Approval Page

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Provost

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Preface

Welcome to Cedar Crest College. We are pleased that you have chosen Cedar Crest College to pursue a Master of Science in Forensic Science. Your acceptance into the program means that we believe that you can make a valuable contribution to the program and that you have the knowledge and skills to succeed.

The demand for forensic science services has continued to grow since the advent of forensic DNA testing in the late 1980s. The success of DNA technology in solving cold cases, identifying perpetrators of crime through DNA databases, and overturning wrongful convictions, has galvanized political leaders and criminal justice professionals into supplying the resources for infrastructure, capital expenditures, and yearly operating costs for maintaining the current demand for forensic services. As a result of the impact of forensic DNA testing on the criminal justice system, other areas of forensic science are beginning to attract interest. Particularly within the private sector, new technologies in areas such as biometrics and drug testing are becoming available. Although the country has met the challenge of creating better technologies and constructing new laboratories, there is a shortage of intellectual capital needed to staff forensic science positions. Properly educated scientists are needed not only to fill new positions but also to fill existing positions due to retirement and turnover. As a result of greater scrutiny of forensic science work by the legal community and the onslaught of accreditation mandates from the professional community, a better educated scientist is needed and desired by laboratory staffing personnel. The need for better scientists was continually emphasized in the 2009 report from the National Academy of the Science on strengthening forensic science. We hope that this program will help meet that need.

The goals and objectives of this program can be found on page 6 of this handbook. This program is not geared toward any one particular discipline in forensic science. Although specialization is the order of the day among forensic science practitioners, the program is taught from a generalist perspective. Given that physical evidence can take an endless array of forms, we strongly believe that a knowledge base in all the requisite forensic science disciplines is important for the practitioner. A forensic biologist, for example, should never anticipate that biological evidence will be devoid of trace or pattern evidence. In practice, an item of physical evidence is likely to contain probative information in a variety of forms, whether it is physical, biological or chemical. Furthermore, we believe that there are certain philosophical tenets that are common to all forensic science disciplines and that forensic science is a separate and unique science. We do not subscribe to the idea that forensic science is simply an "applied science".

We believe the program differs from most others of its kind due to the emphasis this program places on research and developing leadership qualities in students. We believe that there is no better way to develop scientists than by placing research as the foundation for the program. It is also our hope that this program will prepare you not only for a career in forensic science but to inspire you toward leadership positions in the field as well. Given the pertinent role that Forensic Science now plays in the criminal justice system, the development of future leaders is necessary for the field to continue to fulfill its professional mandate.

The program is open to students of either gender and does not discriminate on the basis of race, gender, religion, or sexual orientation. Again welcome to Cedar Crest College. We look forward to having you as a student.
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Mission Statement

Cedar Crest College is a liberal arts college primarily for women dedicated to the education of the next generation of leaders. Cedar Crest College prepares students for life in a global community by educating the whole student at all stages of life and experience.

Philosophy of Graduate Education

Building upon the college’s tradition of teaching excellence, graduate education at Cedar Crest aspires to provide students with the expertise, judgment, vision, and inspiration to participate actively and responsibly within the diverse communities and dynamic knowledge networks wherein their professional lives will unfold. Institutionally, this commitment rests upon four values which serve as the foundation for the college’s philosophy of graduate education:

Scholarship: Graduate programs should ensure that students master the theoretical perspectives, methodological techniques, and professional practices essential to the production of knowledge within their disciplines. This includes exposing students to an expanded definition of scholarship, which moves beyond the traditional emphasis upon discovery to include the integration, application and dissemination of knowledge within and across disciplines.

Innovation: Graduate programs should ensure that students recognize the role that creativity, and the entrepreneurial spirit more generally, plays as a catalyst for the advancement of knowledge. While programs should acknowledge the value of risk-taking as an inherent element of scholarly practice, students also should learn that professional conduct must be tempered by an ethic of responsibility for the communities within which they live, work and learn.

Collaboration: Graduate programs should ensure that students understand how the revolution in information technology is profoundly altering the nature of professional practice by empowering epistemic communities from around the world to respond to issues of local, national and global significance. Programs should equip students with the communications and technological skills needed to collaborate within the context of transnational and interdisciplinary networks that serve as sites for the production, application and dissemination of knowledge.

Professionalism: Graduate programs should impress upon students that graduate school itself is but the prelude to a lifetime of ongoing professional development. Faculty should convey this message by modeling professional practices within the context of an active research agenda and other forms of scholarly activity which contribute to the production, dissemination and application of knowledge within and across disciplines. Similarly, the college should demonstrate its commitment to educational leadership by providing academic programs, faculty, and the graduate community more generally, with the institutional support needed to sustain high levels of academic achievement in the face of evolving professional, societal, and global standards.
Program mission statement

To teach and continually emphasize forensic science foundational principles in all aspects of instruction to students who have a solid background in the natural sciences to help produce a future generation of competent, credible and ethical forensic scientists.

Program educational goals and objectives

After completing the Master of Science Program in Forensic Science students will:

1. Have the necessary theoretical background in all the primary areas of Criminalistics. These topics include crime scene reconstruction, pattern analysis, microscopy, forensic molecular biology, and forensic chemistry and toxicology.

2. Demonstrate proficiency in laboratory skills necessary for a career in Criminalistics.

3. Demonstrate the ability to analyze and interpret scientific data.

4. Demonstrate the ability to provide proper scientific expert witness courtroom testimony.

5. Demonstrate professional conduct and the personal characteristics expected of professionals in the Forensic Science community.

6. Demonstrate the ability to be research scientists.

7. Demonstrate proficiency in oral and written communication skills.

8. Demonstrate knowledge of current policy, legal, and ethical guidelines for professional forensic science practice.

Administration of the program

The program has a director who in consultation with the full-time faculty who teach in the program will determine academic policy.

New course proposals must be approved by the Graduate Programs Committee, which will also serve in an advisory capacity to the program.
Admission to the program

Requirements for admission to the program are outlined below:

1. B.S. degree in a natural or forensic science (or its equivalent coursework in a relevant field).
2. Completion of the GRE General Test.
3. Two letters of recommendations from individuals who can attest to the candidate’s scientific ability.

The following coursework is recommended at the undergraduate level:

1. Two semesters of general (freshman) chemistry and two semesters of organic chemistry.
2. Two semesters of calculus (differential and integral preferred).
3. Two semesters of physics.
4. Two semesters of general (freshman) biology.

The courses listed must be suitable for an undergraduate science curriculum.

Students under consideration for admission may be asked to undergo a successful interview with members of the forensic science faculty before acceptance into the program. Applicants with a minimum GPA of 3.0 have a better chance of being admitted to the program than applicants who do not. Results of the GRE General Test, grade point average, and letters of recommendation will be used as comparative parameters between candidates.

Although it is recognized that some students may not finish the designed program in the desired two-year time frame, it is not designed to be a part-time program. Students wishing to enter the program part-time will be considered but must complete the program in the required time frame (see maximum period of candidacy).

Students may be accepted conditionally into the program. Students accepted conditionally must maintain a minimum GPA of 3.0 after 12 credits in order to be accepted into the program.

The Program Director and the program faculty will make all admissions decisions.

Matriculation

Accepted students are matriculated into the program once they have registered for classes during their first semester of academic study. Any post-baccalaureate student wishing to register for a program course may do so without matriculating. Only matriculated students, however, can file for a degree.
Requirements for continued matriculation and completion of program

Students must complete every class (including undergraduate prerequisites) with a minimum of a B- and are only allowed to repeat a class one time. Program dismissal will result in the following cases:

1. A student receives a grade of F in any course (lab or lecture component) including program prerequisites.
2. A student does not successfully complete any course (receives a grade lower than B-) after two attempts. FSC 501 and 599 are exempted from this policy.
3. Four courses (lecture or lab) throughout the program resulting in a withdrawal or a grade of C.
4. Any student receiving a grade below a B- in any 3 courses within the first two semesters.
5. Lack of research progress as determined by a student’s thesis committee after being matriculated for three academic years.

Students will only be granted the degree of Master of Science in forensic science if:

1. All academic requirements for the degree are completed.
2. The student has removed all research materials from program storage spaces allotted to them. This requires approval from the student’s research mentor.
3. The student has no institutional or program liens against them.

Grades and grade points for FSC courses

A = 4.0
A- = 3.7
B+ = 3.3
B = 3.0
B- = 2.7
C = 2.0
F = 0.0
W = 0.0 (withdrawal)
I = Incomplete

Acceptance of thesis

The thesis component of the program is not completed until all three members of the student’s thesis committee approve the final draft of the thesis. This approval is noted by the signatures of each member of the committee on the approval page of the thesis. Once approved, a minimum of three copies of the thesis will be bound (the program director is responsible for the binding of the thesis). One bound copy will be sent to the library, one to the primary mentor, and one to the student.
Maximum period of candidacy

Students must complete the program in seven academic years beginning from the semester of matriculation.

Transfer credit policy

Students entering the program may transfer up to 6 credits of coursework. The transferred coursework, however, must be equivalent to courses listed in the curriculum and must have been completed within ten years of the date of enrollment in the program (the first day of classes of a student’s first academic year). Once matriculated in the program, students will not receive any credit for coursework taken at another institution. Non-matriculated students who take program courses at Cedar Crest, may transfer all Cedar Crest courses after matriculation. All transfer courses are subject to all policies outlined under Requirements for continued matriculation and completion of program.

Leaves of absence, course withdrawals, and incompletes

Students wishing to take a leave of absence from the program may request to do so in writing to the Program Director. The granting of the requested leave is at the discretion of the Program Director and pending approval from the Associate Provost for Adult and Graduate Education. The time frame associated with a leave of absence is counted in the seven years necessary to complete the program.

Students wishing to withdraw from a course must do so by the date determined by the College. It is advised that students consult the graduate catalog to determine what this date is for both the fall and spring semesters.

Students receiving an incomplete for a course must complete the course in the required timeframe as determined by the College. Students failing to complete the course in the required timeframe will receive a grade of F in the course.

Students must always maintain matriculation every fall and spring during their enrollment. A student will be considered inactive in any semester that they have not registered for at least 1 credit or have not been granted a leave of absence. Those students considered inactive must reapply to the program through the School of Graduate and Adult Education for enrollment in the following semester if they wish to continue in the program.

Refund policy for course withdrawals

Please consult the graduate catalog for a complete description of the refund policy.

Reinstatement

If a student has been dismissed from the program for any reason, the student can reapply to the program but must wait one full academic year before doing so (for instance, a student who was dismissed in academic year 2016-2017 cannot reapply until academic year 2018-2019). Students coming back from a leave of absence will be reinstated into the
program and will continue at the point where they left off as long as the time frame is no longer than 3 years.

Program requirements

First year

Year one of the program will consist of graduate coursework and undergraduate prerequisites (see below) that need to be completed, the writing of a thesis proposal, and the selection of a thesis committee. The writing of the thesis proposal and the selection of the thesis committee will occur in the 2-credit Thesis Prospectus course (FSC 500) which is offered during the spring semester. The thesis committee will consist of a primary mentor and two other individuals. The primary mentor must be a full-time member of the program faculty and the second reader must be external to the forensic science program and the Department of Chemical and Physical Sciences. The selection of the second reader may, for instance, be a faculty member from another department at Cedar Crest College, a faculty member from another institution, or a forensic science practitioner. The role of the second reader is to provide the student with technical guidance in consultation with the primary reader. In most cases, the second reader should have a master’s degree. Individuals with a bachelor’s degree may be considered if they possess rare or very specialized knowledge and have extensive professional experience. The third reader must be a full-time faculty member from the program faculty and is expected to provide technical guidance as well. The third reader is also responsible for conducting an administrative review of the thesis. The composition of the thesis committee, and the topic of the thesis must be approved by the full-time program faculty. A student wishing to change the composition of a thesis committee must put the request in writing along with the rationale to the program director. The requested change must be approved by the faculty.

If a student initiates a change in topic at any point during the research process, the student will be required to write a new thesis proposal and form a new thesis committee which must be approved by the Director and program faculty.

If a primary mentor or a third reader leaves Cedar Crest College, they can continue to be a member of the Committee for a period of six months. After six months, the student with the approval of the faculty must select a replacement from the existing full-time faculty at Cedar Crest College.

Undergraduate prerequisites include Biochemistry and Genetics. Students who are accepted into the program without these courses or have taken these courses and received a grade below a C- must register for these courses at the undergraduate level (CHE 307 – Biochemistry; BIO 360 – (Human and Biomedical Genetics) during the first year.

Summer Term

Students will be required to perform the bulk of their master’s thesis research during the summer between the first and second year. Research can be performed on campus or at an external laboratory (requires prior approval from Director and program faculty). Students are required to register for the full summer term (FSC 501) for 6 credits.
During the second year seminar course (FSC 504), each student will be required to present a one-hour seminar on the results of their research. However, the seminar will only be conducted with the approval of the primary mentor. Students requiring additional time to prepare for the seminar may do so as long as they do not exceed the required timeframe for completion of the degree. A committee of faculty is responsible for writing a review of the seminar and providing a grade to the instructor of the seminar course. Students will also be required to write a thesis during the second year. The progress of the thesis writing will be monitored during the seminar course. Students requiring additional time to complete the thesis may do so as long as they do not exceed the required timeframe for completion of the degree.

The thesis component of the program represents the Capstone experience for the program and supports the goals and objectives of the program. Thesis and seminar procedural and presentation guidelines are given in the Appendix.

Second year

In addition to completing the writing of the thesis, the second year of the curriculum will consist of completing the remainder of required coursework.

In addition to FSC 501, students fulfilling curricular requirements for the degree must complete the following courses.

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<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tr>
<td>BIO 548</td>
<td>Research Design and Statistics</td>
<td>3 credits</td>
</tr>
<tr>
<td>FSC 500</td>
<td>Thesis Prospectus</td>
<td>2 credits</td>
</tr>
<tr>
<td>FSC 503</td>
<td>Professional Communication</td>
<td>2 credits</td>
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<tr>
<td>FSC 504</td>
<td>Seminar</td>
<td>2 credits</td>
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<tr>
<td>FSC 505</td>
<td>Separations Chemistry</td>
<td>2 credits</td>
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<tr>
<td>FSC 506</td>
<td>Analytical Spectroscopy</td>
<td>2 credits</td>
</tr>
<tr>
<td>FSC 507</td>
<td>Forensic Chemistry</td>
<td>3 credits</td>
</tr>
<tr>
<td>FSC 508</td>
<td>Forensic Pharmacology and Toxicology</td>
<td>3 credits</td>
</tr>
<tr>
<td>FSC 509</td>
<td>Advanced Crime Scene Reconstruction (lab component)</td>
<td>3 credits</td>
</tr>
<tr>
<td>FSC 510</td>
<td>Recent Advances in Forensic Biology (lab component)</td>
<td>4 credits</td>
</tr>
<tr>
<td>FSC 511</td>
<td>Molecular Biology</td>
<td>3 credits</td>
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<tr>
<td>FSC 512</td>
<td>Forensic Science Administration</td>
<td>2 credits</td>
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<tr>
<td>FSC 513</td>
<td>Advanced Microscopy (lab component)</td>
<td>3 credits</td>
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<tr>
<td>FSC 514</td>
<td>Legal and Ethical Issues in Forensic Science</td>
<td>2 credits</td>
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<tr>
<td>FSC 515</td>
<td>Advanced Pattern Analysis (lab component)</td>
<td>3 credits</td>
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<tr>
<td>FSC 516</td>
<td>Forensic Chemistry/Toxicology Lab</td>
<td>2 credits</td>
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In addition, students will be required to register for 1 credit of continuing research under FSC 599 each semester after the completion of FSC 501 until the completion of the degree (this does not include summer).

**Commencement and graduation**

As per Book VII of the Cedar Crest College Faculty Handbook, students can only participate in commencement exercises if their primary mentor and program director are assured that all requirements for the degree will be completed within four months of the ceremony date.

In order to be eligible for May, January, or August graduation, students must have completed a full draft of their thesis and have approval from their primary mentor by the following dates:

- **August Graduation**: July 15
- **January Graduation**: December 15
- **May Graduation**: April 15

Those that are eligible must still have approval from their full committee two weeks prior to the date of graduation.

**Course descriptions**

**BIO 548 Research Design and Statistics**

This course deals with fundamental and advanced concepts in probability, statistical methods, and hypothesis testing. Topics include, but are not limited to, fundamentals of probability; summary statistics; basic hypothesis testing; analysis of frequency data; analysis of variance; regression and correlation; factor analysis and principal components analysis; discriminant analysis; and other multivariate methods. Nonparametric approaches will also be covered. Statistical power will be discussed in the context of research design.

**Prerequisites:** one year of undergraduate calculus and a 200-level undergraduate course in statistics of an earned Bachelor’s degree.

**FSC 500 Thesis Prospectus**

An introduction to scholarly and research manuscript writing, forensic science literature, and documentation styles and techniques. Discussion will center on current research trends within the forensic science community. Students will be guided through the thesis proposal writing process. Each student will write a thesis proposal by the end of the semester and select a thesis committee.
FSC 501 Forensic Science Research

Laboratory research in forensic science subject areas. Data generated from research will form the basis of a master’s thesis needed for degree completion. **Prerequisites:** Successful completion of FSC 500.

FSC 503 Professional Communication

The course discusses all aspects of professional communication, oral and written, and evaluates a student’s ability to effectively communicate in the professional world. Students will participate in mock interviews with professionals.

FSC 504 Graduate Seminar

A lecture series involving presentations from students on their master’s thesis research in a one-hour seminar format. Select presentations from invited speakers in some years. **Prerequisites:** Completion of FSC 503

FSC 505 Separations Chemistry

An advanced study of the various types of separation methods used in chemistry with attention to specific types of applications to forensic evidence and modern methods of forensic chemical analysis. This course will challenge and advance the students understanding of the analytical separation methods and analyses of forensic science from a fundamental, chemical perspective. Students will learn from a scientific analytical perspective the theoretical and practical aspects in the concepts of separating analytes in forensic evidence. Topics will be presented to include modern separation methods, concepts, and techniques such as sample preparation techniques, extraction methods such as liquid-liquid, solid-phase, and micro-extraction, precipitation separations, ion-exchange separations, electrochemical and gravimetric separation methods, and chromatographic separations such as gas chromatography, liquid chromatography, supercritical fluid and capillary electrophoresis.

FSC 506 Analytical Spectroscopy

In this course the student will study various types of modern chemical spectroscopic techniques. From a fundamental, chemical perspective the course will challenge and advance the student’s understanding of these analytical methods used in forensic science. The focus of study will be the theoretical and practical spectroscopic concepts of analyzing forensic evidence. Topics will include molecular spectroscopy, ultraviolet spectroscopy, infrared spectroscopy, mass spectrometry (MS), atomic X-Ray spectrometry, inductively coupled plasma (ICP), ICP/MS, Raman spectroscopy, and surface characterization by spectroscopy.
FSC 507 Forensic Chemistry

A study of the chemistry of certain types of forensic evidence and modern methods of forensic chemical analysis. This course will challenge and advance the students understanding of the analytical methods and analyses of forensic science from a fundamental, chemical perspective. Students will learn from a scientific analytical perspective the analysis of materials such as drugs, glass, paints and plastics, fire debris, explosives, fibers and other types of physical evidence. Students will learn the meaning and significance of analytical data from a fundamental approach. Topics will be presented to include modern reactions, concepts, techniques and instrumentation such as chromatography, infrared spectroscopy, and ultraviolet spectroscopy.

FSC 508 Forensic Pharmacology and Toxicology

The course will introduce students to principles and methods in the areas of forensic pharmacology and toxicology. The course will introduce pharmacological and toxicological principles as they pertain to commonly encountered abused and toxic substances. Discussions will focus on the drugs, their mechanism of action, post-mortem characteristics, methods of collection and methods of preservation and analysis. The course will review basic concepts of analytical chemistry as it applies to drug and body fluid analyses. Specific methods for the analysis of alcohol, barbiturates, benzodiazepines, opioids, cocaine, marijuana, amphetamines, and hallucinogens will be presented.

Prerequisites: Completion of a biochemistry course

FSC 509 Advanced Crime Scene Reconstruction

There are various types of analysis a forensic scientist might perform when reconstructing a crime scene, all of which depend on the type of analysis that may be needed in a particular case. For example, reconstruction of violent crimes such as homicides often involves advanced techniques such as bloodstain pattern analysis (BPA) which may be accomplished by direct scene examination and/or scene photographs in conjunction with examination of clothing and weapons from the scene. Knowledge of BPA is also crucial to analysts choosing bloodstains from clothing and other items submitted to crime laboratories for serological and DNA testing. Training and experience are essential to properly reconstruct a crime scene. This course will begin with an introduction to basic crime scene investigation as it relates to crime scene reconstruction; however, the remainder of the course is taught from the scientist perspective in crime scene reconstruction. Emphasis will be placed on developing critical thinking skills and recognizing ways to limit bias which are essential for scientists to properly reconstruct crime scenes. Instruction will be given in forensic medicine, including interpretation of autopsy reports, microbiomes, fire scene reconstruction, staged crime scenes, and an in-depth study of specialized techniques such as bloodstain pattern analysis, bullet trajectory analysis, and entomological post mortem interval estimations as they relate to crime scene reconstruction. Students will then use this knowledge in analyzing, interpreting, and reconstructing numerous mock crime scenes. The course will end with a discussion on report writing and courtroom testimony of reconstruction cases. Each student will be assigned a final mock crime scene where they will analyze, reconstruct, and
prepare/present their case for courtroom testimony. Laboratory included.

**Prerequisites:** FSC 515.

### FSC 510 Recent Advances in Forensic Biology

An advanced forensic biology course that will deal primarily with newer techniques used in body fluid stain identification, DNA extraction, DNA quantitation, PCR, and genotyping. Instruction will be given on state-of-the-art technologies, including Next Generation Sequencing, and their application to common forensic biological issues such as degradation, sensitivity, specificity, and variation in sample type. Advanced DNA topics including SNPs, microbial DNA, Y-STRs, mitochondrial DNA, and plant DNA will also be discussed. The course will also focus on population statistics used in forensic DNA analysis with an emphasis on statistical interpretation of mixtures. Emphasis will be placed on the importance of developing critical thinking skills utilized by forensic biologists to properly analyze evidence and troubleshoot common laboratory issues. Laboratory included.

**Prerequisites:** Concurrent with FSC 511 and either completion or concurrent with a genetics and biochemistry course.

### FSC 511 Molecular Biology

The course begins with an examination of basic molecular biology including the structure of DNA, methodology of DNA replication, regulation of gene expression, and consequences of DNA mutations. The use of recombinant DNA and its applications in the study of human genetics will be explored as well as the impact of biotechnology on society.

**Prerequisites:** Concurrent with or completion of a genetics course

### FSC 512 Forensic Science Administration

This course will focus on the practical application of forensic science laboratory management. Scenarios of actual issues confronted by forensic science laboratory managers will be discussed as well as economic and business considerations in the administration of a forensic science laboratory. Discussion will also include quality assurance and control, accreditation, certification, laboratory oversight, prioritizing resource allocation, management of personnel, forensic science laboratory facilities, leadership in a crime laboratory, and laboratory safety. Current issues include forensic intelligence, contextual bias, and efficiency models such as Six Sigma.

### FSC 513 Advanced Microscopy

Lecture and practical instruction in the theory and forensic application of microscopy methods. This course will focus on light microscopy, polarized light microscopy, fluorescent microscopy, phase contrast microscopy, scanning electron microscopy, and spectroscopic methods that can be interfaced with the microscope (such as micro-FTIR, microspectrophotometry and x-ray microanalysis). Additional emphasis will be placed on sample preparation, chemical microscopy, and photomicrography. Laboratory included.
FSC 514 Legal and Ethical Issues in the Forensic Sciences

The role that a forensic scientist plays in the litigation process will be discussed. Students will learn the appropriate guidelines for professionalism and conduct in expert witness testimony. All students will participate in a moot court exercise. The course will also address standards of reliability and relevance of scientific evidence in United States courts. Legal rules involving discovery of evidence, search and seizure of physical evidence, and the right of the accused to confront expert witnesses will also be discussed. Finally students will be introduced to existing professional codes of ethics and how to apply them in practice.

FSC 515 Advanced Forensic Pattern Analysis

Study in the comparative analysis of pattern evidence typically encountered as forensic evidence with emphasis on developing critical thinking skills, recognizing and limiting bias, and viewing pattern evidence as stochastic events. This course will begin with instruction on the proper documentation methods for pattern evidence followed by the analysis and interpretation of common forms of pattern evidence such as bloodstain patterns, glass fractures, handwriting, fingerprints, footwear impressions, and projectiles and casings from firearms. Students will then use this knowledge along with critical thinking skills to develop testing methods to analyze and interpret various types of pattern evidence. Students will develop their writing and oral skills by submitting laboratory reports in the form of journal articles and lecturing on an assigned topic related to pattern evidence. Laboratory included.

FSC 516 Forensic Chemistry and Toxicology Laboratory

Laboratory course designed for students to gain experience in some of the common analytical techniques utilized in forensic chemistry and toxicology. **Prerequisites:** FSC 505 and 506

FSC 599 Continuing Research

Continuation of summer thesis research into the academic year. **Prerequisites:** FSC 500 and 501.

**Advising**

Students coming into the program will be asked to attend an orientation prior to their first semester of academic study. During this time, each student will be assigned an academic advisor who will be a member of the Forensic Science program faculty. Students are required to meet with their faculty advisor prior to registering each semester.

**Financial aid**

Students accepted to the program may apply for graduate level federal Stafford Loans. Students can contact the Financial Aid Office at 610-740-3770 for information.
Graduate assistantships

Graduate assistantships are designed to promote the educational goals and objectives of the master’s program by providing students with opportunities to actively participate in a range of instructional and research activities which serve to promote mastery of knowledge in the field of forensic science. To this end, graduate assistants are placed with individual forensic science faculty and are expected to work a minimum of 10 hours per week. Duties of a graduate assistant may include:

1. The development of new laboratory exercises for undergraduate forensic science students.
2. Assisting faculty in the instruction of undergraduate coursework laboratories as well as help in the assessment of student performance in the laboratories.
3. Serve as a lecturer or primary lab instructor in the event that assigned faculty are absent.
4. Provide background information in the form of literature searches for faculty projects.
5. Assist in the implementation and development of workshops for the Forensic Science Training Institute as well as other professional activities associated with the Forensic Science Program.
6. Quality control testing of reagents and instrumentation.
7. Tutoring of undergraduate and other graduate students.

To be eligible to receive an assistantship, a student must:

1. Students must be taking a minimum of 6 credits during each semester of the academic year they are applying for the assistantship or are actively conducting thesis research.
2. Have an undergraduate GPA of 3.0 or have completed 10 credits of graduate coursework.

Assistantships are awarded on a per semester basis and recipients are selected on a competitive basis by the program director in consultation with the faculty to whom graduate assistants will be assigned. The number of assistantships available in any academic year and the stipend to be awarded to each graduate assistant is determined by the Program Director in consultation with the Associate Provost and Provost. The decision of the Program Director in regard to award recipients is final and is not subject to appeal.

Program resources

Student research and laboratory coursework are performed in a variety of laboratories available to students in the forensic science program. Students in the forensic science program have more than adequate laboratory space for coursework and research in all areas of criminalistics. Students also have use of several computer labs on campus.
including the Allen Center for Nutrition Computer Lab located in the Miller portion of the Science Center. In addition, the Forensic Science Program has the following instrumentation available for student use:

**Chromatography/Spectroscopy**

*Atomic Absorption*
Buck Scientific ACCUSYS 211 Atomic Absorption Spectrophotometer

*Fluorimetry*
Turner Quantech Digital Filter Fluorometer
Hitachi F-2500 Fluorescence Spectrophotometer

*Fourier Transform Infrared Spectroscopy*
Nicolet 380 FTIR
Nicolet Impact 410 FTIR

*Gas Chromatography*
Hewlett Packard 7890A Gas Chromatographs

*Gas Chromatography/Infrared Spectroscopy*
Spectra Analysis DiscovIR-GC

*Gas Chromatography/Mass Spectroscopy*
Agilent Technologies 6890N Network GC System and
5973 Network Mass Selective Detector (4)

*High Performance Liquid Chromatography*
Agilent 1100 Series UPLC
Lab Alliance Series II HPLC
Shimadzu ELDS-LTII Evaporative Light Scattering Detector

*Liquid Chromatography/Mass Spectrometry*
ABI 3200 Q Trap Mass Spectrometer
Agilent 1100 Series UPLC/MS
**Nuclear Magnetic Resonance**
Varian EM-390, 90-mHz, CW NMR Spectrometer
Varian Unity Inova NMR

**Pyrolysis**
CDS Pyroprobe 5000

**UV/Visible/NIR Spectrophotometry**
Beckman Coulter DU 800 Spectrophotometer
Cary 5E UV-Vis-NIR
Cecil 2041 UV/Vis Spectrophotometer
Unicam Helios Alpha UV/Vis Spectrophotometer

**Biology/DNA Analysis**

**Capillary Electrophoresis**
ABI 3130 Genetic Analyzer

**Real-time PCR**
Corbett Rotor-Gene 6000

**Thermocyclers for PCR Amplification**
ABI Veriti Thermal Cycler

**Imunoassay Technology**
Molecular Devices SpectraMax M2 microplate reader

**Microscopy**

**Fluorescence Microscopy**
Leica DM1000 Fluorescent Light Microscope

**Polarized Light Microscopy**
Leica DMEP Polarizing Light Microscopes
Olympus BX53 Polarizing Light Microscope
Stereomicroscopy
Leica Scientific Stereomicroscopes

Microinfrared spectroscopy
SensIR IlluminatIR

Scanning Electron Microscopy/ X-Ray Dispersive Spectroscopy
Philips XL-20 SEM w/iXRF EDS

Crime Scene/Photography

Imprint Analysis
Sirchie Electrostatic Dust Print Lifter

Digital Photography
Fuji IS Pro IR/UV Digital Camera
Nikon D70 Digital Camera
Nikon D200 Digital Cameras

The program also has excellent forensic science resources in the Cedar Crest College Cressman Library. The library now has over 250 hard copies of books with forensic science subject matter. In addition, the Library carries subscriptions to many forensic science journals and several other journals of forensic science interest. The Library also has purchased FORENSICnetBase which contains on-line copies of many forensic science textbooks from CRC Press.

Student due process – academic matters

A student who has a disagreement with a faculty member about an academic matter should first attempt to resolve the matter through discussion with the instructor. If the issue is not resolved satisfactorily between the student and the instructor, the student may elect to contest the decision through the Student Complaints - Appeals Process (see below). If the issue is a dispute of a final grade received in a course, the appeal must be submitted within thirty days of the date that term grades are issued by the registrar.

Student complaints – appeal process

A student who wishes to appeal the decision of an academic matter (academic matters include disputes over grades, allegations of academic misconduct, and program dismissals) or has a specific complaint regarding a non-academic matter should address the issue in writing to the Program Director. If the complaint or appeal involves the Program
Director, the student should address the issue in writing to the Chair of the Department of Chemical and Physical Sciences. The original complaint or appeal will be kept on file with the Program Director. The Program Director in consultation with the Department Chair and any faculty named in the complaint or appeal or the Department Chair (if the complaint or appeal involves the Program Director) will make a decision on the adjudication of the complaint or appeal to the student in writing within thirty days. This decision will be kept on file with the Program Director. If the student is dissatisfied with the decision of the Program Director or Department Chair, the student has seven days to appeal in writing to the Associate Provost for the School of Adult and Graduate Education. The student should submit all correspondences along with the appeal. The Associate Provost will respond in writing to the student and Program Director within thirty days regarding the Associate Provost’s decision of the appeal. The decision of the Associate Provost will be kept on file with the Program Director. If the student is not satisfied with the decision of the Associate Provost, the student can file a Student Complaint Form with the Provost (http://www.cedarcrest.edu/peer/Student_Complaints.shtml). Complaints must be reported within one (1) calendar year of the incident that caused the complaint. The Provost will seek to address complaints within twenty (20) business days. Individuals and offices identified as party to a complaint may be notified and asked to provide relevant information. Records of all Student Complaints received by Cedar Crest College will be maintained as required by all applicable state and federal regulations or statutes and in accordance with College policies and procedures.

The Program Director also has the option of appealing the Associate Provost’s decision to the Provost. Upon receipt of the appeal and all correspondences, the Provost will consult with the Associate Provost and will have thirty days to respond in writing to the student, Associate Provost, and Program Director regarding the decision of the Provost. All appeals to the Provost and written responses will be kept on file with the Program Director. Decisions of the Provost are final.

**Allegations of student academic misconduct**

Faculty who suspect academic misconduct on the part of a student, should first discuss the issue with the student. If, after discussion with the student, the faculty member believes that academic misconduct occurred the faculty member must report the incident to the Provost’s Office in a timely manner using the “Report of Academic Misconduct” and attach relevant evidentiary documentation as appropriate. Contemporaneous with the submission of the report to the Provost’s Office, the faculty member must report the incident in writing to the Program Director. This report will be kept with the Program Director. Within fourteen days of receiving the report, the Program Director in consultation with the faculty member issuing the report and the Department Chair will make a written notification to the Provost regarding the extent (if any) of the disciplinary action toward the student. The student will also receive written notification from the Program Director regarding this decision. Both the written notification to the Provost and to the student will be kept with the Program Director. Students disagreeing with the decision of the Program Director should follow the Student Complaint – Appeals Process.
Definitions of academic misconduct

Cedar Crest College considers the following acts, but not only the following acts, to be breaches of its academic standard of integrity. Cedar Crest College reserves the right to alter the definitions of academic misconduct herein (below definitions taken from the Cedar Crest College Student Handbook).

i) Cheating. During the completion of an academic assignment (e.g. quizzes, tests, examinations, artistic works, presentations, or papers), it is dishonest to use, have access to, or attempt to gain access to any and all sources or assistance not authorized by the instructor.

ii) Plagiarism. Plagiarism is the act, intentional or not, of misrepresenting the work, research, language or ideas of another person (published or unpublished) as one’s own. An assignment, or part of an assignment, that fails to acknowledge source material through an appropriate academic discipline’s citation conventions for quotation, paraphrase, and summary also constitutes plagiarism.

iii) Collusion. Collusion is the collaboration of two or more individuals in either giving or receiving assistance not authorized by the instructor for the completion of an academic assignment.

iv) Falsification. Falsification is the misrepresentation of academic work or records. Falsification includes, but is not limited to: the fabrication of research, scientific data, or an experiment’s results; providing false information regarding an academic assignment, including reasons for absence, deadline extension or tardiness; the tampering with grade or attendance records; the forging or misuse of college documents or records; or the forging of faculty, thesis committee member or administrator signatures. An assignment, or part of an assignment, submitted for academic credit in one course and resubmitted by the student for academic credit in another course without both instructors’ permission also constitutes falsification.

v) Sabotage. Sabotage is the act of hindering another student’s (or students’) ability to complete an academic assignment. Destruction of college property (e.g. library holdings, laboratory materials, or computer hardware or software) may constitute sabotage.

vi) Other forms of academic misconduct. The forms of academic misconduct defined above are not exhaustive, and other acts in violation of the Cedar Crest Honor Code or academic standards of integrity may be deemed academic misconduct by an instructor or by the College.

Cedar Crest College Honor Code

The Cedar Crest Honor Code Philosophy states that students shall uphold community standards for academic and social behavior in order to preserve a learning environment dedicated to personal and academic excellence. Individuals who accept the honor of membership in the Cedar Crest College community of scholars pledge to accept responsibility for their actions and the effect their actions may have on other members of the College community.
Personal, academic, and professional characteristics

Students in the program are required to read Section I of the TWGED (technical working group on education) document titled, "Qualifications for a Career in Forensic Science" (see Appendix). Section I of the document details the personal, academic, and professional characteristics needed for the model candidate for a career in forensic science. Students wishing to enter a career in forensic science should strive to achieve and maintain these standards. If it is proven that a student in the forensic science program has engaged in behavior contrary to these standards (for instance, illegal drug use), the Program Director at his discretion may recommend to the Associate Provost for the School of Adult and Graduate Education that the student be suspended for a time or not be allowed to continue in the program.

In 2001, the Technical Working Group on Education and Training in Forensic Science (TWGED) was created by the Department of Justice and West Virginia University to develop models for training and education in forensic science. The planning panel for this organization brought together a diverse group of individuals from various disciplines in the forensic sciences with the common thread that each member has a stake in the future of education and training in the forensic sciences. The group consisted of laboratory directors, educators, and trainers and produced a document addressing qualifications for a career in forensic science, undergraduate curriculum in forensic science, graduate education in forensic science, and training and continuing education. Guidelines were recommended for each category and have become the basis for accreditation of educational programs in the forensic sciences through the Forensic Science Education Programs Accreditation Commission (FEPAC). The Master of Science program at Cedar Crest College is FEPAC accredited.

The TWGED document states, “A model candidate for all forensic science practices should have personal integrity. Because forensic science is part of the criminal justice system, personal honesty, integrity, and scientific objectivity are paramount”. In this spirit, deliberate violations of the Cedar Crest College Honor Code by students in the program cannot be tolerated. If a student is found guilty of an Honor Code Violation by any professor, the Program Director at his discretion may recommend to the Associate Provost for Adult and Graduate School Education that the student not be allowed to continue in the program.

It is also expected that when program students represent Cedar Crest College at professional events both on and off campus, that they will do so in a professional manner. At such events, students must be professionally dressed (business casual will usually suffice) with no display of piercings (with the exception of the lobe of the ear) or tattoos. Conduct must also be consistent with that expected of a professional.

Housing facilities

Campus housing is available to female students on a first-come, first-serve basis. Those students interested in campus housing should contact the Director of Residence Life at 610-606-4666, ext. 3351.
Professional organizations

Student memberships are available with the American Academy of Forensic Sciences (AAFS) and the applicable regional organization, the Northeastern Association of Forensic Scientists (NEAFS). Applications for membership are available on-line at www.aafs.org and www.neafs.org and all students are encouraged to apply.

Students are also encouraged to attend the annual meeting of AAFS held every February as well as the NEAFS annual meeting held during the fall.

Forensic Science Honor Society, Delta Delta Epsilon

Cedar Crest College is the Epsilon Chapter of the International Forensic Science Honor Society, Delta Delta Epsilon, and inducts new members each academic year. The Honor Society has provisions for the induction of both undergraduates and graduate students which are outlined in the by-laws. The by-laws can be found in the Appendix.

Intellectual property rights

It is the policy of Cedar Crest College to create an environment that encourages the generation of new knowledge by faculty, staff, and students, and facilitates the transfer of useful inventions and writings to society. To motivate the development and dissemination of intellectual property, the college seeks to ensure that the creators receive proper credit and financial rewards for their work.

For purposes of this policy the term intellectual property includes any patentable invention, any copyrightable subject matter, or valuable technology. It also includes works of art, inventions or creations that might normally be developed on a proprietary basis because copyright or patent protection is not available. This policy applies to any full-time or part-time student, regardless of whether the student receives financial aid from the college or from outside sources.

A student retains all rights to intellectual property created solely by him or herself. This includes rights to articles, and other writings of which the intended purpose is to disseminate the results of student research or scholarly work. The use of college owned computers and other facilities in the preparation of such works does not alter this provision, though other college policies may limit such use or require reimbursement to the college.

In cases where the college provides funding or facilities for a particular student research project that are in excess of those normally available to students working in that area, the college may choose to act as a sponsor for that research and therefore own the rights of such property. Where student research is subject to an agreement between an external sponsor and the college that restricts the disposition of rights to intellectual property, the rights will be handled in accordance with that agreement. If a student is employed by the college specifically for the purpose of working as a research assistant, the college retains the rights of such property.

Students are prohibited from publically disseminating any study or other materials given to them by faculty via internet websites, email, other electronic means, or hard copy.
Issues not covered by any of the above provisions are subject to the policies which apply to the intellectual property rights of faculty and staff at the college.
APPENDIX
Preparation of Master’s Thesis

Guidelines are a modification of the manuscript format used by the Journal of Forensic Sciences made suitable for use in a thesis.

Print out the manuscript on white 24 lb. bond paper, 8 1/2 X 11 inches, with 1 inch margins. Use double-spacing in all areas containing text. All text must be fully justified and the first line of a paragraph should be indented by 1/2 inch. Single-spacing may be used in the Title and Approval Pages, in individual entries in lists (i.e. Table of Contents), and in the legends of tables and diagrams. Number pages consecutively, beginning with the Approval Page. Small Roman numerals are to be used in manuscript components before the Introduction. Arabic numerals will begin on page 1 of the Introduction. All page numbers will be placed in the center at the bottom of each page. Unless otherwise designated, text must be in Times New Roman and 12 point.

Each manuscript component should begin on a new page, in the following sequence: title page, approval page, abstract and key words, acknowledgments, table of contents, list of tables, list of figures, introduction, survey of literature, material and methods, results (including statistics), discussion of results, significance of study and future considerations, references, and appendices.

Title Page

The title page should carry: (a) the title of the thesis in all capitalized letters (center justified and bold); (b) first name, middle initial, and last name of the author, with highest academic degree; (c) the following language:

A thesis submitted to the Graduate Faculty in Forensic Science in partial fulfillment of the requirements for the degree of Master of Science, Cedar Crest College. (center justified and bold)

(d) the year the thesis was approved.

All letters should be 14 point. The Title Page should not be numbered.

An example of a Title Page is provided.
THE EFFECT OF ACCELERANT AND PASSIVE HEADSPACE ANALYSIS OF DNA FROM SIMULATED ARSON EVIDENCE

by

Gina Dougherty, B.S.

A thesis submitted to the Graduate Faculty in partial fulfillment of the requirements for the degree of Master of Science, Cedar Crest College.

2011
Approval Page

The approval page should begin with the title of thesis (center justified, bold capital letters, 14 point) with the following language:

This manuscript has been read and accepted by the Graduate Faculty in Forensic Science in satisfaction of the thesis requirement for the degree of Master of Science.

(center justified, bold capital letters, 14 point)

After this statement, signatures with date signifying the approval of the thesis must be placed. The order of signatures is as follows: student’s primary mentor, second reader, and third reader. Below the signatures, Cedar Crest College must be typed in bold capital letters. The Approval Page should be numbered with “i” (centered at bottom of page). An example of an Approval Page is provided.
THE EFFECT OF ACCELERANT AND PASSIVE HEADSPACE ANALYSIS OF DNA FROM SIMULATED ARSON EVIDENCE

by

Gina Dougherty, B.S.

This manuscript has been read and accepted by the Graduate Faculty in Forensic Science in satisfaction of the thesis requirement for the degree of Master of Science.

__________________________________  ______________________
Lawrence Quarino, Ph.D.                   Date
Primary Mentor

__________________________________  ______________________
Jeet Bains, M.S.                           Date
Second Reader

__________________________________  ______________________
K. Joy Karnas, Ph.D.                     Date
Third Reader

CEDAR CREST COLLEGE

i
Abstract and Key Words

The abstract should be between 300 and 500 words. The abstract should briefly state the purposes of the study or investigation, basic procedures (selection of study subjects; observational and analytical methods), main findings (give specific data and their statistical significance, if possible), and the principal conclusions. Emphasis should be placed on new and important aspects of the study or observations.

Below the abstract, and identified as such, 3 to 10 key words or short phrases must be placed in bold. The first key word is forensic science; the second and subsequent words should properly categorize the work in increasing order of specificity. Frequently, the second key word represents a subfield of forensic science, e.g. forensic anthropology, forensic pathology, or DNA typing. In manuscripts on DNA typing, every locus involved in the study should be listed as a separate key word. Do not use abbreviations for key words, e.g., polymerase chain reaction, not PCR; gas chromatography-mass spectrometry, not GC-MS. The first page of the Abstract should be numbered with “ii” (centered at bottom of page).

The term “Abstract” at the top of the page should be centered.

Acknowledgments

The Acknowledgements section should include specific contributions that individuals make to the completion of the thesis. Acknowledgements can be given to individuals who provide technical and research assistance but they can also be personal in nature.

Acknowledgements of financial support should appear as footnotes to the title of the paper on the Title Page. The term “Acknowledgements” at the top of the page should be centered. The first page of the Acknowledgement page should be numbered with a lower case Roman numeral sequential to the last page of the Abstract (centered at bottom of page).

Table of Contents

Individual sections of the text should be identified in bold capitalized Roman numerals with the corresponding page number the section begins on. An example is provided:

V. Materials and Methods.................................................................p. 53

Subsections of individual manuscript components should be indented and listed with capitalized letters beginning with A and in italics. Additional subsections will be further indented and listed with Arabic numerals in normal font followed by subsections with small Roman numerals. Only the first letter of the first word in all subsections should be capitalized unless required to do so. An example is provided:
V. Materials and Methods.........................................................p. 53
   A. Spectroscopic methods.....................................................p. 55
      1. Mass spectroscopy.......................................................p. 56
      2. Infrared spectroscopy......................................................p. 65
         i. Analysis of spectra.................................................p. 65

Formatting of titles in the text of the thesis should be consistent with the Table of Contents.

The first entry in the Table of Contents is the List of Tables (listed as I.; page number is a small Roman numeral). Students may find the use of the Microsoft Table of Contents Formatting Tool helpful in preparing the Table of Contents.

The term “Table of Contents” should be centered at the top of the page. The first page of the Table of Contents should be numbered with a lower case Roman numeral sequential to the last page of the Acknowledgements (centered at bottom of page).

List of Tables (I)

A list of tables will be placed after the Table of Contents to provide accessible reference to the reader. Tables are listed in the order they appear in the thesis in the following format:

Table 1a – Distribution of SE33 alleles in a Caucasian Database from the Lehigh Valley Section of Pennsylvania..............p. 16

Tables placed in the appendix must also be listed. The first page of the List of Tables should be numbered with a lower case Roman numeral sequential to the last page of the Table of Contents (centered at bottom of page).

List of Figures (II)

In similar fashion, a list of figures (including graphs) will be placed after the List of Tables to provide accessible reference to the reader and are listed in the order they appear in the text. Figures placed in the appendix must also be listed. The word “Figure” will be designated as FIG. followed by the figure number in the list.

The first page of the List of Figures should be numbered with a lower case Roman numeral sequential to the last page of the List of Tables (centered at bottom of page).

Introduction (III)

Clearly state the purpose and the objectives of the thesis. Summarize the rationale for the study.

Survey of Literature (IV)
An exhaustive literature search of all previous work relevant to the topic of the study must be provided. Citations should include data and conclusions from the work being reported. Students electing to the term et al. in lieu of listing multiple authors on a source must place the term in italics and add a period after al.

Material and Methods (V)

Describe your selection of the observational or experimental subjects clearly. Identify the methods, apparatus (manufacturer's name and address in parentheses), and procedures in sufficient detail to allow other workers to reproduce the results. Give references to established methods, including statistical methods (see below); provide references and brief descriptions for methods that have been published but are not well known; describe new or substantially modified methods, give reasons for using them, and evaluate their limitations. Generally avoid the overuse of subheadings in the Methods section. Describe the methods and materials in narrative style, not in the style of a laboratory procedure handout.

Results (VI)

Present your results in logical sequence in the text, tables, and figures. Explanations of tables and figures should be provided in the text.

Describe statistical methods with enough detail to enable a knowledgeable reader with access to the original data to verify the reported results. When possible, quantify findings and present them with appropriate indicators of measurement error or uncertainty (such as confidence intervals). Also, provide data for significance testing where appropriate and state whether populations are normal or non-parametric.

Give details about randomization of samples. Describe the methods for and success of any blinding of observations. Report sample complications. Give numbers of observations. Report losses to observation (such as dropouts from an experimental trial or identification of outlier or spurious data). References for study design and statistical methods should be to standard works (with pages stated) when possible rather than to papers in which the designs or methods were originally reported. Specify any general-use computer programs used.

When data are summarized in the Results section, specify the statistical methods used to analyze them. Where appropriate, present statistical analysis in tables. Define statistical terms, abbreviations, and most symbols.

Tables

Number tables with Arabic numerals consecutively in the order of their first citation in the text. Tables should be placed in the document contiguous to their mention in the text. The term “TABLE” in the title must be capitalized followed by the table number. A hyphen should precede the title which must be in italics. Only the first word should be capitalized unless capitalization of a word is appropriate (such as a name). The table number title is
centered and must end with a period. Only the top line (titles for each column) should be given a vertical line. No other vertical or horizontal lines should be present. Place explanatory matter in footnotes, not in the heading. Explain in footnotes all nonstandard abbreviations that are used in each table. For footnotes use the following symbols, in this sequence: *, †, ‡, §, (¶, ‡‡, §§, ††, ‡‡‡). Footnotes are centered.

Identify statistical measures of variations such as standard deviation and standard error of the mean. Be sure each table is cited in the text.

An example of a proper table is provided:

**TABLE 55—Particle size distribution data for Ramapo sample #5.**

<table>
<thead>
<tr>
<th>Fraction</th>
<th>Weight (g)</th>
<th>Weight %</th>
<th>Cumulative Weight %</th>
</tr>
</thead>
<tbody>
<tr>
<td>#10*</td>
<td>0.0483</td>
<td>4.4972</td>
<td>4.4972</td>
</tr>
<tr>
<td>#35*</td>
<td>0.1687</td>
<td>15.7076</td>
<td>20.2048</td>
</tr>
<tr>
<td>#60*</td>
<td>0.0787</td>
<td>7.3277</td>
<td>27.5325</td>
</tr>
<tr>
<td>#120*</td>
<td>0.0806</td>
<td>7.5046</td>
<td>35.0372</td>
</tr>
<tr>
<td>#230*</td>
<td>0.0549</td>
<td>5.1117</td>
<td>40.1489</td>
</tr>
<tr>
<td>Silt</td>
<td>0.6428</td>
<td>59.8510</td>
<td>100.0000</td>
</tr>
<tr>
<td>Sum</td>
<td>1.0740</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*represents mesh size of sieve

**Figures**

Figures (including graphs and photographs) should be computer generated. Photographs and scanned figures should be at 300 dpi and saved as TIFF files. Figures must be numbered consecutively (in Arabic numerals) according to the order in which they have been first cited in the text. Figures should be placed in the document contiguous to their mention in the text. If a figure has been published, reference the original source. Each figure must be titled at the bottom of the figure. “Figure” must be referenced as “FIG.” followed by the number. A hyphen follows the figure number which precedes the title in italics. Only the first word is capitalized unless capitalization of a word is appropriate (such as a name). The figure number and title is centered and ends with a period. Letters, numbers, and symbols should be clear and even throughout. Axes on graphs must be clearly labeled with proper units of measurement. All detailed explanations including the title are placed below the base of the figure. Legends can be incorporated below the figure if appropriate. Xerox copies of figures and dot-matrix printer generated figures (including spectra, chromatograms, etc.) are not acceptable.

When symbols, arrows, numbers, or letters are used to identify parts of the illustrations, identify and explain each one clearly in the legend. Explain the internal scale and identify the method of staining in photomicrographs. Chemical structures utilized in figures must be generated with chemical drawing software. Reproductions from other published works are prohibited.
FIG. 18—K-S comparison of cumulative fraction plots for Cheesquake vs Rancocas.

Units of Measurement

Measurements of length, height, weight, and volume should be reported in metric units (meter, kilogram, or liter) or their decimal multiples. Temperatures should be given in degrees Celsius.

Abbreviations and Symbols

Terms and nomenclature in all disciplines should be in accordance with the current standards and lists approved or adopted by appropriate national or international committees or organizations, such as the International Anatomical Nomenclature Committee, I.U.P.A.C., I.U.B., the Enzyme Commission, the Committee on International Standardization of Gene Nomenclature (ISGN), etc.

Use only standard abbreviations. Generally, avoid abbreviations in the title, abstract and key words. The full term for which an abbreviation stands should precede its first use in text unless it is a standard unit of measurement. Liter(s) is abbreviated L, not l. Micro should be abbreviated with μ.

Discussion of Results (VII)
The writing of the Discussion is consistent with guidelines set forth by the International Committee of Medical Journal Editors (ICMJE).

The Discussion should emphasize the new and important aspects of the study and the conclusions that follow from them in the context of the totality of the best available evidence. Do not repeat in detail data or other information given in other parts of the manuscript, such as in the Introduction or the Results section. The Discussion should contain four parts:

I. Begin the discussion by briefly summarizing the main findings, then explore possible mechanisms or explanations for these findings;

II. Compare and contrast the results with other relevant studies;

III. State the limitations of the study;

IV. Explore the implications of the findings for future research and for professional practice.

References (VIII)

The heading of the reference list should be "References," and it should contain only published or in-press references cited by number in the text. Published abstracts (duly noted as being abstracts), printed manufacturers' protocols or instructions, and internet URLs may be validly cited as references. Personal communications and submitted manuscripts may be cited only if it is essential and a published or in-press reference is not available.

Number references consecutively using Arabic numerals in the order in which they are first mentioned in the text and formatted in the manuscript by enclosing with parentheses (i.e. Due to the same set of properties, GHB is also a drug of abuse—becoming a Schedule I Controlled Substance in the U.S.A. in 2000 (2).). Identify references in tables and figures also with Arabic numerals in parentheses. References cited only in tables or legends should be numbered in accordance with a sequence established by the first identification in the text of the particular table or figure. Within the reference list, number the references 1., 2., 3., etc.

References in the reference list should be in accord with Uniform Requirements for Biomedical Journals style. This style is based with slight modifications on the formats used by the U.S. National Library of Medicine in Index Medicus. The titles of journals should be abbreviated according to the style used in Index Medicus.

Examples of correct forms of references are given below.

Articles in Journals
1. **Standard journal article** (List all authors, but if the number exceeds six, give six followed by *et al.*)


As an option, if a journal carries continuous pagination throughout a volume, the month and issue number may be omitted.


2. **Organization as author**


3. **No author given**


4. **Article not in English**


5. **Volume with supplement**


6. **Issue with supplement**


7. **Volume with part**


8. **Issue with part**

9. Issue with no volume


10. No issue or volume


11. Pagination in Roman numerals


12. Type of article indicated as needed


13. Article containing retraction


14. Article retracted


15. Article containing comment


16. Article commented on

17. Article with published erratum


Books and Other Monographs

18. Personal author(s)


19. Editor(s), compiler as author


20. Organization as author and publisher


21. Chapters in a book


22. Conference proceedings


23. Conference paper


24. Scientific or technical report

25. *Dissertation*


26. *Patent*


**Other Published Material**

27. *Newspaper article*


28. *Audiovisual*


29. *Computer file*


30. *World Wide Web address or URL*


31. *Legal material*


32. *Map*


33. *Dictionary and similar references*


34. *Classical material*

Unpublished Material

35. In press


Appendix (X)

Tables and graphs of raw data too large or not necessary to place in the body of thesis can be placed in an appendix. All tables and graphs placed in the appendix must be clearly referenced to data contained within the body of the thesis. Multiple appendices may be assembled and designated as Appendix A, B, C,....With the permission of the student’s thesis committee, appendices can be stored on CD and fixed to the inside of the front binder of the thesis.
Procedural Guidelines for Graduate Research Seminars

Preparation

1. The student with approval of his or her primary mentor, will set the research seminar date and time. The date will be set at least three weeks in advance and the seminar evaluation committee will be given sufficient notice of the date and time.

2. The student’s research abstract shall be sent to the graduate seminar instructor at least 2 weeks in advance of the seminar date.

3. The graduate seminar instructor shall email the seminar abstract and announcement to all Cedar Crest College (CCC) staff, faculty and students. Flyers announcing the seminar should also be posted in plain view within the Miller, Science Center and Oberkotter (OBC) buildings.

Procedural Details

1. If at all possible, all three members of the student’s research committee must be present (the external member may be physically present or able to view the seminar remotely though videoconferencing). The research committee will serve as the committee to evaluate the seminar.

2. The two members of the student’s research committee from the Cedar Crest faculty MUST be present. Under no circumstance will the seminar be allowed to go forward if the two Cedar Crest faculty are not physically present. If the external reader is not present, a video recording of the seminar will be made and sent to the external reviewer for viewing. In the event that the second reader is not present, another faculty will serve as the third member of the evaluation committee. The substitute faculty member will be chosen by the student in consultation with the mentor.

3. The graduate seminar instructor shall photocopy and distribute a review form to the members of the evaluation committee.

4. The seminar shall last 60 minutes with the student speaking for 45-55 minutes. The seminar evaluation committee reserves the right to deduct points from the seminar grade if the student does not stay within the required time frame. The extent of the deduction is at the discretion of the seminar evaluation committee.

5. The student shall consult the Cedar Crest College Master of Science in Forensic Science Student Handbook for presentation guidelines.

6. A formal question and answer period will begin at the close of the seminar. All members of the general attendance are encouraged to ask questions.

7. After the general question/answer period, the general audience and the candidate will be asked to leave the lecture room. The candidate is encouraged to escort his or her invited guests to the graduate resource room, or the OBC lobby, should the guests wish to remain on campus for an extended period of time. The candidate should then return and wait outside the lecture room for further instructions. During the candidate’s absence, the
seminar evaluation committee shall have the opportunity to discuss the merits of the candidate's research seminar. The evaluation committee may ask other faculty who attended the seminar to provide comment. After discussion, all individuals except the evaluation committee will leave the lecture hall.

8. The primary mentor will then summon the candidate back into the lecture room to answer any remaining questions posed by the seminar evaluation committee.

If external reader is present:

1. The student will be asked to leave the lecture hall in order for the evaluation committee to deliberate.

2. The seminar evaluation committee shall vote. The committee must arrive at a consensus. Possible outcomes of this vote are as follows:
   
   i. The candidate has passed his or her graduate research seminar without reservation. This decision indicates that the candidate fully complied with program presentation guidelines, including a subjective assessment of merit.
   
   ii. The candidate has passed his or her graduate research seminar with reservations. This decision indicates that the candidate failed to fully prepare for the seminar based on seminar duration, guidelines and/or merit. The evaluation committee at their discretion may suggest the remedial action to be taken.
   
   iii. The candidate has failed his or her graduate research seminar. This decision indicates that the candidate was woefully negligent in preparation for the seminar; a follow-up seminar must be rescheduled after consultation with the primary mentor. Failing the seminar a second time will result in the student being dismissed from the program.

3. After the vote, the primary mentor shall escort the candidate back into the lecture hall and formally announce the decision of the thesis review committee.

4. With input from the other evaluation committee members, the primary mentor is responsible for writing the review of the graduate seminar to be returned to the seminar course instructor and student within 7 calendar days.

5. The graduate seminar instructor shall incorporate the decision and review of the seminar evaluation committee into the candidate's seminar grade.

The external reader is not present:

1. The student or primary mentor must send the external reader the video recording of the seminar and a copy of the evaluation form used to evaluate the seminar.

2. The second reader must return the evaluation to the other three committee members within 10 days of the date of the seminar.

3. The 4-member evaluation committee will discuss the seminar via a conference call within 4 days of the return of the evaluation form. After deliberation, the committee will vote. The committee must arrive at a consensus. Possible outcomes of this vote are as follows:

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i. The candidate has passed his or her graduate research seminar without reservation. This decision indicates that the candidate fully complied with program presentation guidelines, including a subjective assessment of merit.

ii. The candidate has passed his or her graduate research seminar with reservations. This decision indicates that the candidate failed to fully prepare for the seminar based on seminar duration, guidelines and/or merit. The evaluation committee at their discretion may suggest the remedial action to be taken.

iii. The candidate has failed his or her graduate research seminar. This decision indicates that the candidate was woefully negligent in preparation for the seminar; a follow-up seminar must be rescheduled after consultation with the primary mentor. Failing the seminar a second time will result in the student being dismissed from the program.

4. After the vote, the primary mentor will notify the student and program director of the committee’s decision by email.

6. With input from the other evaluation committee members, the primary mentor is responsible for writing the review of the graduate seminar to be returned to the seminar course instructor and student within 7 calendar days of the decision of the committee.

7. The graduate seminar instructor shall incorporate the decision and review of the seminar evaluation committee into the candidate's seminar grade.
Guidelines for Projection of Seminar Presentation

1. Dark background and light text give good contrast and show up well in a darkened room. Avoid color combinations such as red and blue, yellow and green, etc.
2. Times New Roman is the recommended font style.
3. Do not use a font below 24 pt.
4. Limit a frame to a single idea or point.
5. Do not crowd the frame. Limit the number of text lines per frame to a maximum of seven.
6. Use simple graphs and illustrations with a minimum of captions. Avoid using thin lines, dots, dashes, or other specialty lines unless they are very bold and black.
7. All formatting must be approved by a faculty member designated by the program director.

Guidelines for Format of Seminar Presentation

Students should prepare a 60-minute presentation. References should be placed on slides at the point when they are discussed in the presentation. The presentation should follow the following outline:

1. Title slide
2. Introduction

The Introduction should include the goals and objectives of the study. The introduction should explain the purpose of the study and why it is important to forensic science. Students should allocate 5 minutes for this section.

3. Survey of Literature

Students should allocate 10 minutes to discuss all previous published work that provided background for the study. A history of the topic should be provided as well as how the current study will contribute to the body of knowledge in the subject area.

4. Methods

Students should discuss the methods, instrumentation and procedures used in the study without excess detail. Students should treat the audience in a manner similar to a scientific meeting and assume that the listeners are familiar with typical scientific techniques and procedures. Explaining a method in detail is only needed if it is novel and it is reasonable to conclude that it is not familiar to the audience. Students should allocate 10 minutes for this section.

5. Data Analysis and Discussion
Data should be presented in graphs or chart when possible. Tabulated data is often hard to read and difficult to follow and should be avoided if possible. If the presentation of tabulated data is necessary (such as in the case of some statistical testing), descriptive values (e.g. mean, confidence internals, levels of significance) should only be given. Students should explain in detail all methods of data analysis (including statistical analysis) and any conclusions that can be drawn. Students should plan on spending 25 minutes on this section.

6. Significance of Study and Future Considerations

Students should allocate 10 minutes discussing the significance of the study. Discussion should focus on a comparison with past work and how the current study extends and contributes to the subject area. The future impact of the study can be addressed and future areas of research identified.

8. Acknowledgements

Students should include one slide acknowledging specific contributions that individuals made to the completion of the thesis. Acknowledgements can be given to individuals who provided technical and research assistance but they can also be personal in nature.

Guidelines for Abstract Submittal and Meeting Presentations

1. No student will submit an abstract to a professional meeting without the approval from their mentor.

2. Posters and presentation slides used for conference presentations must be done three-weeks prior to the conference.

3. Mentors must approve the poster or presentation two-weeks prior to the conference.

4. A designated faculty member in charge of poster or presentation review must also approve the poster or presentation. Materials must be given to the designated faculty member two-weeks prior to the conference.

5. Posters must be sent to Print Services one-week prior to the conference.

6. Only abstracts on posters should be in paragraph form. All other sections must be bulleted.

7. Upon completion of the presentation, the student must submit a copy of the presentation and the meetings printed abstract or title listing to the program’s administrative assistant. This should also include the name of the conference, the location of the conference, and the date of the presentation.
Delta Delta Epsilon  
Forensic Science Honor Society  

CONSTITUTION  

ARTICLE I: NAME  

The name of this organization shall be Delta Delta Epsilon (ΔΔE) Forensic Science Honor Society hereinafter referred to as the Society.  

ARTICLE II: MISSION  

The mission of the Society is to function as an honor society for students and professionals of forensic science. The activities of the Society shall be designed to stimulate academic achievement, promote community understanding, and advance the fields of forensic science.  

Colleges and universities which grant baccalaureate or advanced degrees in one or more forensic science disciplines that support this mission may establish chapters with the Society. Undergraduate and graduate students and professionals of sound scholarship and character who support this mission may be elected to membership.  

ARTICLE III: INSIGNIA  

Section 1. The official emblem of the Society shall display the three capitalized initials of the organization (ΔΔE).  

Section 2. The colors of the Society shall be gold and blue although ribbons holding the chapter medallions may consist of university colors of the local chapter.  

ARTICLE IV: MEMBERS  

The Society is a membership corporation, with Active Members and Honorary Members as set forth below. Unless otherwise designated, all references to meetings of Members and other related provisions within this Article shall apply to both Active and Honorary Members.  

Section 1. Classes of Members. Individuals shall meet the following minimum criteria for membership. Any chapter, at its discretion, may establish higher criteria.  

A. Active Members. Undergraduate, Graduate, or Professional members shall be active members of the Society.  

1. Undergraduate Members. Undergraduate members shall be students enrolled in an undergraduate program at an institution where a chapter of Delta Delta Epsilon is located. In addition, Undergraduate members must also satisfy the following:
a. Shall be enrolled in or recently graduated from a Forensic Science degree program or a degree in a natural science offering a concentration in forensic science.

b. Have completed at least 37.5 percent of the total hours/credits required for the degree.

c. Have a minimum grade point average of 3.3 on a 4.0 scale and rank in the top 35% of their class.

2. Graduate Members. Graduate members shall be students enrolled in a graduate program at an institution where a chapter of Delta Delta Epsilon is located. In addition, Graduate members must also satisfy the following:

a. Shall be enrolled in or recently graduated from a graduate program in Forensic Science

b. Have completed 12 semester hours of graduate work or one full-term equivalency for one academic term used by the institution.

c. Have a minimum grade point average of 3.5 on a 4.0 scale

3. Professional Members. Alumni of collegiate chapters may become professional members if they meet the above criteria and elected to professional membership by the Chapter.

B. Honorary Members. Honorary membership may be given by a chapter and shall be persons who have made distinctive scholarly and research contributions to Forensic Science.

Section 2. Membership in the Society is open to qualified candidates including persons with disability, without regard to age, color, gender, national origin, race, religion, and/or sexual orientation.

Section 3. Privileges of Membership.

A. Active members shall have the right to vote, hold office, be elected as delegate to the Assembly of Chapters, be elected or appointed to committees of the Society and the chapters to which the members belong provided other uniform criteria are met, and shall have such other privileges as the Board of Directors shall determine.

B. Honorary members shall have all the privileges of active members except the right to vote, hold office, or serve on committees.
Section 4. If a member fails to pay chapter dues, fees, or assessments, active membership shall automatically terminate. A member may be reinstated by payment of required dues, fees, or assessments.

Section 5. A member desiring to resign from the Society shall submit such resignation in writing to their local chapter.

Section 6. Any member having resigned from membership may be reinstated upon application to their local chapter and upon meeting such uniform terms and conditions as may be established by the chapter.

Section 7. Membership in the Society may be suspended or terminated by the chapter for just cause. Sufficient cause for such suspension or termination of membership may be violation of this Constitution or any lawful rule or practice adopted by the Society or other conduct deemed by the Board of Directors to be prejudicial to the best interests of the Society. The chapter may adopt such rules as may be necessary to assure due process to the member. A member suspended or terminated for just cause shall not be entitled to return of dues.

Section 8. The amount of any national dues, fees, and assessments for any class of membership in the Society shall be established by the Board of Directors. Chapter dues will be determined by each chapter. The dues year shall be the same as the fiscal year, July 1 - June 30.

ARTICLE V: OFFICERS AND BOARD OF DIRECTORS

Section 1. The officers of this Society shall be the Chair, Vice Chair, and Secretary. To be eligible for any national office, a candidate shall be a member of the Council of Forensic Science Educators (COFSE) and be an active Society member or chapter adviser.

Section 2. The Chair, Vice Chair, and Secretary shall be appointed by the COFSE President.

Section 3. Officers shall hold their offices for two-year terms or until their successors are appointed.

Section 4. No member shall be eligible to serve more than three consecutive terms in the same office. A member having served more than half a term shall be deemed to have served a term. The term of office shall begin on March 1 following the COFSE annual meeting.

Section 5. Any officer may be removed for just cause. Sufficient cause for such removal may be violation of this Constitution or any lawful rule, practice, or procedure adopted by the Society or other conduct deemed by the Board of Directors to be prejudicial to the best interest of the Society.

Section 6. Should the office of Chair become vacant, the Vice Chair shall become Chair automatically, to serve for the unexpired term. A vacancy in any other office shall be filled by appointment.
Section 7. No member shall receive compensation for service to the Society, unless specifically authorized by the Board of Directors.

Section 8. The Board of Directors may authorize reimbursement of expenses incurred in the performance of their duties for the Society and prescribe procedures for approval and payment of such expenses.

ARTICLE VI: DUTIES OF OFFICERS

Section 1. The officers shall perform the duties prescribed by this Constitution and by the parliamentary authority adopted by the Society.

Section 2. The Chair shall preside at all meetings of the Board of Directors, and provide leadership of the Society on behalf of the members.

Section 3. The Vice Chair shall preside in the absence of the Chair and fill any vacancy in the office of Chair, recommend appointments for committee memberships to the Board of Directors and shall have such other duties as may be determined by the Board of Directors to accomplish Society priorities.

Section 4. The Secretary shall keep a record of all proceedings of the Board of Directors and of all decisions made by the Society, develop an annual summary of Society activities and accomplishments for inclusion in the Society history, provide leadership for maintaining the Constitution, and shall have such other duties as may be determined by the Board of Directors to accomplish Society priorities.

ARTICLE VII: MEETINGS

Section 1. The meeting of the Board shall be held commensurate with the American Academy of Forensic Science meetings in February each year.

Section 2. The Board shall be the policy-making body of the Society, subject to this Constitution. The Board may call an Assembly of Chapters which shall consist of the Board of Directors and one delegate from each collegiate chapter.

ARTICLE VIII: COMMITTEES

Section 1. Committees may be established by the Board of Directors. To be eligible for service on a national committee, a candidate shall be an active member of the Society.

ARTICLE IX: CHAPTERS

Section 1. Collegiate Chapters.

A. A chapter of the Society may be established in a college or university in the United States of America and its territories offering a baccalaureate or advanced degree as
defined in Article II. The institution shall be fully accredited by its regional accrediting agency, and the program shall meet uniform criteria determined by the Board of Directors.

B. International chapters may be established according to uniform criteria determined in Article II.

Section 2. Chapters in Good Standing. A chapter in good standing shall comply with the Constitution, shall meet uniform criteria determined by the Board of Directors, and shall be current in all financial obligations to the Society. The Board of Directors shall apply uniform criteria to determine those chapters which are not in good standing.

Section 3. Chapters Not in Good Standing.

A chapter shall be declared inactive by the Board of Directors in the event that (1) the institution at which the chapter is located fails to meet the requirements listed in Section 1 of this Article or (2) the chapter requests inactive status.

Section 4. Each chapter shall determine the number of meetings to be held during the year and report the same on the Chapter Annual Report.

Section 5. A chapter must have at least three elected officers representing the functions of President, Vice President, Secretary, Treasurer, and Editor. The elected officers shall be the members of the chapter Executive Committee.

Section 6. Collegiate chapters shall have chapter advisory councils. A Chapter Advisory Council shall consist of one or more members of the faculty of the institution. The Council may also consist of one professional member.

Section 7. Chapter dues shall be determined by the chapter.

Section 8. Chapter names shall be designated according to the Greek alphabet in order of chartering by the Board of Directors.

Section 9. Nomination of Members. Nominations and acceptance of collegiate members shall be made by the Chapter Advisory Council.

ARTICLE X: PARLIAMENTARY AUTHORITY

The rules contained in the current edition of Robert’s Rules of Order Newly Revisé shall govern the Society in all cases to which they are applicable and in which they are not inconsistent with this Constitution and any special rules of order the Society may adopt.

ARTICLE XI: AMENDMENT OF CONSTITUTION

A Constitution amendment approved by the Board of Directors and the Assembly of Chapters by majority vote may be adopted provided that the amendment has been submitted in writing to the chapters 120 days before the Board meeting. Input provided by any chapter should be considered in final deliberations.
Qualifications for a Career in Forensic Science

Introduction

Forensic science plays a crucial role in the criminal justice system. As an applied science, it requires a strong foundation in the natural sciences and the development of practical skills in the application of these sciences to a particular discipline. A forensic scientist must be capable of integrating knowledge and skills in the examination, analysis, interpretation, reporting, and testimonial support of physical evidence. A properly designed forensic science program should address these needs and strengthen the student’s knowledge, skills, and abilities in these areas. A combination of education and practical training can prepare an individual for a career in forensic science.

Most of the Nation’s practicing forensic scientists are employed in crime laboratories associated with law enforcement or other government agencies. Forensic scientists come to the profession with diverse undergraduate science degrees. They also may go on to earn graduate degrees. This document contains suggestions for model programs in forensic science at both the undergraduate and graduate levels. A combination of personal, professional, and academic criteria will influence a prospective forensic science examiner’s suitability for employment.

Government entities’ hiring processes are driven by civil service regulations or collective bargaining agreements that are specific to the branch of government, State, or locality. Private laboratories have their own hiring processes. The hiring process may include written and practical tests, phone interviews, and one-on-one personal interviews conducted by a panel. New employees may be hired provisionally or go through a probationary period. Provisional employment offers may be revoked either before or after reporting for duty.

Model Candidate

A model candidate for all forensic science practices possesses personal integrity, holds a baccalaureate degree (at a minimum) in the natural sciences, and has additional KSAs that fulfill the recommendations set forth in this Guide.

Personal characteristics

Because forensic science is part of the criminal justice system, personal honesty, integrity, and scientific objectivity are paramount. Those seeking careers in this field should be aware that background checks similar to those required for law enforcement officers are likely to be a condition of employment. The following may be conducted and/or reviewed before an employment offer is made and may remain as ongoing conditions of employment (this list is not all inclusive):

- Drug tests.
- History of drug use.
- Criminal history.
Personal associations.
- Polygraph examination.
- Driving record.
- Past work performance.
- Credit history.
- Medical or physical examination.

Personal candor in these areas is critical. In addition, an individual’s history of community service and outside activities may also be considered.

Academic qualifications

Forensic scientists need to have a strong fundamental background in the natural sciences. For example, new hires who analyze drugs, DNA, trace, and toxicological evidence in forensic science laboratories typically have a degree in chemistry, biochemistry, biology, or forensic science from an accredited institution. Although forensic scientists involved in the recognition and comparison of patterns (such as latent prints, firearms, and questioned documents) historically may not have been required to have a degree, the trend in the field is to strengthen the academic requirements for these disciplines and require a baccalaureate degree, preferably in a science. The academic qualifications required for some of the emerging disciplines, such as digital evidence, are currently being defined and will be published by the appropriate groups. Achieving the appropriate academic qualifications is discussed in greater detail later in this Guide.

Copies of diplomas and formal academic transcripts are generally required as proof of academic qualification. Awards, publications, internships, and student activities may be used to differentiate applicants.

Claims in this regard are subject to verification through the background investigation process.

Professional skills

A variety of skills are essential to an individual’s effectiveness as a forensic science professional, including:
- Critical thinking (quantitative reasoning and problem solving).
- Decision making.
- Good laboratory practices.
- Awareness of laboratory safety.
- Observation and attention to detail.
- Computer proficiency.
- Interpersonal skills.
- Public speaking.
- Oral and written communication.
- Time management.
- Prioritization of tasks.

For some of these skills, systematic tools are available that may be used to measure skill or proficiency at or after the time of hire.

Model Career Path for Forensic Scientists

A model career path for a forensic scientist begins with formal education and continues with training, postgraduate education, certification, and professional membership. Exhibit 1 depicts stages of a career path in forensic science.
Implementation: Keys to a Career in Forensic Science

Pre-employment preparation

Competitive candidates can demonstrate the knowledge, skills, and abilities that establish their readiness for a forensic science position. These KSAs may include areas important to all potential forensic science practitioners, including but not limited to quality assurance, ethics, professional standards of behavior, evidence control, report writing, scientific method, inductive and deductive reasoning, statistics, and safety. Documentation of coursework and practical experiences involving these KSAs can significantly enhance the objective information available to an agency evaluating potential new hires.

On-the-job training

After hire, on-the-job training by the hiring agency is common. This initial training is generally completed within 6 months to 3 years of the date of hire, depending on the trainee, agency, and forensic science specialty. Some specialties have established peer-based objective standards adopted throughout the field, while others vary from agency to agency.

Certification

Accreditation applies to forensic science laboratories, whereas certification applies to analysts or examiners. Individuals whose competencies have been certified by an independent, peer-based, appropriately credentialled certifying body are highly desirable to employers.
Outstanding laboratories seek certification from an organization that is accredited by the Forensic Specialties Accreditation Board or another program that is based on nationally or internationally recognized standards (see appendix C). A credible certification program requires a meaningful evaluation of credentials, examination, an ethics component, and periodic recertification. Recertification requires a person to undergo a minimum amount of continuing education and may require demonstration of continued competency. Certification has been used by some employers as a prerequisite for employment and/or advancement, and it may enhance an individual’s credibility as an expert witness.

Professional involvement
While casework is the primary focus of a forensic scientist, he or she can also strive to advance the profession. This may be accomplished through professional involvement: research; mentoring; teaching; and participating in professional organizations, community outreach, publishing, and other professional activities.

Summary
A strong educational background in the natural sciences, personal attributes such as honesty and integrity, and additional professional skills are necessary to prepare a candidate for a career in forensic science. In addition to formal academic education and employer-provided training, a level of self-motivated professional development, including certification and involvement in the field, provides tremendous growth opportunities for both experienced professionals and those entering the field.