

University of North Texas Health Science Center *at* Fort Worth
Graduate School of Biomedical Sciences

Department of Cell Biology and
Genetics

Master of Science Degree Program



FORENSIC
GENETICS

HANDBOOK 2008-2010

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FORENSIC GENETICS MASTER OF SCIENCE PROGRAM

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Program Description

Rapid advances and growth in the field of forensic genetics has created a demand for individuals with expertise and training in the areas of forensic DNA testing, statistical evaluation of DNA results and legal testimony on testing procedures, results and interpretations.

The Forensic Genetics graduate program is designed to offer a broad-based learning experience in forensic science with an emphasis on current and developing DNA technologies. The program was designed to meet all educational and many training requirements as outlined in the *National Quality Assurance Standards for Forensic DNA Testing Laboratories* adopted in 1998. The Master of Science degree requirements are met upon satisfactory completion of 58 semester credit hours (SCH) of course work, including six semester hours of an internship that culminates in a practicum report and public defense. In addition to completing selected components of the Graduate School's Integrative Core Curriculum, students in Forensic Genetics are trained in biostatistics, population genetics, several forensic DNA technology laboratory methodologies, and are prepared to accurately provide legal testimony on their work product. Thus, the program prepares individuals for careers in forensic DNA sciences, emphasizing the application of current methods and technologies to legal proceedings.

The master's program in Forensic Genetics will provide a strong foundation upon which to build a career. Upon completion of the program, graduates are prepared to become qualified DNA analysts and, later, after obtaining the experience required in the *National Standards*, individuals are qualified to serve as forensic DNA Technical Leaders. Graduates will also find the program helpful in building a foundation to pursue further studies at the doctoral level. Certain individuals interested in related investigative fields or practicing law might find the curriculum appropriate for their professional objectives as well.

Program Requirements

Each student is responsible for the completion of the requirements for the Forensic Genetics program according to the procedures that follow. Each item must be completed in the sequence and time period indicated. Curricula, courses and required forms are subject to revision at any time and should be obtained from the Graduate Advisor or Graduate School of Biomedical Sciences.

1. The Admission Committee for Forensic Genetics will review all applicants for acceptance into the Forensic Genetics degree program. A student must have Bachelor of Science degree and must meet the general requirements of the graduate school as described in the current graduate catalog. All applications must be completed and received into the Graduate School according to the deadlines on the academic calendar posted by the Graduate School. A student admitted into the Master of Science in Forensic Genetics program must enroll in the courses required in the program's degree plan (minimum 58

SCH) and meet a minimum of 24 SCH/year as required by the Graduate School of Biological Sciences. A minimum GPA of 3.0 must be maintained.

2. During the first Spring semester of a student's enrollment or earlier, the student will select a major professor and an advisory committee consisting of the major professor and two other graduate faculty involved in the Forensic Genetics program. In addition, a degree plan must also be filed with the graduate school at this time. The required forms may be obtained from the graduate advisor.

3. Following the completion of the Year 2 Spring curriculum (as outlined on the degree plan), the student will enroll in BMSC 5920 (6 SCH), the Internship Practicum. The student will complete a 6-8 week (40 hours/week) internship at a forensic laboratory previously approved by the advisory committee. The student is responsible for housing during the internship and transportation to and from the site. During this time, the student will learn how to perform the duties expected of the particular task assignment as directed by a supervising scientist from the internship site. The student will not receive a stipend or other monetary compensation for the internship.

4. A formal plan describing the task to be accomplished during the internship must be submitted and approved by internship mentor and student's advisory committee 1 week after starting the internship. See *Guidelines for Internship Project Proposals* for information on proposal format and requirements.

5. Students will present their work as both an oral and written report. The oral presentation will be open to the public and will then be followed by a private defense with the advisory committee. Students should coordinate the reservation of a seminar room with the Graduate School office no later than two (2) weeks into their internship. The student must submit a first draft of their Internship Practicum Report to the major professor no later than two (2) weeks prior to the public defense for review. The major professor must approve the Internship Practicum report prior to the student submitting it to committee members.

6. Following acceptable revision, the student will distribute a copy of Internship Practicum report to the advisory committee no later than one (1) week prior to the public defense date. The internship mentor may participate in the private defense if he/she desires. The committee will either approve/or not approve the work of the internship and the report. If disapproved, the student must revise the report or repeat the practicum at the discretion of the committee. The major professor together with the other members of the committee will assign a letter grade to the practicum. A copy of the approved report must be submitted to the graduate school before graduation in accordance with the graduate school rules and time limits for the Master's thesis.

7. It is strongly suggested that the student and major professor communicate on a regular basis to review the student's progress during the practicum.

Typical Curriculum

The following curriculum is required for all students enrolled in the Forensic Genetics program:

			SCH
Year 1			
Summer 1			
CGEN	5510	Forensic Laboratory Quality Assurance	1
BMSC	5200	Biostatistics for Biomedical Sciences	4
FALL			
BMSC	5600	Principles of Biochemistry, CORE I	4
BMSC	5610	Molecular Cell Biology, CORE II	4
CGEN	5600	Current topics in Forensic and Molecular Genetics	2
BMSC	5960	Biomedical Ethics	1
SPRING			
BMSC	5710	Immunology and Microbiology, CORE IV	3
CGEN	5600	Current topics in Forensic and Molecular Genetics	2
CGEN	5300	Population Genetics	3
		Electives	3
Summer 2			
CGEN	5050	Methods in Forensic Molecular Biology	4
Year 2			
FALL			
CGEN	5310	Genetic Data Analysis	4
CGEN	5100	Biological Evidence Evaluation	4
CGEN	5600	Current topics in Forensic and Molecular Genetics	2
		Electives	2
SPRING			
CGEN	5200	Expert Testimony in Forensic Science	3
CGEN	5600	Current topics in Forensic and Molecular Genetics	2
CGEN	5950	Forensic Anthropology	3
CGEN	5800	Blood Spatter Analysis	1
Summer 3			
BMSC	5920	Laboratory Internship Practicum	6

Course Descriptions

The following courses are specific to the Forensic Genetics Program. Course titles followed by an asterisk (*) indicate required courses.

5050. Methods in Forensic Molecular Biology *

4 hours. An intensive laboratory course designed to give student experience and expertise in the basic molecular biology techniques currently utilized in forensic DNA analysis. Techniques will include multiple methods of extraction of nucleic acids from various sources; DNA quantitation methods; design and process of PCR amplification; agarose gel electrophoresis; capillary electrophoresis theory and methods; analysis of microsatellite DNA; mitochondrial DNA sequencing and analysis; single nucleotide polymorphism analysis methods. Offered each Summer.

5060. Forensic Biology: The History and Science of Human Identification

2 hours. This course is open to all graduate students but is specifically intended for first year students in the Forensic Genetics program. There are no prerequisites but familiarity with concepts in immunology protein biochemistry and genetics are helpful. The focus of this course is to familiarize the student with the science and history of human identification and analysis of biological evidence prior to the advent of PCR-STR analysis. The course will cover the use of science to analyze evidence associated with crimes from the early 19th to the later part of the 20th century. Topics to be covered include identification and speciation of bloodstains, forensic serology and bloodtyping, electrophoretic analysis of serum proteins and red cell alloenzymes, the science and genetics of fingerprint identification, anthropometry and the Bertillion system of personal identification. RFLP DNA Analysis and the early use of PCR technology. This course will not only cover the science and development of the various analytical methods and assays used, but will also cover the first use of those technologies in crime solving and the criminal justice system. This course will also be used to serve as an introduction to concepts in population genetics, electrophoresis, immunology, molecular biology, criminal investigations and the intersection of law and science that students will need in their future coursework and careers.

5100. Biological Evidence Evaluation *

4 hours. Course topics include collection and preservation of biological evidence, chain of custody, evidence screening for biological components (blood, seminal fluid, saliva, hairs, etc.), presumptive and confirmatory testing, and an overview of historical testing procedures. Training will also include DNA extraction procedures, RFLP, ASO and STR analysis. Offered each Fall. Prerequisites: CGEN 5050, concurrent enrollment in CGEN 5310.

5101. The Applications of Y-Chromosome Analysis in Forensic and Genealogical Investigations

2 hours. This course is specifically designed as an elective for second-year students in the Forensic Genetics discipline. The purpose of this course is to introduce the student to the specialized field of Y chromosome analysis and its use in human molecular identity

testing. Lecture material will include the following: biology, evolution and genetics of the Y chromosome, Y STR and Y SNP genetic markers, use of the Y chromosome in evolutionary, anthropological and forensic studies, statistical interpretation of Y-chromosome test results and validation of Y STR kits in forensic testing laboratories. The laboratory portion of this course will be concurrent with the laboratory portion of CGEN 5100. It will include the DNA extraction of mock case samples that would be appropriate for Y STR testing, PCR amplification, and genetic analysis of those samples using commercially available Y STR kits. Prerequisites: CGEN 5050, concurrent enrollment in CGEN 5100.

5200. Expert Testimony in Forensic Science *

3 hours. This course is intended to provide students with training in forensic testimony in the courtroom. Students will be required to provide testimony in a moot court setting. Discussions of admissibility standards, visual aids and trial preparation will be covered. Offered each Spring.

5300. Population Genetics *

3 hours. Course topics will include the evaluation and characterization of genetic and phenotypic variation, population substructure, selection and random drift models, molecular processes of genetic change, quantitative genetics, and processes and modes of speciation, and organismal zoogeography. Offered each Spring.

5310. Genetic Data Analysis *

4 hours. Methodological approaches to evaluating genetic data for population analysis, phylogenetic analysis, and genetic evaluation of quantitative trait loci. Emphasis on the statistical evaluation of microsatellite DNA, SNP panels and DNA sequences as applied to forensic DNA evaluations. Several software packages will be utilized for processing diploid and haploid genetic data sets. Offered each Fall. Prerequisite: CGEN 5300 or prior approval from course director.

5400. Non-Human Forensic Genetics

3 hours. Course content and methods will concentrate on identification of biological evidence that is from non-human sources. Emphasis on biological methods for identifying and individualizing materials from vertebrate organisms of economic and environmental concern.

5500. Forensic Laboratory Quality Assurance *

1 hour. Principles of quality assurance, current industry standards for quality systems in forensic DNA and other forensic disciplines. Creating, maintaining and improving quality systems.

5600. Current Topics in Forensic and Molecular Genetics *

1 hour. Seminar course in which new and advanced methods in the genetic evaluation of biological forensic evidence will be discussed to expand the training of students in the Forensic Genetics program and students interested in clinical genetics. Topics to be discussed will include statistical analysis, microarray technology, bioinformatics,

genomics and legal testimony. Offered each Fall and Spring.

5700. Forensic Hair Analysis

1 hour. Introduction to the microscopic analysis of hair for forensic evidence evaluation. Offered each Spring.

5800. Blood Spatter Pattern Analysis *

1 hour. Introduction to the analysis of blood spatter patterns for forensic evidence and crime scene evaluation. Offered each Spring.

5950. Forensic Anthropology *

3 hours. Human identification techniques with emphasis on identification from human skeletal remains. Fundamental biology of osseous and dental tissues; forensic botany and entomology; genetics of human variability; serotyping; HLA typing; analysis of hair and dermatoglyphic lines; DNA fingerprinting.

6100. Mitochondrial DNA Analysis

2 hours. Laboratory course covering the analysis and interpretation of mitochondrial DNA sequence data currently used to augment forensic DNA investigations.
Prerequisites: CGEN 5050, 5100, and 5310 or approval of course director.

Program Specific Information

Timeline

The Master of Science in Forensic Genetics program was developed as a two-year curriculum. Students accepted into the program enter as a cohort and progress through the program together. Classes begin in a Summer semester and students typically complete the program in 24-26 months. The program is structured in such a manner that each course builds background knowledge and specific skills required in the next course. Classes must be taken in the order and semester designated in the curriculum due to the capacity constraints of the training laboratories.

Students may transfer into the program from other disciplines in the Graduate School of Biomedical Sciences pending the availability of space in the current class. Students transferring into the program will be placed in the appropriate cohort depending on the courses they have taken and semester of transfer. Transferring students may require more than the typical 24-26 months to complete the program.

Core Curriculum Courses

Students in the Forensic Genetics program take three of the five available Core Curriculum courses offered by the Graduate School of Biomedical Sciences. All graduate students are expected to complete the core requirements described for their discipline. The integrative biomedical sciences curriculum is designed to provide a broad background in biochemistry, microbiology, molecular biology, cell biology, immunology, pharmacology, and physiology. Students in the Forensic Genetics program are required to take the Core Curriculum courses that focus on Biochemistry, Molecular Biology, Cell Biology and Immunology. These course topics are mandated for forensic DNA analysts and technical leaders by the *National Quality Assurance Standards for Forensic DNA Testing Laboratories*. Descriptions of the three required Core Curriculum courses are listed below:

5600. Integrative Biomedical Sciences I: Principles of Biochemistry.

4 hours. A broad introduction to the fundamentals of biochemistry, especially those relating to thermodynamics, molecular pathways and regulation. Discussion of important techniques that contribute to our present understanding of biochemistry. Prerequisite: Concurrent enrollment in BMSC 5600 or consent of the department.

5610. Integrative Biomedical Sciences II: Molecular Cell Biology. 4 hours. The fundamentals of cell and molecular biology, concentrating on understanding of the experimental basis of these disciplines as well as the current state of knowledge. Prerequisite: Concurrent enrollment in BMSC 5610 or consent of the department.

5710. Integrative Biomedical Sciences IV: Immunology and Microbiology.

3 hours. A general exploration of basic concepts of immunology, microbiology and virology including study of genomics, proteomics and gene therapy. Prerequisites: BMSC 5600, 5610, concurrent enrollment in BMSC 5700 or consent of the department.

All students in the Forensic Genetics program are required to participate in weekly study group sessions while enrolled in the Core Curriculum courses. Active participation in the study group has shown a strong correlation with successful completion of the Core Curriculum courses. A meeting room will be arranged every long semester for student usage. Students experiencing difficulty in the Core Curriculum courses are highly encouraged to meet with the Graduate Advisor as soon as possible. Peer Tutoring programs are also available through Academic Support Services at: 817-735-2409 or 817-735-2407, or visit their website at: www.hsc.unt.edu/departments/Oasis/.

Current Topics Course

All students in the Forensic Genetics program are required to enroll and participate in the Current topics in Forensic and Molecular Genetics course (CGEN 5600) during each Fall and Spring semester. First year students will be responsible for selecting a recent journal article relevant to the field of forensic genetics and presenting a synopsis and critical review of the data/methods presented in the article.

Second year students will participating in a more advanced form of the seminar course to better prepare them in the art and process of scientific writing and presentation of technical materials relevant to the discipline. Over the course of the Fall and Spring semester, students will research and prepare a review article in a focus areas that will be specified that semester. Students will select a “seed” article, which is presented to the class during the Fall semester. In the presentation, students must specify which areas of paper pose interesting questions deserving a more thorough treatment.

Using the seed article that was selected, students will be required to perform a thorough literature review of the topic using primary sources and preparing a manuscript following guidelines for Review Article manuscripts as used in the discipline. The *First Draft* will be due December 1st in the Fall Semester. The manuscript will be reviewed and edited by your major professor and returned for revision. A second draft will be due February 1st of the Spring Semester. Both the first and second drafts must be submitted at that time. If needed, additional editing will be suggested and a third draft of the manuscript must be submitted by the end of the semester.

During the Spring semester, students must prepare a comprehensive PowerPoint presentation based on the review article, which in essence can serve as a lecture on the “state-of-knowledge” on the chosen topic. The presentation should be structured so that the topic is first introduced and developed, then discussed in detail using materials from the review, and culminate in a detailed discussion of issues surrounding your topic. The presentation should be approximately 30 minutes in length when presented.

Second year students are required to participate in the journal club meetings by reading the various articles selected by first year classmates and asking questions.

Note: Doctoral students taking this class for credit must participate in the “second year” curriculum each year.

The Roles of the Major Professor and Student’s Advisory Committee

During the first Spring semester of a student’s enrollment or earlier, the student will select a major professor and an advisory committee consisting of the major professor and two other graduate faculty involved in the Forensic Genetics program. In addition, a degree plan must also be filed with the graduate school at this time. The required forms may be obtained from the graduate advisor.

Students wishing to modify their degree plan may do so with the consent of their major professor and the graduate advisor. A final degree plan representing the courses taken during matriculation must be on file with the graduate school office before completion of the internship practicum.

The general roles of the major professor, advisory committee and internship mentor are outlined below.

Major Professor

Each student will select a major professor during the spring of the first year. The student should be made to feel that he/she may come to this mentor for advice/mentoring as needed. The major professor serves as chair of the advisory committee and thus, is responsible for overseeing the professional development of the student and assisting the student to optimize his/her entire educational experience. It is also the major professor’s responsibility to review the student’s research/practicum proposal and practicum report before these go to the entire advisory committee and give feedback on each to the student in a timely manner. The student will then use this feedback to revise the document in question before handing it to the other members of the committee.

The major professor gives the interim satisfactory/unsatisfactory practicum grades (when applicable) after consulting with the internship mentor and, along with the rest of the advisory committee, determines the final letter grade for the internship practicum.

Advisory Committee

Each student will select two additional Forensic Genetics faculty members for their advisory committee. The student may select other members of the graduate faculty of UNTHSC to serve as one of the committee members if desired. The *Internship Mentor* may also be included on the committee*, if he/she is not already one of the three required individuals.

The advisory committee approved the student's degree plan, guides the student in determining internship goals, and approves the research/internship proposal. The advisory committee reviews the Research Proposal and final Internship Practicum Report, administers the final defense examination for the degree, approves the internship practicum report before submittal to the graduate school and determines the final grade for the internship.

* Individuals at the internship site with master's degrees or higher may be designated Adjunct Category I graduate faculty in order to become members of the advisory committee. This process must be initiated a minimum of three (3) months prior to the internship period.

Internship Mentor

The student will work under the guidance and direction of an Internship Mentor at the internship site and thus, the Internship Mentor plays a critical role in the success of the internship experience. The Internship Mentor will be the immediate supervisor of the student at the internship site. This individual will be an employee of the internship site. In rare cases, the internship mentor and the major professor may be the same individual.

The Internship Mentor may be a member of the Advisory Committee if he/she has the credentials to receive Category I Adjunct Graduate Faculty status. If the Internship Mentor is not a member of the Advisory Committee, he/she may, nevertheless, attend all committee meetings and have input into all decisions regarding the Internship Practicum. The Internship Mentor will sign the flysheet of the thesis in a space indicated for the Internship Mentor.

The Internship Mentor provides oversight and guidance while the student is being trained. At no time during the internship will the delegation of tasks constitute a delegation of responsibility. The Internship Mentor remains responsible.

Laboratory Policies and Expectations

There are two student laboratories in which the Forensic Methods, Biological Evidence Evaluation, Y STR and Mitochondrial DNA Analysis courses are taught. One of the laboratories is designed as a "wet lab". This is where the student will perform manual and visual evidence examination, presumptive and confirmatory testing, DNA Extraction and PCR set-up. This laboratory will also accommodate microscopic hair examination and bloodstain pattern analysis experiments. The second laboratory is used post-PCR analysis, Real-Time PCR, Capillary Electrophoresis and computers with software dedicated to genetic analysis, DNA sequence analysis, DNA microsatellite analysis and statistical analysis of forensic DNA tests.

Each student is will be trained in meticulous note-taking and is expected to keep an instructor approved laboratory notebook. The student will also be supplied with

worksheets and forensic testing protocols to be used in conjunction with the laboratory exercises and assignments. The student will have 24/7 access to all laboratories.

Grades are determined by a combination of completion of assignments, laboratory quizzes, student participation and proper laboratory notebook maintenance. 100% student participation is mandatory.

Expert Testimony

This is the most crucial course offered in this program. This course distills all the information the student has been exposed to during the Forensic Genetics program and instructs the students into communicating that knowledge to a lay public comprised of lawyers, law enforcement and jurors. Each student will develop a curriculum vita in preparation for courtroom testimony exercises. The student will also learn about ethics in forensic science.

The final student assignment is undergoing a moot court exercise. This is considered to be the student's oral qualifying examination. Grading is determined by completion of one exam, class participation, class exercises and mock court performance. 100% participation is mandatory.

Internship Practicum

Function and Grading of the Student Internship Practicum

The Internship Practicum provides a hands-on training experience for the graduate student who has been trained in the technologies used in forensic DNA laboratories. The goal is two fold: Allow the student some perspective of the operations of a crime laboratory and provide the laboratory with a capable individual to perform validation studies, special projects or other tasks that laboratory needs performed. The internship is a required course (BMSC 5920, 6 SCH) for completion of the Forensic Genetics Master of Science degree. The student will receive either an "Unsatisfactory (U)" or a "Satisfactory (S)" for all semesters enrolled in the practicum, until the semester the student graduates. At the end of this semester, when the student completes all requirements for the practicum, he/she will receive a letter grade. Only this letter grade will contribute to the overall GPA. The U/S grades will not be figured into the overall GPA.

The internship is intended to take place at an approved off-campus site such as a State or Local Crime Laboratory, Federal agency or private corporation. In some rare cases a student may conduct their internship practicum on-campus, either within the laboratories of the UNT Center for Human Identification.

Students will be expected to provide for their own transportation and housing needs during the internship experience. The health science center does not offer any remuneration to the student when he/she is enrolled in BMSC 5920 and the student

should not expect to be paid as an intern. If an internship site offers a stipend, the site will determine the amount and conditions. All interactions concerning the stipend will take place between site administration and the student. No student should consider that the internship site has any obligations to pay, hire or in anyway retain a student during or after the internship or after graduation. If the site offers to remunerate the intern while he or she is registered in BMSC 5920, the student will not attempt to collect unemployment compensation after completion of BMSC 5920 or the master's program.

Duration and Timeline of the Internship

The internship takes approximately 6 – 8 weeks (40hrs/week) during which the student will be working under the direct supervision of the *Internship Mentor*. If the student does not complete the practicum in the time frame stipulated in his/her program, the student will be required to register for additional hours of BMSC 5920. During the practicum, students will be available 5 days a week, usually from 8:00 a.m. until 5:00 p.m., however the exact work schedule will be determined at each internship site.

The process of setting up an internship must be initiated by the start of the last Spring semester of the student's degree program. Many governmental crime laboratories require interns to go through various levels of background checks prior to being accepted. Some laboratories have formalized programs for applying for an internship with prescribed application deadlines. If a student is interested in performing their internship at a specific laboratory, it is their responsibility to determine the process that needs to be followed to apply for an internship at that facility. The student's advisory committee is a valuable resource for internship site suggestions and contact information for the laboratory directors.

The timeline for the internship will depend upon the internship site, student's degree plan, and nature of the internship project. Due to the relatively short nature of the internship period students must carefully plan their use of time and meet specific deadlines. A typical internship timeline is presented below.

January – March	Contact laboratory site to set up internship
April – May	Discuss nature of internship project with mentor
May 1 st	File Intent to Graduate form with Graduate School
mid-May	Begin Internship
June 1 st	Submit Internship Proposal
mid-July	Submit Practicum Report to Major Professor
Aug 1 st	Defense complete
Aug 8 th	Deadline for submissions to Graduate School

Once a student has enrolled in BMSC 5920, he/she must maintain continuous enrollment until the Advisory Committee and graduate school has accepted the final internship report. Failure to maintain continuous enrollment will either invalidate any previous BMSC 5920 credit or will result in the student's dismissal from the degree program, unless granted an official leave of absence by the graduate dean for medical or other

exceptional reasons.

Activities during the Internship

During the internship, the site administrator(s) will assign the student responsibilities that have been previously agreed upon and approved by the student's major professor and advisory committee in the *Research/Practicum Proposal*. The student will work under the guidance and direction of an *Internship Mentor* at the internship site. This individual will be an employee of the internship site. Details about the components and formatting of the *Research Practicum Proposal* are outlined in a separate section in this handbook.

As part of the internship, the student will be required to keep an accurate laboratory notebook of her/his activities. It is strongly recommended that the notebook be of the variety which produces a duplicate copy. All photographs, images and external material added to the notebook must be also duplicated. The laboratory notes should be prepared in the manner discussed during the laboratory courses of this program. An accurate index/log of the notebook's contents must be included. The *Internship Mentor* will review and sign-off on the log each week. The notebook must be submitted to the major professor with the first draft of the internship practicum report and will be reviewed by the major professor in the course of evaluating the report. The notebook will be made available to the advisory committee, if requested, during the student's private defense and their review of the final Internship Practicum Report. Either the original or a copy of the notebook must be provided to the internship site upon completion of the internship. The student may retain a copy of the notebook.

Proprietary Studies and Agreements

If a student is involved with a proprietary study, the exact nature of the reagent/devise, etc. under study will not be identified in either the lab notebook, practicum report or any other student-generated document, but will be designated by a code as approved by the *Internship Mentor*. The *Internship Mentor* will also be a member of the student's advisory committee and will review the practicum report to ensure that the confidentiality of the study under question will be maintained. In addition, before beginning the internship, the student and major professor will sign confidentiality agreements as required by the internship site.

The Internship Practicum Report

The Internship Practicum Report will consist of a detailed account of the activities performed during the internship as agreed upon in the research proposal. The students will be briefed before and during the internship as it relates to the required format. Previous examples can be consulted in Room EAD-824 or from their major professor. Please refer to Section "Guidelines for Final Internship Practicum Report and Defense" in this handbook.

Students must have their final draft submitted to their major professor a minimum of two (2) weeks prior to the intended defense date for review. The major professor will return to the student suggestions/corrections required to improve the practicum report. The major professor must approve the distribution of the practicum report prior to the student providing copies to the remaining committee members. Final drafts of the internship practicum report must be provided to the committee members and internship mentor no later than one (1) week prior to the defense date. If a student is unable to provide copies of the internship report to the major professor and/or committee members by the prescribed due dates, they must reschedule their defense for a later date.

The Oral Defense

The student must file an *Intent to Defend* form in the graduate school approximately one month before the date of the oral defense. Each student must present his/her practicum work to the public in a formal lecture and then defend it in front of the Advisory Committee in private immediately after the public presentation. The student should plan on a minimum 45 minute presentation, allowing an additional 15 minutes for questions from the audience. The student should plan for an additional 2 hours for the private defense. It is the student's responsibility to set up his/her oral defense and private defense. All members of the Advisory Committee must be in attendance. The student must contact Ms Amanda Griffith in the graduate school to set up a lecture room and advertise the oral presentation. This should be done at a minimum of two (2) weeks prior to the defense. In addition, the student must contact the graduate secretary in the Department of Cell Biology and Genetics to arrange for public advertisement of the defense seminar date and time.

Proposal Guidelines for Internship Practicum Projects

Many studies end in futility or waste considerable amounts of time and resources because the student begins the project with only a meager understanding of the area under consideration and no real plan or road map. To be successful, the student should have a detailed plan as well as an overall conceptualization of the study. For this reason, it is important for the student to begin the internship process as early as possible and discuss possible projects with the Internship Mentor well in advance of their arrival at the laboratory. This lead time also gives the student the opportunity to use the library resources at the health science center to begin gathering necessary literature for the introduction and methods sections of their proposal and practicum report. The student's major professor and advisory committee may also be consulted and in conference calls with the internship mentor a reasonable and well planned project can be constructed.

The proposal for the internship project allows the student to specify the problem/activities that will be pursued during the internship; to elaborate on the significance of the study to the particular laboratory and the field of forensic science; to review related literature; and outline the appropriate methodology employed in the study within a reasonable time-frame. It essence the proposal serves as a "road map" for the activities to follow. The student must prepare and submit the proposal to the advisory committee 1 week after starting the internship.

- I. **Summary:** Provide a few concise paragraphs that describe the laboratory where the work will be done, what the focus of the practicum work will be, what the project will accomplish for the laboratory, and what other general on-the-job training activities will be accomplished.
- II. **Introduction:** Provide a review of the literature that provides important insight into the project objectives to be met. The literature and arguments should be of critical importance for the reader to understand the challenge, give insight in similar methods, tools or software used and lead into providing understanding to the importance of the proposed project to the laboratory.
- III. **Specific Aims:** A concise and clearly written statement describing the focus and direction of the practicum problem, listing the specific aims and the means (tools) that will be applied to meet the objectives of the internship goals. Depending on the nature of the research this may consist of stating and testing a hypothesis.
- VI. **Materials and Methods:** Begin with an introduction to the internship laboratory and what methods are in use and equipment available.

Describe in detail the study design and processes that you will follow to complete the project during the time allotted. This section should include any of the following which apply: 1) procedures, software, data collection tools; 2) methods, data collection sampling techniques and analysis plan to be employed; 3) any new methods or tools that will be developed; 4) any populations that will be sampled (if applicable).

Develop a timeline for the process by which the project will be conducted including deadline dates and project milestones. This is best done in the form of a Gantt chart which should be included in the proposal. Templates for these charts are available online.

Describe any potential pitfalls that may arise and alternate means to approach the problem. And also describe any key factors that will limit your ability to interpret the data or interfere with the planned timeline for collection/analysis of the information.

- V. **Preliminary Data:** If available, publishable and applicable, preliminary findings, demonstration of methodology or preliminary tools etc. may be included. Very few proposals have this section.
- VI. **Bibliography:** List all references cited in the proposal using an accepted form of scientific citation. You will be required use the name system, e.g. (Miles et al,

2004) unless advised otherwise by your major professor. Be consistent! Unless the idea is totally your own, cite a source! Failure to do so is plagiarism!

There are several evidence-based full-text and abstracting services available through online computer services at the library. These databases can save the student an immense amount of time when seeking high-quality evidence-based information. Examples are: MEDLINE, PubMed and TRIP. If you've never used these services, ask a librarian for assistance. Use primary sources (books and journal articles) not information gathered from non-reviewed internet sites in your literature review.

NOTE: A major objective in writing a good proposal is that it completes approximately half of the Internship Practicum report! The student should read the requirements, consult examples for writing the practicum report and work closely with the Major Professor before beginning to actually write either the proposal or the final document. They are highly encouraged to ask assistance in the library for properly and efficiently conducting on-line searches and to use a citation software program such as END-NOTES, Stat-Ref or RefWorks.

Guidelines for the Final Practicum Report and Defense

Students must have their final draft submitted to their major professor a minimum of two (2) weeks prior to the intended defense date for review. The major professor will return to the student suggestions/corrections required to improve the practicum report. The major professor must approve the distribution of the practicum report prior to the student providing copies to the remaining committee members. Final drafts of the internship practicum report must be provided to the committee members and internship mentor no later than one (1) week prior to the defense date. If a student is unable to provide copies of the internship report to the major professor and/or committee members by the prescribed due dates, they must reschedule their defense for a later date.

Three copies of the final practicum report must be bound for institutional use. These are distributed to the major professor, major department and the reference section of the Gibson D. Lewis Health Sciences Library. An additional copy is also required. This fourth copy will remain unbound in the library archives.

The internship report must be prepared for digital submission format according to the instructions in the Guidelines for Filing Theses, Internship Practicum Reports and Dissertations (available online at <http://hsc.unt.edu/education/gsbs> under Forms).

The following format for the main body of the Internship Practicum Report for Forensic Genetics students must be employed:

	Abstract
	Signature Page
	Title Page
	Acknowledgements
	Table of Contents
	Table of Figures and Tables
Chapter I:	Introduction
	Background and Literature Review
	Specific Aims
Chapter II:	Materials and Methods
	Site description
	Samples used
	Materials, kits, instrumentation
	Statistical analysis
Chapter III:	Results
Chapter IV:	Discussion
Chapter V:	Conclusions
	Literature Citations
	Appendix

An Appendix, if included, should be restricted to working documents prepared for the internship laboratory, i.e. protocols, worksheets, software code or instrument programming code. Raw data should not be included in the appendix, but sample information, electronic data, computer spreadsheets, software output and raw data from sequencers, must be submitted to both the major professor and internship mentor on a CD or DVD with the laboratory notebook.

Criteria for Internship Practicum Grade Assignments

The internship is an approved course (BMSC 5920) offered through the Department of Biomedical Sciences, Graduate School of Biomedical Sciences and is a requirement for the Forensic Genetics Masters Degree program. Six (6) semester credit hours (SCH) must be completed for the degree. The student will receive a letter grade following the completion of the oral presentation, private defense and submission of the final practicum report. This letter grade will contribute to the overall GPA. A student unable to complete their internship during the semester for which they enrolled in BMSC 5920 will receive either a U (Unsatisfactory) or S (Satisfactory) grade for that semester. This grade will be decided upon by the major professor and internship mentor. The U/S grades will not be figured into the overall GPA. Students must maintain continuous enrollment in BMSC 5920 for 6 SCH each semester until the oral presentation, private defense and final practicum report is submitted.

The final letter grade is a reflection of performance throughout the internship, public seminar, and private oral defense as well as quality of the final practicum report. The letter grade is determined by the entire Advisory Committee after conclusion of the defense.

- **Suggested rating scale for the final practicum semester grade:** *Exemplary* = A+; *Excellent* = A; *Above Average* = B+; *Average* = B; *Poor* = C; *Failing* = F
- **For the practicum grades prior to the last semester:** A “Satisfactory (S)” should reflect A/B work; An “Unsatisfactory (U)” indicates C and below.

Suggested Criteria

1. Attendance
2. Met all requirements in a timely manner, including filing of appropriate forms
3. Observed accepted standards of professional behavior, e.g. academic integrity, proper behavior in dealing with the public, dress etc.
4. Regularly and actively participated in the activities, both research and educational, during the internship experience
5. Commitment, drive, determination, perseverance
6. Creativity, imagination, in terms of problem interpretation, as well as project design
7. Technical ability
8. Awareness and understanding of pertinent literature
9. Effectively completes tasks
10. Technical writing ability
11. Ability to speak clearly and answer questions knowledgeably
12. Leadership qualities
13. Organizational skills (e.g. good record keeping and well prepared notebooks) and time management skills
14. Appropriate demonstration of independence
15. Overall depth of understanding of the practicum problem and its significance to the field of forensics
16. Attention to detail

Required Forms

Required Forms and Signatures

There are several Forms that must be completed and filed with the Graduate School office during the course of the program. Most of these can be obtained on the GSBS website and completed online at www.hsc.unt.edu (select Departments>Graduate School>Forms and Guidelines). The names and degrees of the individuals who will sign the form need to be TYPED IN under their respective signature lines, prior to printing the forms out and collecting the signatures.

Students, who include the Internship Mentor as a fourth Advisory Committee member, need to ADD a signature line on the forms for this additional member. With the exception of the Degree Plan and Designation of Advisory Committee forms, the student is responsible to obtain the signatures of their major professor, committee members, Graduate Advisor and Department Head or other individuals (if applicable) as indicated on the form. The Degree Plan and Designation of Advisory Committee forms will be completed with the assistance of the Graduate Advisor and will be submitted to the Graduate School office as a completed set. The signatures from the Dean, or GSBS office representative will be collected internally after the student drops off the forms. All forms are to be dropped off at the Graduate School Office.

Who signs where?

Graduate Advisor: John V. Planz, Ph.D.

GSBS Approval: Carla Lee

GSBS Office: Carla Lee

Graduate Dean: Jamboor K. Vishnawatha, Ph.D.

Department Chair or Division Head: Robert Wordinger, Ph.D.

Program Director: John V. Planz, Ph.D.

Required Forms

Master of Science-Degree Plan

Submitted before completion of 24 SCH, typically in early Spring of the first year. Form will be provided by the Graduate Advisor and student must review this form with their selected Major Professor before submitting it to the Graduate Advisor for completion.

Master of Science- Designation of Advisory Committee

Student submits this form with the Degree Plan to the Graduate Advisor after meeting with their selected Major Professor.

Master of Science- Research Proposal

Student collects all committee members' signatures, attaches approved final research proposal, and drops the documents off in the Graduate School Office for internal processing.

Declaration of Intent to Graduate

Form to be completed and filed by student in Graduate school Office after collecting required signatures. To be filed NO LATER THAN DATE listed on website for the semester in which student plans to graduate (typically this will be the Summer Semester).

Declaration of Intent to Defend

To be completed and dropped off in Graduate School Office by student, no later than 30 days prior to actual defense date.

Master of Science- Report of the Final Comprehensive Examination (Defense)

Student brings this form to the defense for Advisory Committee members to sign. Student must file this signed form with the Graduate School Office after the committee has assigned a Pass, Repeat or Fail grade, based on recommendation of all committee members. Student may turn in the signed form along with the other graduation materials.

Other forms may be included in the graduation packet obtained from the Graduate School Office. It is the student's responsibility that all required documents are submitted by their deadline.

FIRE – Forensic Investigation, Research & Education



Forensic Investigation, Research & Education was established as a student organization at the University of North Texas Health Science Center at Fort Worth on February 10, 2005. F.I.R.E. was established as a way to gain recognition for the Forensic Genetics students on campus. The objectives are to learn about various fields of Forensics through speakers, fieldtrips, and other educational activities, to establish a network of contacts in the field, to aid students in establishing a career path, and to increase communication between students interested in Forensics. At present, there are approximately 30 student members from the Graduate School of Biomedical Sciences and the Texas College of Osteopathic Medicine and several faculty and staff members.

F.I.R.E. is a highly active organization, participating in forensics conferences, educational opportunities, and community service. Since its inception, F.I.R.E. members have attended the American Academy of Forensic Sciences (AAFS) annual meetings in New Orleans, Seattle, and Hollywood, and regularly attend the Association of Forensic DNA Analysts and Administrators (AFDAA) summer and winter meetings in Austin. F.I.R.E. has also sponsored on-campus lectures on Expert Witness Testimony, Fingerprint Examination, Hair and Trace Evidence Analysis, Forensic Entomology, Ballistics, as well as Forensic Biology/DNA topics. F.I.R.E. is educating the local community about Forensics and DNA analysis through presentations and demonstrations at middle schools, high schools, and regional science fairs. In order to serve the community, F.I.R.E. members have volunteered at the UNTHSC Research Appreciation Day and organized a very successful clothing drive for Hurricane Katrina evacuees, as well as a canned food drive that benefited the Tarrant Area Food Bank.

All students in the Forensic Genetics Masters Program are strongly encouraged to join F.I.R.E. and be an active participant. Dr. Joseph E. Warren serves as the Faculty Advisor for the organization. Please visit our web site <http://www.hsc.unt.edu/fire/> or contact an officer at FIRE@hsc.unt.edu for more information.

Forensic Genetics Masters Program Handbook- Revision for 2008-2010 students

The health science center reserves the right to make changes at any time to reflect current board policies, administrative regulations and procedures, amendments by state law and fee changes. Information provided in this document is subject to change without notice and does not constitute a contract between the University of North Texas Health Science Center and a student or an applicant for admission. The institution is not responsible for any misrepresentation or provisions that might arise as a result of errors in preparation.