near future. The ACS requires that we have an Analytical Chemist on the faculty. We have been fortunate to have had some excellent instructors over the past few years, however, we have not had a tenured instructor in this position since 2007. The tenured professor that left in 2007 accepted a position in industry. We have had three full-time instructors in the position since that time, however, all three have since left (one accepted a position in industry, and the other two accepted positions at other academic institutions). Our goal is to identify a person to fill this role that will be a good fit for our program and progress through the tenure cycle.

Also mentioned in the previous section is the need to hire an additional faculty member to teach Introductory Chemistry. We have covered this class solely with adjuncts and full-time temporary instructors for the past ten years. Our full-time visiting instructor will retire at the end of this academic year. We would not be able to continue offering the classes without a full-time replacement even if enrollments only stayed level. With the promise of a new nursing building in the near future, it is assumed that the additional space will allow that program to grow. Given that a substantial percentage of our CH 101 courses are occupied by nursing majors, we expect the demand for that class to increase by approximately 50%. Based on the assumption that we will be able to hire a highly qualified person to fill our needs one year out, and based on the assumption that the person will have expertise in biochemistry, we intend to begin offering an option in Biochemistry during the next five-year period.

At least three faculty have expressed interest in working closely with the new forensic science program being proposed, specifically, with the day-to-day operations of a forensic or "crime" lab. During the next five years, it will be imperative that faculty gain knowledge of specific methods and techniques required to produce legally defensible data and accurate analysis for local law enforcement agencies. As the forensic science program proposal progresses, we will make efforts to seek out new training in the field of forensic chemistry.

13. <u>Program Recommendations</u>

13.1 Recommendations for changes which are within the control of the program:

In an effort to increase enrollment and retention of chemistry majors, the department intends to conduct a complete review of the current curriculum. Certain changes have already been suggested, such as separating the advanced inorganic and organic labs from the lectures, and combining them into a single synthesis based laboratory. Though we will cross reference guidelines from the ACS, we believe this change will be acceptable as it will not reduce the total number of hands-on laboratory hours, but will provide a greater level of flexibility in scheduling, and should also improve the quality of the course. Other curriculum changes could include reformatting the Quantitative Analysis class so that it could be offered in a four-week summer session. Currently, it is not feasible to offer the course over a four-week period, and past attempts to offer the class over the regular summer term have not been attractive to students. Currently, students needing this course in the summer are having to take the class at Athens State University.

13.2 Recommendations for changes that require action at the Dean, Provost, or higher, which are congruent to and support the institution's mission and strategic plan:

Additional faculty needed to make the biochemistry option a success depends upon approvals at higher levels. At the time of this writing, the request rests with the President and we await what is hopefully final approval to advertise.

In addition, see recommendation for an EHS staff member in this section of the Industrial Hygiene Program Assessment below (i.e., final pages of this document) as it pertains to both chemistry and industrial hygiene.

Part II
Academic Program Assessment

Departments should identify expected outcomes for each of their educational programs (graduate and undergraduate). The process below helps to determine whether the program achieves the stated outcomes and provides documented evidence of improvement based on analysis of those results. If a department offers more than one program, each program coordinator should complete this part of the report.

7. **<u>Name of Program:</u>** Industrial Hygiene

8. **<u>Coordinator of Program:</u>** Dr. Leshan Elliott

9. **<u>Mission Statement of Program:</u>**

The industrial hygiene (IH) program at the University of North Alabama is dedicated to preparing students who are technically competent to fulfill the professional duties in the practice of IH, who understand the challenges of ethical responsibility of the IH profession, and who are properly educated to undertake graduate studies in occupational health and safety.

10. **<u>Program Overview:</u>**

10.1 Brief overview of program

The Industrial Hygiene (IH) Program at the University of North Alabama (UNA) was created in the late 1970s in response to the passage of the Occupational Safety and Health Act of 1970. Dr. Raymond Isbell, Chair of the Department of Chemistry, anticipated the emerging educational need in occupational health and created a program that, even by current standards, is unique. The IH program graduated the first two students in 1979. The first course descriptions appeared in the 1979-1980 UNA catalog.

The name of the department was changed to the Department of Chemistry and Industrial Hygiene in 1987. The nesting of the IH program in the chemistry department influenced its curriculum, which has a strong emphasis of chemistry. Under the current configuration, the IH curriculum requires enough coursework to award students a double major in industrial hygiene and general chemistry. ASAC of ABET evaluators, reviewers of NIOSH Training Project Grants (TPG), and employers of our graduates have commended the dual-track configuration. The final statement from the previous ABET review alluded to this unique characteristic of the program. It said "This industrial hygiene program is unique in the United States in that it is housed within a chemistry department. Students enrolled in the program have an opportunity to receive more training in chemistry than normally occurs in industrial hygiene programs, which enhances their technical expertise."

The initial faculty members for the program were industrial hygienists employed by the Tennessee Valley Authority (TVA) who served as adjunct instructors. Early students benefited from these well-prepared professionals who were responsible for creating innovative programs for TVA and had at their disposition a wealth of technological resources. The academic program had a successful start and consequently grew up quickly in the early years. A few years after its creation, it became apparent that a permanent full-time faculty was needed to give stability, direction and leadership to this program. Dr. Thomas Pierce joined the faculty in 1981 and continued serving as IH faculty until 1989. Under Dr. Pierce's guidance, the program became more structured and adopted an organization with components still present in the curriculum today. Under Dr. Pierce's leadership, special emphasis was given to industrial hygiene sampling and analytical techniques including bioaerosols (at that time, an emerging field). Dr. Hyunkwood Kim led the program between 1989 and 1992. The former director, Dr. Crescente Figueroa, joined the program in 1993. The content of courses and laboratories were extensively revised and modified between 1993 and 1995. Under Dr. Figueroa's direction, the curriculum shifted from a focused IH concentration to a more generalist approach in occupational health and safety while still retaining the central emphasis in the general practice of IH. Courses were added to the curriculum to provide a broader educational foundation and in this way expand the array of employment opportunities for our graduates. From a basic structure of five IH courses existing in 1993, five more lecture courses have been added to the curriculum. Practicum activities have been separated and grouped as laboratory courses. Under the current curricular configuration, the program offers nine lecture and three laboratory courses in occupational health and safety and one lecture course in environmental regulations.

The program was awarded a NIOSH Training Project Grant (TPG) in 2001, initially for a cycle of three years. The NIOSH-TPG was renewed three more times with the current cycle of five years coming up for renewal by June 2017. The program became ASAC-ABET accredited in 2003. Our current director, Dr. Leshan Elliott, just completed her first academic year, and recently completed required report updates for both NIOSH and ABET.

10.2 Student Learning Outcomes of the program *(student learning outcomes should identify the broad skill area students should master as a result of the program by the time they graduate. A matrix indicating which courses address each of the outcomes identified may be included)*.

The IH curriculum is designed to serve 25 student outcomes which are expectations of knowledge, skills and values acquired by our students at the time of graduation. The outcomes are directly related to, and, in great part, assessed by the IH core course components. However, the outcomes also receive important contributions from courses outside the IH discipline included in the prescribed supporting courses and general education component. The 25 specific outcomes are stated below, along with measurable "Performance Criteria" that are used to assess the outcome. Following the list of outcomes and performance criteria, Table 1 shows the relation between discipline courses and related performance criteria/outcomes.

OUTCOME 1
Identify health-affecting agents, factors, and stressors and how they relate to typical industrial processes, unit operations, and tasks

Students will:
1.1 list and recognize typical industrial chemical agents of concern
1.2 list and recognize typical physical agents of concern
1.3 list and recognize ergonomics risk factors
1.4 recognize mental, psychophysical, and physiological work stressors
Relate recognized health agents, factors, and stressors to industrial processes or operations
1.5 associate health, safety and ergonomics hazards to operations and processes such as welding, grinding, degreasing, abrasive blasting, and acid/alkaline cleaning
1.6 perform field observations, conduct process hazard analysis and prepare literature searches on industrial processes and related health and safety problems

OUTCOME 2
Explain mechanisms of human physiological response, toxicity, and health damage associated with the exposure to industrial agents, factors, or stressors

Students will:
2.1 Describe main anatomical and physiological systems of the human body
2.2 Describe mechanisms of physiological response to environmental stressors
2.3 Create or use algorithms for calculating the energy cost of work, thermal stress, and weight limits for lifting
Explain mechanisms of toxicity and health damage
Students will:
2.4 Recognize general toxicological responses and describe mechanisms of toxicity associated with specific industrial agents and classes of compounds commonly found in industrial processes.
2.5 Describe health damage associated to cumulative trauma

OUTCOME 3
Describe mechanisms of generation and air dispersion of chemical agents in quantitative and qualitative terms

Students will:
3.1 Apply the saturation vapor pressure, the box, and the well-mixed models for calculating air concentrations of gases or vapors in air
3.2 Apply laws governing gas behavior to describe the effects of temperature and pressure on gas volume

3.3 Explain how vapor pressure of liquids affects rates of evaporation and apply Raoult's law to mixtures of volatile liquids
3.4 Apply laws of gas diffusion to assess mass transfer between phases
3.5 Differentiate between gases, vapors, solid (dust, fume and smoke), and liquid aerosols (mist and sprays)
3.6 Know how to calculate air concentrations of gases, vapors and aerosols

OUTCOME 4
Assess dose-response and risk characterization based on toxicological data, mechanisms of exposure and routes of entry

Students will:
4.1 Graph dose-response curves from supplied toxicological data and determine relevant toxicological indicators such as LD50, LC50, ED50, Therapeutic Index, etc.
4.2 List the 4 major routes of entry into the human body.
4.3 List the major factors that affect the dose-response relationship
4.4 Calculate an average life-time risk given a dose-response relationship, routes of entry, and exposure assessment data.

OUTCOME 5
Apply principles of epidemiology and statistics

Students will
5.1 State appropriate null and alternative hypotheses for determining statistical significance of disease-exposure relationships.
5.2 List advantages and disadvantages of the general types of epidemiological study designs
5.3 Recognize hazards by interpreting the results of epidemiologic ratio calculations

OUTCOME 6
Use sources of information for identifying and predicting health, safety, and environmental hazards and stressors

Students will:
6.1 List sources of toxicological data for industrial and environmental agents
6.2 Search publications of EHS research
6.3 Use OSHA, EPA, and NIOSH online resources

OUTCOME 7
Understand the scope, application, use, and interpretation of occupational exposure standards and guidelines

Students will:
7.1 Identify legal and authoritative standards that regulate occupational exposures
Understand the application and use of occupational exposure standards and guidelines
Students will:
7.2 Distinguish what standards protect against acute and chronic effects of the working population and the general public
7.3 Apply corrections for unusual exposure schedules
Understand the interpretation of occupational exposure standards and guidelines
7.4 List general principles used by ACGIH in the establishment of occupational exposure limits

OUTCOME 8
Be proficient in all phases of exposure assessment including the selection of strategies for obtaining representative data; the application of analytical chemistry and microbiology for the collection, handling and analysis of samples; the interpretation of data and the communication of results

Students will:
8.1 Set-up objectives for exposure assessment
8.2 Use the concept of similarly exposed groups
8.3 Select sampling protocols from reliable sources
8.4 Assemble calibration and sampling trains
8.5 Use standard analytical methods for analysis of samples
8.6 Describe in quantitative terms the size-selected fractions of aerosols that are of occupational concern
8.7 Use underlying distributions to describe exposures
8.8 Recognize measures of central tendency and dispersion for normal and lognormal distributions and make decisions based on statistical estimates

OUTCOME 9
Apply principles of physics and mathematics to describe mechanical systems, energy sources, and the methods used for evaluating occupational exposures to physical agents

Students will:
9.1 Use vector analysis to balance systems of forces and moments
9.2 Calculate force and pressure
9.3 Differentiate the concepts of energy and power

9.4 Identify and describe the components of the electromagnetic spectrum and their effects on the human body
9.5 Use spreadsheets for calculating overall sound pressure levels by using A weighting attenuation values

OUTCOME 10
Identify, prioritize and make recommendations of applicable options for the control of occupational hazards

Students will
10.1 Identify control options that apply to airborne chemical hazards
10.2 Identify control options that apply to ergonomics hazards
10.3 Identify control options that apply to physical hazards
10.4 Rank control options according to effectiveness
10.5 List examples of substitution of materials, equipment and processes

OUTCOME 11
Apply principles of design and use standard practices for performance evaluations of ventilation systems used for exposure control

Students will:
11.1 Describe air flow characteristics and pressure components of a ventilation system
11.2 Identify acceptable design features of GV and LEV systems
11.3 Select control velocities and calculate volumetric flow rates
11.4 Select air moving devices
11.5 Select air cleaning devices for different types of air pollutants
Evaluate performance of GV and LEV systems
Students will:
11.6 List applicable performance evaluation methods
11.7 Conduct face velocity and hood static pressure evaluations
11.8 Calculate volumetric flow rate from hood static pressure and/or velocity pressure evaluations

OUTCOME 12
Select and recommend proper personal protective equipment

Students will:
12.1 Identify types and characteristics of devices used for respiratory, hearing, eye, head, foot, and skin protection
12.2 Know limitations, proper use and selection guidelines for devices used in personal respiratory protection
12.3 Be able to conduct fit testing of tight fitting respirators

12.4 Select acoustical protection based on attenuation ratings of ear plugs and muffs
12.5 Select respiratory protection according to standard operating procedures

OUTCOME 13
Describe fundamental aspects of safety and understand the importance of creating effective safety programs

Students will:
13.1 Identify theories of industrial accident causation and prevention
13.2 Apply models for assessing the cost of industrial accidents
13.3 Describe the mechanisms for enforcing federal regulations affecting occupational health and safety
13.4 Apply the legal definition of the OSHA recordable injuries and illness
13.5 Criticize the use and limitations of metrics used for assessing safety performance

OUTCOME 14
Describe fundamental principles of environmental health

Students will:
14.1 Calculate average life-time risk of cancer from environmental exposures
14.2 List risk comparison/communication methods used to convey adverse health impacts from environmental exposures

OUTCOME 15
Understand that occupational and environmental health issues can impact the environment, trade, and economical growth of different countries

Students will:
15.1 List international agreements concerning occupational and environmental health
15.2 List environmental disasters caused by human activity with serious effects to the environment and/or economical growth
15.3 List issues of global environmental concern and its consequences on sustainability, growth and advancement

OUTCOME 16
Apply principles of management to health and safety

Students will:
16.1 Learn basic elements of managing an EHS consulting business
16.2 Learn principles of building and working with teams and managing people
16.3 Learn principles of “Plan, Do, Check, Act” management systems

OUTCOME 17
Understand the scope of application, use, and limitations of selected standards and guidelines applicable to health, safety, and environmental practice

17.1 Outline procedures and practices from OSHA general industry safety rules
17.2 Outline procedures and practices from OSHA general industry health rules
17.3 Summarize major aspects of applicable environmental regulations such as the CAA, CWA, RCRA, and CERCLA

OUTCOME 18
Understand the importance of information updating and knowledge of contemporary issues

Students will:
18.1 List emerging topics and new concerns in OH&S
18.2 Attend professional meetings or seminars
18.3 Recognize the value of professional certification

OUTCOME 19
Communicate effectively, both written and orally, with various constituencies

Students will:
19.1 Deliver oral presentations
19.2 Prepare reports using a technical and business format

OUTCOME 20
Design programs and training materials for educating constituencies in occupational health and safety

Students will:
20.1 Design training sessions listing objectives, lesson plans, and teaching visuals
20.2 Create presentations in Power Point to be used in oral presentations of selected topics

OUTCOME 21
Demonstrate familiarity with the code of ethics of the IH profession and the importance of ethical conduct and professional responsibility

Students will:
21.1 Create a scenario that exemplifies a case of ethical conflict in the practice of industrial hygiene and discuss it with fellow students
21.2 Read a paper discussing the issue of ethical conduct in the professional practice of OH&S

21.3 Use the guidelines of ethical conduct of the IH Profession and Code to recognize situations of possible ethical conflict

OUTCOME 22
Work effectively with others and in a multi-disciplinary team

OUTCOME 23
Value the need of staying current and the advantage of life-long learning

Students will:
23.1 Recognize the importance of professional certification
23.2 Consider the option of graduate studies in occupational health and safety

OUTCOME 24
Design and conduct experiments and interpret results from the analysis of experimental data

Students will:
24.1 Design experiments for searching facts, causal relationships, or the effects of planned interventions
24.2 Interpret results from the analysis of experimental data

OUTCOME 25
Use current technology and modern scientific tools

Students will:
25.1 Use different applications of software including word processors, spread sheets and information sharing
25.2 Use different techniques of instrumental analysis
25.3 Use different techniques and instrumentation for air sampling

Table 1. Discipline-Specific Courses/Activities and Related Performance Criteria

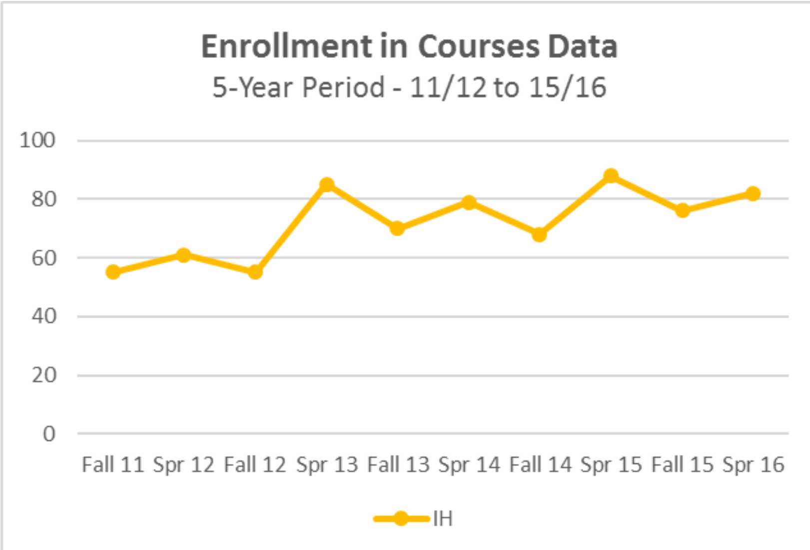
Course	Performance Criteria/Activity	No. of PCs per Course
IH 301	1.4, 2.1, 2.2, 3.5, 4.2, 7.1, 7.2, 7.3, 7.4.	9
IH 310	1.2, 1.3, 1.4, 2.5, 5.3, 6.2, 6.3, 9.1, 9.3, 9.4, 9.5, 10.2, 10.3, 12.1, 12.4.	15
IH 310L	2.3, 12.4, 19.1, 24.1, 24.2.	5
IH 311	6.3, 9.2, 12.1, 12.2, 12.5, 13.1, 13.2, 13.3, 13.4, 13.5, 15.2, 15.3, 17.1, 20.1.	14
IH 322	1.1, 1.5, 1.6, 7.1, 10.1, 10.3, 10.5, 11.3, 12.1, 15.1, 15.3, 17.2, 19.1, 20.2, 21.1, 21.2, 21.3, 24.2.	18
IH 333	2.4, 4.1, 4.2, 4.3, 4.4, 5.1, 5.2, 5.3, 14.1, 14.2, 20.2.	11
IH 422	3.1, 3.3, 9.2, 10.4, 11.1, 11.2, 11.3, 11.5.	8
IH 422L	10.5, 11.4, 11.6, 11.7, 11.8, 12.3.	6
IH 444	3.1, 3.2, 3.4, 3.6, 6.2, 6.3, 7.2, 7.3, 8.1, 8.2, 8.3, 8.6, 8.7, 8.8, 15.1, 17.2.	16
IH 444L	8.4, 8.5, 19.2.	3
IH 490	16.1, 16.2, 16.3, 16.4, 16.5, 16.6.	6
CH 341L	24.1.	1
CH 465	17.3.	1
Exit Interview	6.1, 15.1.	2
Survey	18.1, 18.2, 18.3, 22.1, 22.2, 22.3, 23.1, 23.2, 25.1, 25.2, 25.3	11

10.3 Program productivity to include five-year trends for number of majors, degrees conferred, and other data that demonstrate program growth:

<u>Enrollment</u>

An analysis of enrollment in industrial hygiene courses during the five-year period from Fall 2011 to Spring 2016 is included below in tabular and graphical format.

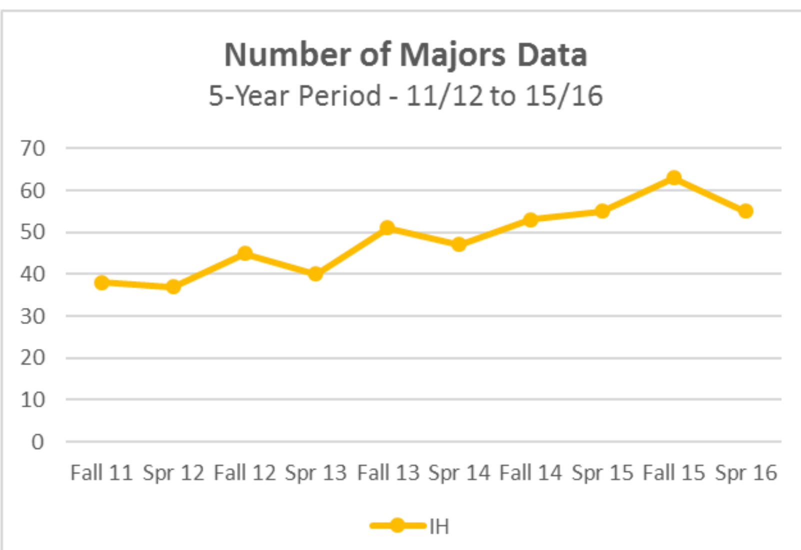
Major	Fall 11	Spr 12	Fall 12	Spr 13	Fall 13	Spr 14	Fall 14	Spr 15	Fall 15	Spr 16
IH	55	61	55	85	70	79	68	88	76	82



<u>Majors</u>

An analysis of the number of IH majors during the five-year period from Fall 2011 to Spring 2016 is included below in tabular and graphical format.

Major	Fall 11	Spr 12	Fall 12	Spr 13	Fall 13	Spr 14	Fall 14	Spr 15	Fall 15	Spr 16
IH	38	37	45	40	51	47	53	55	63	55

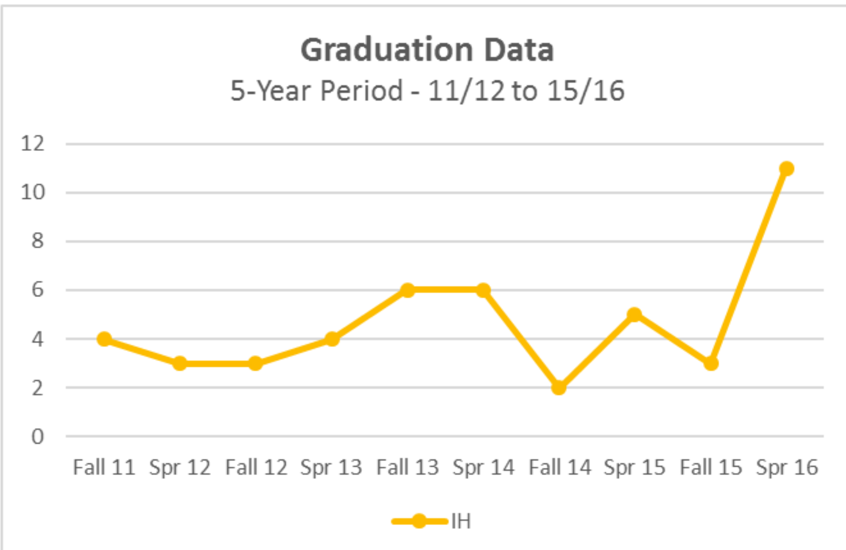


<u>Graduation</u>

An analysis of degrees conferred in industrial hygiene during the five-year period from Fall 2011 to Spring 2016 is included below in tabular and graphical format.

Major	Fall 11	Spr 12	Fall 12	Spr 13	Fall 13	Spr 14	Fall 14	Spr 15	Fall 15	Spr 16
IH	4	3	3	4	6	6	2	5	3	11

In addition to the fall/spring graduations listed above, four additional students graduated at the end of a summer term, bringing the five-year total in IH to 51.



10.4 Evaluate the adequacy of library resources available to support your program:

The UNA library's collection in industrial hygiene and related disciplines consist of approximately 1,439 book titles. The library subscribes to over 20,000 e-journals and more than 200 titles specifically related to the fields of chemistry or industrial hygiene which are available to support the chemistry and industrial hygiene department's majors. Subscriptions to key titles in these fields include the American Chemical Society (ACS) publications and Ovid. Both of these resources are fully accessible online through the UNA libraries website.

10.5 If you deem existing library resources to be inadequate for your program, identify resources that would improve the level of adequacy:

N/A

11. Program Evaluation Including Appropriate Documentation

11.1 Means of assessing each Student Learning Outcome:

Student outcomes are expressed as general expectations of accomplishment. Each of the outcomes contains a series of related Performance Criteria (PC) which are more specific statements of purpose with the added benefit of being measurable. For example, student outcome 3: *describe mechanisms of generation and air dispersion of chemical agents in quantitative and qualitative terms*; includes the PC 3.1: *students will apply the saturation vapor pressure, the box, and the well-mixed models for calculating air concentrations of gases or vapors in air*. The models listed in PC 3.1 are materials for which students must generate work that is graded and, therefore, the attained proficiency can be assessed.

In the assessment of each of the PC, supporting graded student coursework was identified and selected as assessment elements (direct methods). The coursework consisted of test questions, assignments, laboratory reports, term projects, or student presentations. In addition to student coursework, responses to questions of the student outcome surveys and the exit interviews (indirect methods) were also used for the assessment of a few PCs.

For each of the coursework identified as an assessment element, the total number of points earned by all the students in a given semester was divided by the total number of points possible (the element's possible points times the number of students) and the ratio converted into a percentage. For PCs with multiple assessment elements, the total average percent for all elements was computed. The averages for each PC were computed annually (except those using indirect methods, which were assessed only once during this cycle) and accumulated over the accreditation cycle period.

To aid in the process of assessment, a template (Excel spreadsheet) was developed and used for each of the outcomes. The created template requires an entry of (1) the identification of the assessment elements, (2) the individual points earned by each of the students in that element, and (3) the total number of points possible assigned to each of the elements under consideration. The template then calculates annual percentages, plots trends of percentages over the years (for each PC) and generates a cumulative report.

The rubric selected for the evaluation of the outcome data is as follows. A PC did not pass the assessment when the cumulative average was less than 70%. Corrections were recommended for all non-passing PCs. A PC was in need of monitoring if the scores were between 70% and 74.99% with no corrections recommended for this category. For those outcomes that were evaluated by indirect methods, acceptance was achieved when 70% or more of responders selected choices of satisfactory proficiency. For example, when asked about rating the level of proficiency reached in college using IH instrumentation for chemical agents, at least 70% of responders should have rated their skills at an advanced or intermediate level in order to assure compliance.

11.2 Summary of the results of the assessment/s for each Student Learning Outcome:

Outcome #	Below 70% - In Need of Corrective Action				Between 71 and 75% - In Need of Monitoring		
Outcome 1	None				1.5	Associate health, safety and ergonomics hazards to operations and processes	74.91%
Outcome 2	None				2.1	Describe main anatomical and physiological systems of the human body	73.90%
					2.5	Describe health damage associated to cumulative trauma	71.92%

Outcome #	Below 70% - In Need of Corrective Action				Between 71 and 75% - In Need of Monitoring		
Outcome 3	3.1	Apply the saturation vapor pressure, the box, and the well-mixed models for calculating air concentrations of gases or vapors in air	69.05%		None		
Outcome 4	None				None		
Outcome 5	5.1	State appropriate null and alternative hypotheses for determining statistical significance of disease-exposure relationships	62.50%		5.2	List advantages and disadvantages of the general types of epidemiological study designs	73.91%
Outcome 6	None				None		
Outcome 7	None				None		
Outcome 8	None				None		

Outcome 9	9.1	Use vector analysis to balance systems of forces and moments	57.12%		None
Outcome 10	10.3	Identify control options that apply to physical hazards	60.33%		None
Outcome 11	None				None
Outcome 12	None				None
Outcome 13	None				None
Outcome 14	None				None

Outcome #	**Below 70% - In Need of Corrective Action**				**Between 71 and 75% - In Need of Monitoring**
Outcome 15	None				None
Outcome 16	16.6	Learn principles of "Plan, Do, Check, Act" management systems	63.33%		None
Outcome 17	None				None
Outcome 18	18.1	List emerging topics and new concerns in OH&S	53.85%		None
Outcome 19	None				None
Outcome 20	None				None
Outcome 21	None				None
Outcome 22	None				None

Outcome 23	23.2	Consider the option of graduate studies in occupational health and safety	7.69%		None
Outcome 24	None				None
Outcome 25	25.2	Use different techniques of instrumental analysis	67.69%		None

11.3 Program improvements made as a result of these assessments:

The following is a list of corrective actions devised for the performance criteria with scores under 70%.

PC 3.1 Apply the saturation vapor pressure, the box, and the well-mixed models for calculating air concentrations of gases or vapors in air.

Corrective Action

The models are presented in lectures in IH 444 (saturation vapor pressure) and IH 422 (box and well-mixed models). Students' proficiency on these models is evaluated by completed assignments and tests questions. A more focused assignment in IH 444 on the application of the saturation vapor pressure model, which is the subject that creates most of the missed points, will be created.

PC 5.1 State appropriate null and alternative hypotheses for determining statistical significance of disease-exposure relationships.

Corrective Action

Currently, this is covered in a single session with a supplementary handout included. Additional time and focus will be placed on hypothesis statements, with more specific examples cited.

PC 9.1 Use vector analysis to balance systems of forces and moments.

Corrective Action

Include as component of the laboratory course, a session on the completion of force and moments diagrams and the calculation of resulting forces applied to biomechanical models.

PC 10.3 Identify control options that apply to physical hazards.

Corrective Action

Place more emphasis in the method for calculating the thickness of shielding for gamma sources which is the topic that causes the majority of the missing points. This calculation method that is presented in a laboratory session (manual and model) should be followed by personal student work.

PC 16.6 Learn principles of "Plan, Do, Check, Act" management systems.

Corrective Action

The assessment of this PC was limited to one year and two students did not complete the test where the selected question was included. With the removal of "0" given to these students, the average becomes 79%. Nevertheless, more emphasis will be placed on the concept of PDCA in the classroom.

PC 18.1 List emerging topics and new concerns in

OH&S. Corrective Action

Students are currently required to write a short essay with a list of environmental concerns that in their point of view may cause an impact on survival, security, economic growth, health and safety and wellbeing of the human race (IH 322). In addition, the course IH 422 now requires the completion of a review of NIOSH document on nanotechnology (Approaches to Safe Nanotechnology; Managing the Health and Safety Concerns of Engineered Nanomaterials, DHHS (NIOSH) Publication 2009-125) and the preparation of a Power Point presentation of the main points given in this document.

PC 23.2 Consider the option of graduate studies in occupational health and safety.

Corrective Action

No remedial action was considered because PC 23.1 does not specifically require actual enrollment in graduate studies. Graduate school coordinators will be invited annually to promote enrollment and discuss opportunities.

PC 25.2 Use different techniques of instrumental analysis.

Corrective Action

New equipment will be acquired and installed in the new building with an allocated budget of $240,000. It is expected that the new technology will eliminate the problems of faulty equipment that frequently affected the laboratory practices.

11.4 Appropriate documentation to support the assessment of Student Learning Outcomes as well as the improvements made as a result of these assessments:

Student outcomes are assessed on a continual basis, though not necessarily all IH outcomes are assessed every year. As an example of documentation used to summarize any given year's assessment, the 2012-2013 IH outcome summary assessment is copied below.

Evaluation of Educational Outcomes

Industrial Hygiene (IH) Program

Department of chemistry and Industrial Hygiene

University of North Alabama

The IH Program at UNA has identified 25 educational outcomes. These outcomes are defined as broad expectations of knowledge and abilities that students must acquire upon completion of their academic program. Each outcome is evaluated by a set of related measurable performance criteria (MPC). The MPC are measured by using direct and indirect methods of assessment. Direct methods of assessment consist of selected samples of graded work that students must complete as requirements of the IH courses. Indirect methods of assessment consist of specific questions of surveys and questionnaires submitted to former students and employers.

ASSESSMENT

During the academic year 2012-2013, the outcomes listed in Table 1 were evaluated by using direct methods of assessment. Achievement of at least 75% was considered as a minimum for acceptance of either, the outcome and its related MPC.

Table 1: IH Outcomes Evaluation Results

Outcome #	Outcome Statement	# of Measurable Performance Criteria (MPC)	# of MPC Passing	Evaluation Results (%)*
11	Apply principles of design and use standard practices for performance evaluations of ventilation systems used for exposure control	8	8	83.94%
13	Describe fundamental aspects of safety and understand the importance of creating effective safety programs	5	5	86.30%
15	Understand that occupational and environmental health issues can impact the environment, trade, and economic growth of different countries	3	3	85.97%
17	Understand the scope of application, use, and limitations of selected standards and guidelines applicable to health, safety, and environmental practice	3	2	74.58%

21	Demonstrate familiarity with the code of ethics of the IH profession and the importance of ethical conduct and professional responsibility	3	3	84.87%
24	Design and conduct experiments and interpret results from the analysis of experimental data	2	2	83.60%

Note: * overall average of all MPC, direct methods only.

FINDINGS

From these six educational outcomes evaluated, only one needs to be brought into compliance. These six outcomes include 24 measurable performance criteria with 22 exceeding the criteria for acceptance. Good reliability is expected on these results since a great number of data points include four years of cumulative data.

The following MPC were below the expectations:

Outcome 17, MPC 17.3: "Students will summarize major aspects of applicable environmental regulations such as the CAA, CWA, RCRA, and CERCLA."

Overall Score: 71.85%

Outcome 17, MPC 17.1: "Students will outline procedures and practices from OSHA general industry safety rules."

Overall Score: 75.00%

This is a passing score but at a minimum level of acceptance.

CORRECTIONS

The assessment/evaluation method was reviewed and ways were devised to streamline this task. With current additions to the spreadsheets and a consistent marking of questions, the collection and reporting of data have become more standardized.

Other needs identified in this latest review:

Outcome 17, MPC 17.3:

Corrective action: The course containing this educational outcome is CH 465, "Environmental Regulations." This course is regularly taught by adjunct faculty. Data was collected only for one semester and for an instructor who was teaching this subject matter for the first time. Collection of additional data will help verifying this trend which, if it is confirmed, will require a revision on the emphasis placed on critical topics of this course.

Outcome 17, MPC 17.1:

Corrective action: In addition to the lecture and reading assignment materials, a list of basic requirements for each OSHA regulation included in the course will be given as study guide.

12. <u>Planning</u>

12.1 Outline program goals over the next five years including, but not limited to, accreditation/re-accreditation, enrollment or expansion, and curriculum:

The industrial hygiene program has seen slow, but steady growth during the period from 2011 to 2016. During this time period, the program has been evaluated, and re-evaluated by ABET, resulting in continued accreditation. Over the next five years, we will continue to work towards maintenance of the ABET accreditation. Because of the structure of their accreditation process, and the emphasis placed on continual improvement, it is something that must be worked on each academic year.

During the next five years, the program will be required to submit both annual and periodic competitive renewal request to maintain the NIOSH Training Program Grant. The grant serves an important role in recruiting and retaining students through our ability to award industrial hygiene majors NIOSH scholarships. NIOSH has encouraged us to take a more active approach in minority recruitment. Our program director is currently working on a plan to target high schools in our region, particularly those with higher than average minority populations. This program will be implemented starting with the 2017-2018 academic year.

In terms of enrollment and expansion, we will continue to actively recruit students. The field of industrial hygiene is largely unknown to most incoming freshmen, so we must be very intentional in our recruiting efforts. Fortunately, job outlooks and salaries are very positive, so we have a good product to sell. With current enrollments, we are able to sustain the program with one full-time faculty member who is 100% industrial hygiene, one full-time faculty member who is approximately 75% industrial hygiene, and 25% chemistry, and two classes per year taught by adjunct faculty. Once we grow to the point of having to increase offerings or add additional sections, the demand will likely exceed what current faculty can handle, and we will need to request additional faculty. It is possible that this could occur over the next five years.

Faculty in the program will continue to review the curriculum. At this time, two projected changes could be proposed within the next five years. Though the program is already at 130+ credit hours, there is a need to add an additional course in industrial safety. Very often job openings are driven by regulatory requirements, so a good working knowledge of the federal laws pertaining to health and safety is necessary. Currently we teach one three credit hour course in safety, but a second semester could easily be added based on the amount of material that needs to be covered. In addition, we are considering a new class more targeted on biological agents. Currently, the majority of the training in this area occurs in BI 307 Microbiology. While this course provides a good broad background, it does not cover topics specific to traditional industrial hygiene practice. A new course with a focus on biological hazards may serve our students better than a general overview course.

12.2 Outline faculty development goals for the next five years including new faculty, research, and professional development:

As stated earlier (and noted by ABET), currently the program is at near maximum capacity in terms of the match between current course offerings and available faculty. In order to grow the program substantially, it is likely that new faculty will be needed. There are two full-time faculty, Dr. Leshan Elliott, Assistant Professor and new Program Director, and Dr. Brent Olive, Professor and Department Chair. Though our time is divided between teaching, administrative duties and other forms of service, the research component needs to stay healthy and is important to NIOSH. They expect undergraduates to be active in research and submitting work for publication. Over the next five years, Dr. Elliott will be active in re-establishing her previous work in control banding, and seeking out new areas of interest. Dr. Brent Olive will be working to continue established research in UV open path monitoring and with helium diffusion samplers. Both IH faculty are Certified Industrial Hygienists (CIHs), which has a required continuing education component. Both faculty will attend national conferences, professional development courses, and/or complete webinar training activities to further faculty development.

13. Program Recommendations

13.1 Recommendations for changes which are within the control of the program:

The primary recommended changes currently involve curriculum changes (previously mentioned). The addition of two classes (along with possibly one replacement to limit the number of hours added) would be useful to make our student more “job ready”. No other major changes are planned at this time, although as the nursing program expands, we will explore the idea of offering an occupational nursing option, or possibly a certificate in occupational nursing.

13.2 Recommendations for changes that require action at the Dean, Provost, or higher, which are congruent to and support the institution's mission and strategic plan:

It is recommended that the University hire a full-time Environmental Health and Safety professional. This would serve to support the academic programs in our Department, but also the entire campus including students, staff, and faculty. An official request was initiated by this Department in 2015 at the request of the Dean of the College of Arts and Sciences, and I believe this request was re-initiated by Assistant Vice President for Facilities Administration & Planning in 2016, though I cannot be sure. A copy of the request originating in this Department along with the explanation/justification is provided on the following pages.

During the last review cycle, ABET listed "the lack of health and safety oversight at the institutional level" as a "concern". Though this did not keep our program from being re-accredited, it is something that ABET would expect us to address.

REQUEST FOR FUNDING

Requests for funding are submitted during the academic year prior to the implementation of the new budget year, which begins October 1. Submissions are accepted from October 1 to March 1. The request must be linked to the goals of the annual report of the unit, provide a support rationale, and have the approval signatures, in the appropriate order, as shown below. Requests are transmitted and presented to the SPBS Committee by the appropriate Executive Council member.

TRANSMITTAL:

Name/Budget Unit Originating Request Chemistry and Industrial Hygiene

FUND _____ ORG _____ PROG _____

Budget Year(s) for which Funds Requested Permanent (if permanent, specify such)

Amount Requested on Annual Basis $50,000 - 70,000

Date of Submission 3/2/2015

Attach documentation addressing the link between the budget request and the annual report goals, specifying which goal is addressed by this funding. Please attach the relevant page from the report. Is the request linked to the annual report? ☐ Yes ☒ No

Annual Report Year: _____ Long-term Goal # _____ and/or Short-term Goal # _____

Attach a description and rationale of the funding request (include all relevant information, including a detailed budget and comparative data used to justify request).

One-Time Request for New Money (information item only as submitted by VP) ☐ Yes ☒ No

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APPROVALS:

Brentley S. Olive _______________ 3/2/15
Department Chair or Equivalent — Date

_______________ _______________
Dean or Equivalent — Date

_______________ _______________
Vice President — Date

Date Action Taken by SPBS Committee _______________

_____ Denied

_____ Returned for Additional Information

Accepted for: _____ Immediate Petition _____ Added to List

Form Approved by SPBS Committee 1/14/15

Department of Chemistry and Industrial Hygiene
Floyd Science Building 203A
UNA Box 5049
Telephone: (256) 765-4622
Facsimile: (256) 765-4958

MEMORANDUM

TO: Dr. Carmen Burkhalter, Dean
College of Arts and Sciences

FROM: Dr. Brentley S. Olive, Chair
Department of Chemistry and Industrial Hygiene

DATE: March 2, 2015

RE: Budget Request Justification – Health and Safety Position

It is clear that University administration recognizes a need for campus-wide safety oversight. The University has experienced growth in the last decade in terms of student enrollment, workforce, diversity of campus activities, and physical resources such as new buildings and infrastructure. The Southern Association for Colleges and Schools (SACS) requires the following in Comprehensive Standard 3.11.2,

> "The institution takes reasonable steps to provide a healthy, safe, and secure environment for all members of the campus community."

During the last SACS self-study submission and comprehensive review, SACS determined that the University met the minimum criteria for compliance with this standard. This request for a new position is not meant to negatively reflect on what is currently being done by the University to provide a healthy, safe, and secure environment, however, there exists a significant gap in at least one area of this effort. Under the current organizational layout, the Assistant Director of Facilities serves as Campus Safety Officer and fulfills an array of responsibilities, many of them unrelated to health and safety (H&S). The University does not have a single employee whose full time effort is devoted to health and safety. The statement submitted to SACS shows clearly that campus health and safety is viewed basically as a function of the University Police Department and University Health Center.

Excerpt from SACS Self-Study, 2010.

"The University of North Alabama takes reasonable steps to provide a healthy, safe, and secure environment for all members of the campus community. Policies and procedures relating to health and safety are articulated in documents such as the campus Health and Safety Manual and the Student Affairs Crisis Manual, which are made available to employees and students. Multiple offices and department heads assume responsibilities for health, safety, and security. The University Police Department is a full service law enforcement agency established to provide the highest degree of safety and security possible for the University of North Alabama community. The Campus Safety Officer works closely with the Director of Facilities to ensure that buildings are regularly checked for safety deficiencies. The University Health and Wellness Center is designed to meet the basic health care needs of the students and employees. Additionally, the Safety and Emergency Preparedness Committee reviews information and serves as an advisory committee on the University's emergency/disaster preparedness and other safety and health matters.

University Police

The University Police Department employs Alabama-certified law enforcement officers. Officers patrol on foot, bicycles, motorized scooters, Segways, and in patrol cars 24 hours a day, 7 days a week, year around, to protect and secure the University Community. Officers perform patrol activities and other assignments in both uniform and plain clothes. The University Police Department is committed to the prevention of crime and the protection of life and property. Like many municipal, county, and state law enforcement agencies, University Police has a Criminal Investigations Division dedicated to investigating crimes occurring on campus, an Emergency Response Team, and other specialized units responsible for duties unique to the campus environment. Officers are committed to providing personal and property safety information to students and employees to help make educational, living, and working experiences on campus as enjoyable and crime-free as possible.

The University Police Department website provides direct access to programs and information designed to make the campus safe for faculty, staff, students, and visitors. Example programs include the Student Nighttime Auxiliary Patrol, or SNAP which makes officers available to escort students and employees around the campus at night; Operation ID; CARE (Campus Assistance Referral and Evaluation) Team; and the Crime Watch/Silent Witness program. Examples of information available for quick and easy access include the Campus Security Guide and other emergency guidelines such as weather-related emergency procedures. In addition to making information available via the website, the Department has taken a proactive stance against the crimes that are most prevalent on campus by designing and purchasing signage to enhance the awareness of the community.

In addition to the staff of full-time University Police officers, the University Police Department works closely with, and receives support from, the Florence Police Department, Lauderdale County Sheriff's Department, Alabama State Troopers, Alabama Alcoholic Beverage Control Board, and the Federal Bureau of Investigation. These agencies are contacted when assistance is needed, and fostering healthy working relationships with these federal, state, county, and local law enforcement agencies is a continual goal.

The University Police Department adheres to all reporting requirements of the Clery Act. The annual disclosure of campus crime statistics is prepared by the University Police Department in conjunction with the Offices of Student Affairs, Judicial Affairs, and the Florence Police Department. In addition to annual disclosures, the University Police Department issues timely warnings to the campus when specific criminal activity becomes known, and copies of specific police reports can be obtained via online request.
The University Police Department has a mission to provide a safe and secure environment to the University community. This vision of the Department is clear and can be summarized as follows:

• The University must maintain a safe and secure environment, free from the distraction of criminal activity and disorder, for the pursuit of education and scholarship that brings people to the University of North Alabama.
• The University Police Department firmly believes in a community-oriented problem-solving philosophy. The core components of the philosophy are prevention, partnerships, and problem solving.
• Officers are committed to preventing crime and disorder, and focus their efforts on eliminating the underlying causes of those problems.
• The University Police Department actively engages in partnerships with the community to address and solve problems.
• Partnerships are the foundation of effective problem solving, safety, security and crime prevention. Through these partnerships and collaborative problem solving, officers deal with problems, prevent crime, and help maintain a community free of disorder and safe from natural and man-made disasters.

Campus Safety Officer

The Campus Safety Officer works closely with the Director of Facilities to ensure that buildings are regularly checked for safety deficiencies. The Campus Safety Officer also oversees the receiving of hazardous substances, and assures that hazardous wastes are removed in an appropriate and timely manner. In addition to internal oversight by the Campus Safety Officer, external agencies conduct regular safety audits, examples of which include fire extinguisher and elevator inspections.

University Health and Wellness Services

The Department of University Health and Wellness Services is dedicated to promoting optimum wellness by providing targeted medical, counseling, and disability support services to aid and equip students to successfully reduce the individual roadblocks to their personal and academic success. The Health and Wellness Center, located in the Bennett Infirmary, is an outpatient, acute care clinic designed to meet the basic health care needs of students and employees. The Health and Wellness Center is staffed with registered nurses, nurse practitioners, physicians, counselors, and administrative personnel. Services available include: treatment of short-term illnesses and minor injuries; basic physical exams; pap smears; allergy injections; select immunizations and vaccines; wellness screenings; and health education offerings. Student counseling services are also located in the Health and Wellness Center. In addition to the health services provided by the Center, the professional staff has developed and implemented health related policies and procedures such as the pandemic influenza plan to increase awareness and preparedness for potential health related emergencies before they are realized, and is proactive in educating students, faculty, and staff about potential health threats.

Safety and Emergency Preparedness Committee

The Safety and Emergency Preparedness Committee is a Shared Governance task committee with the following charge:

• to serve as an advisory committee on the University's emergency/disaster preparedness and other safety and health matters
• to continually review the University's emergency/disaster preparedness plans and other policies and procedures on allied safety and health matters
• to develop and edit the University Safety and Health Manual
• to gather information about the University's emergency/disaster preparedness plans and on other allied safety and health matters and assess University performance in these areas in light of the information obtained
• to propose changes in the University's emergency/disaster preparedness plans and in other policies and procedures on allied safety and health matters

The Safety and Emergency Preparedness Committee is composed of 19 members including administrators, faculty, and staff. The Committee schedules monthly meetings during the fall and spring semesters, and *minutes are posted on the Committee's website. The Committee reports directly to the Vice President for Student Affairs, and a summary report is submitted at the end of each year. The Safety and Emergency Preparedness Committee was responsible for developing the University's Health and Safety Manual, and the Committee edits that document as needed.*

In addition to the University Police Department, Campus Safety Officer, Health and Wellness Center, and the Safety and Emergency Preparedness Committee, the Division of Student Affairs has implemented an emergency communications system known as Lion Alert. The system allows students, faculty, and staff to receive time-sensitive emergency messages in the form of e-mail, voice, and text messages. Everyone who has a University of North Alabama e-mail address receives emergency alerts to their campus e-mail address. Students, faculty, and staff may also voluntarily provide phone contact information so as to receive text and voice messaging notification. Although this portion of the Lion Alert service is optional, enrollment is strongly encouraged. "

The roles of the University Police Department and Health and Wellness Center are clear. What might not be apparent is the fact that the Safety and Emergency Preparedness Committee functions basically as a review and advisory committee. The members of the committee work in other full-time capacities, so recommendations made by the Safety and Emergency Preparedness Committee are in no way implemented by the committee's members. This leaves the supervision and implementation of all health and safety issues not directly handled by police or medical personnel in the hands of what is essentially a part-time person. Many universities employ a team of health and safety professionals to oversee and implement the campus health and safety program. The University of North Alabama needs at least one full time professional with the educational background and experience to handle these issues.

All faculty, staff, and students would benefit from the services provided by this new position in a variety of areas. The faculty and students in the Department of Chemistry and Industrial Hygiene would benefit specifically in the area of laboratory safety and hazardous waste management. Both of our majors are approved and/or accredited by external agencies and are subject to periodic review (our chemistry major is approved by the American Chemical Society, and the industrial hygiene major is accredited by ABET). We were recently visited by a team of ABET program evaluators. One of the ABET findings is as follows"

> *Accreditation Policy and Procedures Manual II.G.6.b(1) states that site visit teams will examine "Facilities to assure the instructional and learning environments are adequate and safe for the intended purposes." Individual course instructors are responsible for implementing and enforcing documented university laboratory health and safety policies. Currently, instructors in all laboratory classes perform health and safety training according to university policies; however, lack of laboratory health and safety oversight at the institutional level may result in safety concerns in the future.*

The faculty in the Department agrees with this finding. Though we make efforts to train our students how to work safely in the laboratory, we are "self-policed", and there is no oversight of the program. This presents a liability issue in the event of an accident. While we hope that no major incidences occur, it is not uncommon in university settings. Within the last few years, there have been two high profile cases involving accidents in university laboratories, one at the University of California at Los Angeles, and one at Texas Tech University. The UCLA accident resulted in a student death, and the Texas

Tech explosion resulted in serious injuries to the student's involved, including a partial amputation of a student's hand. An investigation report of the Texas Tech accident from the Chemical Safety Board is attached, and a video summary of the incidences can be viewed at http://www.csb.gov/texas-tech-university-chemistry-lab-explosion/. It should be noted that both of these universities had programs in place with full-time staff providing oversight, and they were still found to be negligent in providing a safe work environment. Both the University and the professor involved with the accident at UCLA were charged criminally in the case (though the case recently settled with the professor and did not involve imprisonment). One has to wonder what the findings would have been if neither of these universities had active health and safety program management. The ultimate goal is to reduce the risk of injuries and illness, nevertheless, the liability must also be considered.

Like ABET, the ACS expects that faculty and students are provided with a healthy and safe environment in which to work. Following the higher profile university laboratory accidents, the ACS Committee on Chemical Safety published "Creating Safety Cultures in Academic Institutions", calling for "changes in the academic safety educational process and in the academic safety culture" (full document attached). We expect the ACS to be much more thorough in their review of approved programs in terms of health and safety. Our next periodic review is due on June 1 of this year.
Again, it should be noted that this request is not for one department, but for the benefit of the entire university. Thank you for your consideration in this matter.

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