

# Course Change Request

## New Course Proposal

Date Submitted: 11/23/20 2:07 pm

Viewing: **FRSC 670 : Forensic Genomics**

Last edit: 11/23/20 2:07 pm

Changes proposed by: kcarisi

**Are you completing this form on someone else's behalf?**

Yes

### Requestor:

Name	Extension	Email
Mark Wilson	703-993-5071	mwilso47@gmu.edu

**Effective Term:** Fall 2021

**Subject Code:** FRSC - Forensic Science

**Course Number:** 670

### Bundled Courses:

**Is this course replacing another course?** No

### Equivalent Courses:

**Catalog Title:** Forensic Genomics

**Banner Title:** Forensic Genomics

**Will section titles vary by semester?** No

### Credits:

### In Workflow

1. **FRSC Representative**
2. **SC Curriculum Committee**
3. SC Associate Dean
4. Assoc Provost-Graduate
5. Registrar-Courses
6. Banner

### Approval Path

1. 11/24/20 12:08 am  
Kimberly Rule  
(kcarisi): Approved for FRSC Representative

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**Schedule Type:** Lecture

**Hours of Lecture or Seminar per week:** 4

**Repeatable:** May only be taken once for credit (NR)  
\*GRADUATE ONLY\*

**Default Grade Mode:** Graduate Regular

**Recommended Prerequisite(s):**

The successful completion of coursework in topics of Cell Biology, Statistics, Genetics, and Forensic DNA Analysis.

**Recommended Corequisite(s):**

**Required Prerequisite(s) / Corequisite(s) (Updates only):**

**Registrar's Office Use Only - Required Prerequisite(s)/Corequisite(s):**

And/Or	(	Course/Test Code	Min Grade/Score	Academic Level	)	Concurrency?

**Registration Restrictions (Updates only):**

**Registrar's Office Use Only - Registration Restrictions:**

**Field(s) of Study:**

**Class(es):**

**Level(s):**

**Degree(s):**

**School(s):**

**Catalog Description:**

This course will cover advanced principles and methods related to DNA typing in a forensic context. The course will review the current applications of DNA typing, and then address emerging methods and technological advances. The focus of the course will be on methods and techniques involved in Investigative Genetic Genealogy. A second focus of the course will be on how to properly interpret these data. Particular emphasis will be placed on how these emerging methods can advance the field of forensic DNA typing and lead to new capabilities in human identification. Students will gain an understanding of the capabilities and limitations of these emerging areas within forensic science, covering how they build on current practices. Data review and analysis from forensic DNA results will be included in the course.

**Justification:**

Justification (What has been proposed?): The Forensic Science Program has proposed a newly created course FRSC 670 Forensic Genomics which will be a 4 credit lecture hybrid course with a laboratory component focused on data analysis.

Justification (Why is this proposal necessary?): The proposed FRSC 670 Forensic Genomics will be an elective course for the established Forensic Biology Concentration within the Masters of Science in Forensic Science degree. This course is necessary to give graduate students more elective selections that relate directly to their concentration and to make them more marketable for employment purposes with this specific and unique knowledge base. Additionally, this course will satisfy the education requirements for the Forensic Science Education Programs Accreditation Commission (FEPAC) standard in the current MS Forensic Biology Concentration as a "graduate-level science course appropriate for specialization". This course has been currently offered as a graduate level FRSC 515 Special Topics course and has already gained student interest. The advancing technology within this topic has gained outstanding attention both in the media and within the field of Forensic Science as it used to help solve cold cases such as the Golden State Killer.

**Does this course cover material which crosses into another department?** No

**Learning Outcomes:**

Students will understand how forensic DNA typing is conducted, including strengths and limitations.

Students will be able to explain current interpretational issues.

Students will be able to understand and interpret genetic genealogy data and cases.

Students will be able to identify future trends in this rapidly advancing field.

Students will be able to address how these emerging methods can advance the field of forensic DNA typing and lead to new capabilities in human identification

**Attach Syllabus**

[FRSC 470-670 Forensic Genomics Syllabus.pdf](#)

**Additional Attachments****Staffing:**

Mark Wilson

**Relationship to  
Existing Programs:**

FRSC 670 Forensic Genomics will be an elective course for the current Forensic Biology Concentration of the Master of Science in Forensic Science degree.

**Relationship to  
Existing Courses:**

FRSC 670 Forensic Genomics is a very unique and specialized course within Forensic Science and has been currently taught at the graduate level under FRSC 515 Special Topics and has gained student interest. This course will be cross level listed with the undergraduate course FRSC 470 Forensic Genomics.

**Additional  
Comments:****Reviewer  
Comments**

Key: 17044



## FRSC 470/670 Forensic Genomics (4 credit hours)

**Instructor:** Mark R. Wilson, Ph.D.  
Assistant Professor  
Forensic Science Program  
George Mason University

Time	Day	Location	Instructor
TBD		TBD	Wilson, M.

**E-mail:** [mwilso47@gmu.edu](mailto:mwilso47@gmu.edu)

Dr. Wilson is available to meet with students. Send an email and schedule an online Blackboard session to discuss specific topics.

**Text:** Butler, J. *Advanced Topics in Forensic DNA Typing: Interpretation*  
1st Edition, 2014, Academic Press. Directed Readings as identified by the instructor.

**Pre-requisites (FRSC 470):** Students are required to have completed the following with a minimum grade of a C in: BIOL 213 (Cell Structure and Function), BIOL 214 (Biostatistics) or STAT 250 (Intro to Statistics), BIOL 311 (Genetics), and FRSC 460 Forensic DNA Analysis or equivalent courses.

**Pre-requisites (FRSC 670):** Students are required to have successfully completed coursework in Cell Biology, Statistics, Genetics, and Forensic DNA Analysis.

**Catalog/Course Description:** This course will cover advanced principles and methods related to DNA typing in a forensic context. The course will review the current applications of DNA typing, and then address emerging methods and technological advances. The focus of the course will be on methods and techniques involved in Investigative Genetic Genealogy. A second focus of the course will be on how to properly interpret these data. Particular emphasis will be placed on how these emerging methods can advance the field of forensic DNA typing and lead to new capabilities in human identification. Students will gain an understanding of the capabilities and limitations of these emerging areas within forensic science, covering how they build on current practices. Data review and analysis from forensic DNA results will be included in the course.

### Course Information:

The course will be a lecture hybrid course with a laboratory component focused on data analysis to include class discussions, homework assignments, a term paper (graduate students

only), a mid-term exam, and a final exam. This course will be delivered in a hybrid format, with some introductory lectures on campus, and others using Blackboard.

**Goals and Objectives:** Upon completion of this course, students will understand how forensic DNA typing is conducted, including strengths and limitations, current interpretational issues, and future trends in this rapidly advancing field. Students will be able to understand and interpret genetic genealogy data and cases. Students will be able to address how these emerging methods can advance the field of forensic DNA typing and lead to new capabilities in human identification.

**Student Responsibilities:** Students will be responsible for reading the required material prior to each class and to be prepared for questions and discussions. Class attendance and participation is essential in order to cover the course material with a breadth of understanding. Students are further encouraged to formulate questions for the instructor which address the scientific, technological, legal, and practical aspects of the methods discussed.

Homework questions will cover material from lectures, including data analysis, with supplementary information from the text. Students should cite outside sources if used in answering homework questions.

Exams will be a combination of multiple choice, short answer, and essay. Most examination questions will be based on lecture and discussion materials. Fewer questions will be based on the text book and assigned readings, but students are expected to read the text and come to class with discussion questions from the text and assigned readings. In addition to completing all required course assignments, graduate students will complete a term paper describing a method, technique, or interpretational issue discussed in the course in greater detail.

**Undergraduate Grading (FRSC 470):**

- Attendance and Class Participation (10%)
- Homework (45%)
- Mid-term Exam (20%)
- Final Exam (25%)

100	A+	87-89	B+	77-79	C+	60-69	D
95-99	A	83-86	B	73-76	C	0-59	F
90-94	A-	80-82	B-	70-72	C-		

**Graduate Grading (FRSC 670):**

- Attendance and Class Participation (5%)
- Homework (45%)
- Mid-term Exam (15%)
- Term Paper (20%)
- Final Exam (15%)

100	A+	87-89	B+	-70-70	C
95-99	A	83-86	B	0-69	F
90-94	A-	80-82	B-		

**Graduate Grading Expectations (FRSC 670):** The expectation for graduate students is that they will do not only more work, but more advanced work. Therefore, graduate student assignments will be evaluated at a more advanced level and graduate students will additionally complete a term paper. The term paper should be at least 20 pages, 1.5 line spacing, with at least 10 references. The paper should outline the issue using historical developments and also address future solutions and approaches. Each term paper topic must be approved by the instructor.

**GMU Add/Drop Deadlines – Check the GMU Website**

- Last day to add classes
- Final class drop deadline (no tuition penalty)
- Withdrawal Period (100% tuition liability)
- Selective Withdrawal Period (100% tuition liability)

**GMU Honor Code**

The Honor Code states that all students “pledge not to cheat, plagiarize, steal, or lie in matters related to academic work.”

**Academic Integrity**

GMU is an Honor Code university; please see the University Catalog for a full description of the code and the honor committee process. The principle of academic integrity is taken very seriously and violations are treated gravely. What does academic integrity mean in this course? Essentially this: when you are responsible for a task, you will perform that task. When you rely on someone else’s work in an aspect of the performance of that task, you will give full credit in the proper, accepted form. Another aspect of academic integrity is the free play of ideas. Vigorous discussion and debate are encouraged in this course, with the firm expectation that all aspects of the class will be conducted with civility and respect for differing ideas, perspectives, and traditions. When in doubt (of any kind) please ask for guidance and clarification.

**GMU Code of Student Conduct**

The University Code of Student Conduct is George Mason University’s statement of community values. The Code fosters a safe, secure, and fair learning environment by establishing expectations for behavior, identifying a process for resolving incidents outside the stated expectations and the results of such processes. No student or student organization shall commit an Act of Misconduct in any location. Students and student organizations found responsible under this CSC of committing Acts of Misconduct are subject to sanctions by the University. The Office of Student Conduct has authority over all non-academic disciplinary matters. Please refer to <https://studentconduct.gmu.edu/>.

### **COVID Considerations**

All students taking courses with a face-to-face component are required to take Safe Return to Campus Training prior to visiting campus. Training is available in Blackboard (<https://mymason.gmu.edu>). Students are required to follow the university's public health and safety precautions and procedures outlined on the university Safe Return to Campus webpage ([www2.gmu.edu/safe-return-plan](http://www2.gmu.edu/safe-return-plan)). Similarly, all students in face to face and hybrid courses must also complete the Mason COVID Health Check daily, seven days a week. The COVID Health Check system uses a color code system, and students will receive either a Green, Yellow, or Red email response. Only students who receive a "green" notification are permitted to attend courses with a face-to-face component. If you suspect that you are sick or have been directed to self-isolate, please quarantine or get testing. Faculty are allowed to ask you to show them that you have received a Green email and are thereby permitted to be in class.

### **Diversity and Inclusion**

Students from all diverse backgrounds and perspectives be well served by this course, that students' learning needs be addressed both in and out of class, and that the diversity that students bring to this class be viewed as a resource, strength and benefit. It is my intent to present materials and activities that are respectful of diversity: gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture. Your suggestions are encouraged and appreciated. Please let the instructor know ways to improve the effectiveness of the course for you personally or for other students or student groups. In addition, if any of our class meetings conflict with your religious events, please let me know so that I can make arrangements for you.

### **Sexual Harassment, Sexual Misconduct, and Interpersonal Violence**

Notice of mandatory reporting of sexual or interpersonal misconduct: As a faculty member, I am designated as a "Non-Confidential Employee," and must report all disclosures of sexual assault, sexual harassment, interpersonal violence, stalking, sexual exploitation, complicity, and retaliation to Mason's Title IX Coordinator per University Policy 1202. If you wish to speak with someone confidentially, please contact one of Mason's confidential resources, such as Student Support and Advocacy Center (SSAC) at 703-380-1434 or Counseling and Psychological Services (CAPS) at 703-993-2380. You may also seek assistance or support measures from Mason's Title IX Coordinator by calling 703-993-8730, or emailing [titleix@gmu.edu](mailto:titleix@gmu.edu).

### **GMU E-mail Accounts**

Students must activate their GMU email accounts to receive important University information, including messages related to this class.

### **Office of Disability Services**

If you are a student with a disability and you need academic accommodations, please see me and contact the Office of Disability Services (ODS) at 993-2474. All academic accommodations must be arranged through the ODS. <http://ods.gmu.edu>

### **Other Useful Campus Resources**

WRITING CENTER: A114 Robinson Hall; (703) 993-1200; <http://writingcenter.gmu.edu>



***University policy states that all sound emitting devices shall be turned off during class unless otherwise authorized by the Professor.***

Note: The schedule is subject to change, please listen for announcements during class.

Note: Additional reading assignments may be added throughout the semester.

**Course Schedule: Lecture and Lab/Data Analysis Topics**

Week	Subject	Reading (s)
	FRSC 470/670 Forensic Genomics.	
1	Introduction and Course Overview: The Human Genome and Current Forensic DNA Typing and History : Legal Admissibility	Butler, chs. 1-5
2	Techniques I: DNA Extraction, DNA Sizing, Sequencing, Arrays, SNP Genotyping	Butler, chs. 1-5
3	Techniques II: DNA Extraction, DNA Sizing, Sequencing, Arrays, SNP Genotyping	<i>Greytak et al 2019</i>
4	DNA Mixtures and Probabilistic Genotyping I	<i>Budowle et al 2009</i>
5	DNA Mixtures and Probabilistic Genotyping II Intro to Massively Parallel DNA Sequencing (MPS) I Forensic MPS kits: aSTRs, X-STRs, Y-STRs, mtDNA, aSNPs. Interpretation of NGS data.	<i>Gill et al 2012</i>
6	Review for Midterm Exam	
7	<b>Midterm Exam</b>	
8	Massively Parallel DNA Sequencing (MPS) II MPS and DNA mixtures	Butler, chs. 6-7, 12, Appendix 4
9	Microbial Genome Sequencing and Microbial Forensics	Allard hand-out

10	AMX case – 2001 – 2007 Data Analysis of NGS data	Slides and computer analysis
11	Nanopore Sequencing and Forensic DNA – Identity Sketching Rapid DNA Whole Genome DNA Arrays (WGA) I Data Analysis of nanopore sequencing data	<i>Zaaijer et al 2017</i> Computer analysis
12	WGA II: Phenotyping, Ancestry, Kinship, Genetic Genealogy Advanced DNA Sequencing Techniques Data Analysis of microarray SNP data	Slides and computer analysis
13	Validation Criteria for New Methods - FBI Quality Assurance Standards	FBI QAS 2020
14)	Validation Review of SNP Genotyping and Prediction <i>Review Term Paper Due for Graduate Students only</i>	
15	Review for Final Exam	
16	Final Exam	