

**Proposing Institution**  
Clemson University

**Revised Title of Proposed New Program**

**Interdisciplinary PhD, Healthcare Genetics**

**Original Submission and ACAP Approval**  
January 17, 2007

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CEO of Clemson University

### Executive Summary

Minor modifications include a name change and expansion to provide interdisciplinary students from multiple disciplines the opportunity to achieve a terminal degree in healthcare genetics.

**Purpose:** Prepare interdisciplinary scientists to extend the knowledge base relevant to healthcare genetics, translate research to advance the application of genetics in healthcare, and collaborate in interdisciplinary research and practice.

**Target audience** would include but not be limited to those with degrees in Biochemistry, Bioethics, Chemical Engineering, Genetic Counseling, Microbiology, Nursing and Public Health.

**Prerequisite:** BIOCH 632 (3, 0) Biochemistry of Metabolism or equivalent.

Core Courses	Credit hours =34
1. Advanced Research Issues * BIOCH805 or equiv	3 credits
<b>2. NURS 901 Advances in Human Genetics</b>	3 credits
3. GEN 610 Basics I	3 credits
4. GEN 620 Basics II	3 credits
<b>5. NURS 905 Genetics Ethics &amp; Health Policy</b>	3 credits
6. MTHSC 805 Data Analysis	3 credits
7. PSYCH 810 Research Design & Quantitative Methods I	3 credits
8. PSYCH 811 Research Design & Quantitative Methods II	3 credits
9. Qualitative Methods*	3 credits
<b>10. NURS 903 Interdisciplinary Research</b>	1 credit
11. GEN 640 Bioinformatics	3 credits
12. Theory Development* such as Systems Biology or equiv.	3 credits

\*Core Course Options are available at Clemson as well as other institutions.

Ethics & Policy Cognate Total = 36 credits	Interventionist Cognate Total = 36 credits	Bench Scientist Cognate Total =36 credits **
POST 842 Ethics & Public Policy (3 cr)	GEN 670 Human Genetics (3 cr)	GEN 810 Methods in Molecular Biology (3 credits)
POSC 877 Public Policy Evaluation (3 cr)	GEN 830 Population Genetics (3 cr)	GEN 820 Genomics & Proteomics (3 credits)
Elective (6 credits)	Elective (6 credits)	Elective (6 credits)
NURS889 Seminar (6 credits)	NURS889 Seminar (6 credits)	NURS 889 Seminar (6 credits)
Dissertation (18 Credits)	Dissertation (18 Credits)	Dissertation (18 Credits)

\*\*Interdisciplinary students who desire this option will be referred to the PhD Genetics program

**Job opportunities:** This field is changing so rapidly that it is difficult to anticipate emergent opportunities even within the next five years. Current opportunities include research scientist in medical/life science and industry; clinical molecular geneticist (focus on symptom management), clinical trials research associate, pharmaceutical educator, hospital medical technical advisor, clinical researcher in embryology/andrology, genetic epidemiologist, health policy/bioethics consultant and faculty researchers in a university setting.

**Uniqueness:** There is no program like this one in the United States.

**Why Clemson:** This program enhances Clemson's partnership with the Greenwood Genetics Center. Our focus on human genetics and healthcare compliments the existing Genomics Institute, SC DNA Learning Center and the existing animal and plant genetics degrees already at Clemson University. The program enhances Clemson's current research focus on health disparities and gerontology while embracing the trend towards functional genomic research applications. The program fits within Clemson's research emphasis area of Family and Community Living and will support increased research funding as well as economic development initiatives that focus on healthy and well communities.

**Classification:**

- |   |  |
|---|--|
| 1. Name of the proposed program:          | Interdisciplinary PhD in Healthcare Genetics                             |
| 2. Academic Unit:                         | College of Health, Education and Human<br>Development, School of Nursing |
| 3. Designation, type and level of degree: | Doctor of Philosophy   |
| 4. Proposed implementation date:          | August, 2008   |
| 5. CIP code:                              | <b>26.0806 (new)</b> Human Genetics                                      |
| 6. Program Identification:                | New  |

**Justification**

This proposal is a request for approval to establish a new interdisciplinary Doctor of Philosophy in Healthcare Genetics for implementation in the fall of 2008. This program is designed for students from multiple disciplines in the health sciences who seek advanced practical and theoretical education related to genetics.

Few healthcare professionals in academia or practice have formal education in genetics, yet advances in this area project that genetics will be one of the most significant factors affecting health care over the next 10 plus years. The recent sequencing of the human genome is associated with frequent reports of new genetic discoveries related to health and disease. Studies reveal that 9 of the 10 leading-causes of death have genetic components ([www.cdc.gov](http://www.cdc.gov)). Response to the “genetic paradigm shift” is important for all health science disciplines. Scholars with expertise in genetics need to be involved at all levels of healthcare and policy-making by developing strategies to expand and translate knowledge to their practice, teaching, and research (Berry & Hern, 2004). There are multiple graduate programs in the United States (US) offering combinations of didactic content in basic science or biomedical programs that incorporate genetics. Two schools, the University of Maryland, Baltimore and Vanderbilt University offer interdisciplinary doctoral programs, which include pharmacology with their basic science and/or biomedical courses for their genetics doctorate. However, there were none found that included course options and cognates for students from disciplines other than biology/biomedical who want a healthcare genetics alternative. There are only two nursing doctoral programs in the country known to offer a specialty option in genetics. More institutions need to address the challenge of meeting the nation’s emerging health care needs through education and research coupled with new technologies and understandings of human genetics. Clemson University plans to proactively respond to this need by developing a new generation of experts with an interdisciplinary PhD in Healthcare Genetics.

This innovative proposal is based on the recognition that the problems facing health care can be better answered using an interdisciplinary approach at the doctoral level. The interdisciplinary approach promotes intellectual growth by challenging conventional thinking and addressing areas that are too broad or too complex to be dealt with adequately by a single discipline (AACN, 2005). Successful grant applications to NIH (National Institutes of Health) and other federal sources require the expertise of multiple disciplines to work toward solutions for complex health care problems. NIH has established genetics as a priority for funding through NHGRI (National Human Genome Research Institute) and NINR (National Institute for Nursing Research). Based on an extensive review of the literature and input from external health care constituents, an interdisciplinary degree offers the best use of current resources and meets the complex health care needs of the future. Graduate student research committees in health disciplines have increasingly included multiple health care disciplines including an epidemiologist from Greenwood Genetics Center, doctorally prepared pharmacists and specialty practice physicians in addition to faculty members from Microbiology, Nursing,

Psychology, Public Health, English, Business and the Ethics Center. Faculty members in the School of Nursing have collaborated in their research with other disciplines including laboratory studies to monitor DNA activity in populations of women at high risk for breast cancer and effects of berry extract on immortal cell lines.

The proposed interdisciplinary PhD curriculum responds to the need to develop doctorally prepared individuals from all health science disciplines for leadership roles which integrate genomics into research, policy and practice. Students will have the option of developing skills in basic and applied research as bench scientists; interventionists with individuals groups and populations; or health policy and ethics. An articulation model allows entry of interdisciplinary students with a BS or MS, especially those from the health science disciplines. Students with a baccalaureate or master's degree would be eligible to enter to work toward the doctorate (BS to PhD, MS to PhD).

Clemson's mission statement emphasizes the university's commitment to "fulfill a covenant between its founder and the people of South Carolina by establishing a 'high seminary of learning' through its historical land-grant responsibilities of teaching, research, and extended public service." Clemson offers a wide array of high-quality graduate programs that respond to the needs of professionals in the field. The University promotes excellence in selected areas of the creative arts, health, human development, the humanities, social sciences, and the hard sciences. The primary goal of the university is to "develop students' communication and critical-thinking skills, ethical judgment, global awareness, and scientific and technological knowledge."

The proposed PhD in Healthcare Genetics at Clemson University is aligned with the vision of the university to achieve Top 20 public university status and would serve as a national model. Expanding the pool of doctoral students and drawing on the strengths of existing programs with this innovative interdisciplinary program promotes the vision of Clemson University and its visibility.

In July 2005, officials from Clemson University and Greenwood Genetic Center (Greenwood, SC) announced an initiative to find causes and cures for birth disorders and health problems common to the residents in SC. This included the formation of a Genetics Collaborative to increase research and doctoral education in human genetics, with an investment of nearly \$15 million. This doctoral program will join the Genetics Collaborative to increase the numbers of doctoral students enrolled in those courses and interdisciplinary scholars graduating with specialized knowledge in healthcare genetics.

### **Relationship of the Program to Other Programs in the University**

The essence of an interdisciplinary education is reflected in the partnership among faculties from multiple departments, schools, centers and institutes to provide a variety of courses and share in the work of student dissertation committees. These academic units include **Psychology, Mathematical Sciences, Nursing, Political Science, Policy Studies, Public Health and Genetics**. The Genetics Department and the Genetics Institute in partnership with Greenwood Genetics Center will be strong partners by providing multiple core and cognate courses. Other disciplines such as Biochemistry, Chemistry, Biological Sciences, Environmental Engineering and Science, and International Family and Community Studies can provide consultation and committee membership for doctoral students. The close proximity of the **Biological Sciences Laboratories** to the collaborative and interdisciplinary **Nursing Research Laboratory** allows for partnership in bench science research projects. Recently faculty in the College of Health, Education, and Human Development established the **Center of Research on Health Disparities**. This Clemson University center provides students' with enhanced access to diverse populations for research in newly recognized areas of genes and gene products linked with obesity, diabetes and other related disorders

that exhibit a genetic basis. Partnership with this Center has the potential to positively impact the health and well-being of SC residents by focusing on genomic health-related issues that are correlated with some of SCs health-related morbidity and mortality rates, which are among the worst in the nation.

### **Assessment of Clemson University programs that relate to the proposed program**

**a. Genetics and Biochemistry.** The genetics and biochemistry departments were combined during the restructuring of the College of Agriculture, Forestry and Life Sciences (AFLS). Genetics is a key partner in the proposed PhD program and the departmental faculty has been very positive about collaboration. There is a willingness to offer critical core courses; provide lab space, equipment, and serve on dissertation committees. Research awards per faculty average \$118,800. Greenwood Genetics Center (GCC) faculty and staff are also positive about the proposed degree program. They are also willing to provide lab space, equipment, and adjunct faculty to co-teach seminars and to serve on committees. GCC has achieved international recognition for expertise in focused areas of research—Fragile X, autism, and mental retardation. It also has a strong clinical focus. The Greenwood Genetics Center is 60 miles from the main Clemson University campus. Polycom conferencing is available for distance education.

**b. Chemistry.** Several faculty members in the department are conducting pharmaceutical research. This would provide another important option for student research. The unit has a stable rate of research funding (3 to 4 million per year).

**c. Biological Sciences.** The research areas of molecular and cellular biology are obvious fits for interdisciplinary research partnerships with nursing. The laboratories are located in close proximity to the nursing research laboratory. A willingness to share equipment and expertise is illustrated by the multi-departmental purchase and use of cell flow cytometry equipment. Recently new faculty hires from highly ranked biological sciences programs have been added to alleviate some of the heavy teaching loads in this area.

**d. Environmental Toxicology.** Several faculty members have a research interest in carcinogens and the environment as well as related policy interests.

**f. Environmental Engineering and Science.** This is one of Clemson's strongest programs. It has consistently been ranked in the Top 20 graduate programs (US News and World Report). Faculty members conduct research in the areas of environmental chemistry and environmental policy with a stable record of external funding averaging around \$220,000 per faculty per year.

**g. Policy Studies.** One of the courses in the proposed PhD program will be taught by the Policy Studies faculty as part of the Ethics and Policy cognate. Faculty members are supportive and willing to co-teach courses and serve on dissertation committees.

**h. International Family and Community Studies.** The Institute offers courses in the right to healthcare, human rights law, international law and children. These could be available as electives. Faculty members are experts in the area of policy development and legal aspects and will provide guest lectures and serve on dissertation committees. One faculty member holds faculty rank in the School of Nursing. External funding averages around 4 million dollars a year. Faculty members are interested in collaboration.

Methodological and statistical expertise is available from the interdisciplinary partners in mathematical sciences, psychology and statistics departments. One faculty member in the School of Nursing is a biostatistician and additional research support is available through the HEHD Collaborative Research Center.

## **Relationship to Other Programs in the State, Region, and Nation**

The interdisciplinary PhD in Healthcare Genetics does not duplicate the curriculum of any existing academic programs in South Carolina or the United States. A search of doctoral programs identified no program in the US with an interdisciplinary focus on healthcare genetics and/or genomics. There are multiple graduate programs in the United States (US) offering didactic content for basic science or biomedical programs that incorporate genetics. Two schools, the University of Maryland, Baltimore and Vanderbilt University offer interdisciplinary doctoral programs, which include pharmacology with their basic science and/or biomedical courses for their genetics doctorate. However, there were none found that included course options and cognates for students from other disciplines wanting a healthcare genetics alternative. Two graduate programs have formalized genetics components in their PhD nursing curricula. The program at the University of Iowa has options for doctoral study in genetics and post-doctoral training in genetics. The University of Pittsburgh received T32 funding for pre and postdoctoral academic and research training in nursing and Genetics. (*Advanced Practice Nurses in Genetics: A Survey of ISONG Members.*” Genetics Health Services Research Center, Baltimore, MD. (2005) and University of Pittsburgh, School of Nursing “*Targeted Research and Academic training Program for Nurses in Genetics*” brochure, fall 2006)

Over a one year period, approximately 500 students in health science disciplines graduated from Clemson University with degrees at the baccalaureate or masters level. The majors included Chemistry, Biological Sciences, Health Science, Microbiology, Nursing, Physics, Political Science, Psychology, and Sociology and are a logical recruitment pool for entry into the interdisciplinary PhD in Healthcare Genetics program. This does not include the larger national recruitment pool of interdisciplinary students that will be targeted, especially as the reputation of the Healthcare Genetics doctoral program gains recognition.

## **Overall purpose**

The purpose of the Clemson University’s Interdisciplinary PhD in Healthcare Genetics is to prepare interdisciplinary scientists to: extend the knowledge base relevant to healthcare genomics, translate research to advance the application of genomics in healthcare, and collaborate in interdisciplinary research and practice.

Objectives of the program are to:

1. Collaborate with other disciplines to generate knowledge and develop theories that focus on the genetic aspects of actual and potential health problems of diverse individuals, families, groups, and communities while addressing health disparities.
2. Formulate health promotion, disease prevention and treatment strategies that translate and integrate genomic knowledge from a variety of disciplines.
3. Demonstrate leadership that facilitates interdisciplinary development and application of ethical guidelines and health policy in genetics.
4. Disseminate research findings to develop healthcare models that incorporate the expanding knowledge of genetics.

## **Anticipated employment opportunities for graduates, or demand for services**

The field of healthcare genetics/genomics is changing so rapidly that it is difficult to anticipate emergent employment opportunities even within the next five years. However, the proposed interdisciplinary PhD in Healthcare Genetics does immediately respond to a number of current needs within the state. This includes the areas of academics, industry, healthcare agencies and

government. Academic positions could include many aspects of research including clinical and translational research, as well as work with genetic aspects of disorders for individuals, families and communities in South Carolina. Specialists at the Greenwood Genetics Center have indicated that a key need for these graduates will be in educating health care providers related to the interpretation of complex genetic tests for well informed decisions. It is expected that graduates will be in high demand by healthcare agencies including hospitals, ambulatory clinics, genetic clinics, public health agencies. Health policy positions offer another option related to work in policy development associated with genetics.

### **Need for the program in the state**

Leaders in genetics emphasize the need to "...promote the use of genomic research technologies and information in the context of health, biology, and society, as well as in research, practice, education and policy" (Feetham, Thomson, & Hinshaw, 2005). Nationally, more than 25 healthcare organizations participated in developing core competencies in genetics that are essential for healthcare professionals across disciplines. Attempts are underway to differentiate those competencies at graduate and undergraduate levels. (NCHPEG Core Competencies. Retrieved from <http://www.nchpeg.org/core/Corecomps2005.pdf> September 3, 2007.) This emphasizes the point that the healthcare professionals who are experts in multiple disciplines support the need for some overlap of knowledge and competencies, even though the disciplines have different foci. Therefore, doctorally prepared individuals in interdisciplinary healthcare genetics can bring issues to the "appropriate forums, use results of research in health and social policy debates, and participate in developing optimal practices and policies that are in the best interest of individual patients, families and groups..." with health problems now recognized to be associated with genetic/genomic causes (Olsen et al, 2003; Wakefield, 2004).

The College of Health, Education and Human Development Advisory Board, the School of Nursing Community Advisory Board, and various South Carolina (SC) upstate health care agencies have identified that access to health related doctoral (PhD) programs is problematic for potential students in the upstate. To substantiate this concern, a targeted survey in upstate SC was conducted to determine the level of interest in the proposed program. In spring, 2006 five thousand surveys were mailed to health care providers using a list from the SC Department of Labor, Licensing and Regulation. From a single mailing, more than 570 completed surveys were returned, a response rate greater than 11% which is considered a strong response rate for this methodology.

Of surveys returned, 44% (n=248) of respondents indicated a strong interest in attending an interdisciplinary PhD genetics program with a healthcare focus if it were offered by Clemson University. Of the 248 responding with interest, 52% (n=129) indicated they would be ready to enroll in the next two years. Another 39% (n=96) indicated an anticipated enrollment in 3-5 years, and the final 10% in 6-10 years. Potential enrollees who specified their current area of practice are evenly distributed across the spectrum of healthcare providers from administration and education, to pediatrics, obstetrics, and geriatrics. Nineteen percent indicated their specialty as medical/surgical and another 39% specified 'other.'

Given the opportunity to specify a preference for one of the three major cognates in the proposed program, 56% (n=239) indicated 'Interventionist,' 24% 'Bench Scientist', and 20% designated 'Health Policy and Ethics'. Respondents who indicated a desire to enroll in the next two years reflected the same distribution as above with 59 persons interested in Interventionist, followed by 34 in Bench Scientist, and 33 in Health Policy. With the 11% response to one mailing of the survey, there appears to be significant 'pent-up' demand for healthcare genetics education in Upstate SC. Since most potential applicants indicated they are employed with family and other

responsibilities, easy accessibility to courses, educational resources, and faculty support will be important to the success of the program.

In addition several interdisciplinary students from SC and surrounding states have contacted Clemson regarding the new interdisciplinary PhD. Based on the survey and queries, there appears to be significant interest by individuals in target areas for recruitment including South Carolina, western North Carolina, and northeast Georgia as well as interested students in the broader community with special interests in genetics (public health, health policy and ethics). Recent master level graduates, not included in the survey, have already expressed interest in the program. **Of note**, with these queries there has been, to date, *no marketing* for this program and *no deliberate recruitment* of students.

Three factors highlight the need for the proposed interdisciplinary PhD in Healthcare Genetics. First, the strength of the results from the needs assessment survey; second, website searches demonstrating the lack of higher education programs for emerging healthcare needs related to genetics; and third, the dedication of national organizations through the National Coalition for Health Professions Education in Genetics (NCHPEG) to develop a document supporting the necessity for healthcare professionals to receive genetics education emphasizes the necessity for an interdisciplinary PhD in Healthcare Genetics in SC and the US.

## **Enrollment**

### **Admissions Criteria Specific to the program**

Students applying for the interdisciplinary PhD in Healthcare Genetics program will have at least a bachelor's degree in a related health science discipline from an accredited institution.

Other requirements will include:

- a. GRE scores equivalent to the current scores of 500 for verbal and quantitative sections and 4.0 for the analytical writing section.
- b. Master's (MS/MA) thesis or publications. (BS applicants entering without a data-based research experience will be required to satisfactorily complete a research project utilizing the 6 hours of cognate electives prior to beginning the core courses in the doctoral program.)
- c. Submission of a Curriculum Vita.
- d. Written statement of career goals.
- e. Graduate School application with three letters of recommendation which address research and scholarly potential.
- f. Interviews with two faculty members (may be conducted in person, Polycom or telephone depending on individual circumstances).
- g. Cumulative GPA of 3.4 or higher in the undergraduate (and/or graduate programs if applicable).

**Table 1**

PROJECTED TOTAL ENROLLMENT						
YEAR	FALL		SPRING		SUMMER	
	Headcount	Credit Hours	Headcount	Credit Hours	Headcount	Credit Hours
2008-09	6	54	6	54	0	0
2008-10	12	109	12	90-108	0	0
2010-11	15	117-153	15	90-160	6	18
2011-12	21	144-160	21	117-180	12	36
2012-13	21	144-160	21	117-180	9	27

**Table 2.**

ESTIMATED NEW ENROLLMENT						
YEAR	FALL		SPRING		SUMMER	
	Headcount	Credit Hours	Headcount	Credit Hours	Headcount	Credit Hours
2008-09	6	54	0	0	0	0
2008-10	6	54	0	0	0	0
2010-11	6	54	0	0	0	0
2011-12	3	27	0	0	0	0
2012-13	6	54	0	0	0	0

**Table 1** represents the total enrollment for each full-time student taking 9 credit hours during the fall and spring semesters of years one and two of the four year degree. During year three they will take 6-12 credit hours in the fall and spring semesters depending on the cognate area chosen. Nine credit hours will be taken during the fall of year four and 6-9 credit hours depending on the status of the needed cognate and elective courses. Candidates will begin their dissertation hours during the summer of year three and continue through the summer sessions of year four with the goal of graduation at the end of year 4. Projected numbers were taken from positive responses received from the spring 2006 survey. Using the Graduate School average of 10% of interested students converting to enrollees, 6 students are anticipated in the fall semester of each of the first two years. In years 3-5, nine students total are anticipated. Interest in doctoral study from a new cohort of bachelor's and master's degree graduates once the program is established is anticipated. With only one other doctoral program in the nation offering advanced study in healthcare and genetics (nursing,/genetics) coupled with Clemson University's reputation, students from the national and international arena are anticipated to apply.

**Table 2** represents the estimated new enrollment for academic years 2008-2013. These numbers are extracted from the interest survey conducted by the School of Nursing in the spring, 2006. Academic years 2008-2012 reflect the calculation of a graduate admissions formula based on numbers obtained from the interest as documented by the survey. Academic year 2012 reflects a new student pool of healthcare graduates from years 2007-2012 and establishment of a national reputation for the new PhD Healthcare Genetics program.

## Curriculum

The curriculum in the Interdisciplinary Doctor of Philosophy in Healthcare Genetics program is designed to create and apply new knowledge and discoveries in genetics to the practice of healthcare. The curriculum will prepare leaders and scholars in healthcare related disciplines who will contribute to the body of basic and applied research knowledge. While this program is based in the School of Nursing, it is interdisciplinary with students taking courses in multiple Clemson University schools, departments or institutes. Building on existing courses in Nursing, Genetics, Biochemistry, Policy Studies, Political Science, Psychology and Mathematical Sciences an interdisciplinary faculty team has worked collaboratively to plan a curriculum including the development of three new courses for this degree.

The proposed curriculum for the PhD in Healthcare Genetics is composed of 12 core courses and three cognate specialties/tracks. The core curriculum provides 34 hours of coursework in the areas of genetics, health policy and ethics, theory development, and quantitative and qualitative research methods. In the specialty cognates, students pursue advanced study in basic Genetics [Bench Research], applied population Genetics as an Interventionist or genetics in Ethics/Health Policy. Seminars and electives bring the cognate hours to 18 hours. With 18 hours of dissertation, the total credit hours required is 70. This can be accomplished full-time, over a four year period.

A sample curriculum follows with course descriptions. Variations will exist in the courses required depending upon the specialty cognate selected and courses that have already been taken that meet the intent, goals and purposes of the academic program. The coordinator of the PhD program in Healthcare Genetics, in concert with individual faculty advisors, will work with each student to determine the requirements for their program of study. The plan of study for a student entering with a bachelor's degree will be developed that reflects prior coursework, required prerequisites, and data-based research experiences.

### **Proposed Curriculum Plan Interdisciplinary PhD Healthcare Genetics**

**Table 3.1 Core Courses**

<b>Course</b>	<b>Credit hours</b>
1. Advanced Research Issues* BIOCH805 or equiv	3 credits
<b>2. NURS 901 Advances in Human Genetics</b>	3 credits
3. GEN 610 Basics I	3 credits
4. GEN 620 Basics II	3 credits
<b>5. NURS 905 Genomics Ethics &amp; Health Policy</b>	3 credits
6. MTHSC 805 Data Analysis	3 credits
7. PSYCH 810 Research Design & Quan. Methods I	3 credits
8. PSYCH 811 Research Design & Quan Methods II	3 credits
9. Qualitative Methods	3 credits
<b>10. NURS 903 Interdisciplinary Research</b>	1 credit
11. GEN 640 Bioinformatics	3 credits
12. Theory Development* such as Systems Biology or equiv.	3 credits
<b>Total</b>	<b>34 credit hours</b>

\*Core Course Options are available at Clemson as well as other institutions.

**Table 3.2 Three Proposed Cognates**

<b>Ethics &amp; Policy</b>	<b>Interventionist</b>	<b>Bench Research++</b>
POST 842 Ethics & Public Policy (3 credits)	GEN 670 Human Genetics (3 credits)	GEN 810 Methods in Molecular Biology (3 credits)
POSC 877 Public Policy Evaluation Seminar (3 credits)	GEN 830 Population Genetics (3 credits)	GEN 820 Genomics & Proteomics (3 credits)
Elective* (6 credits)	Elective* (6 credits)	Elective* (6 credits)
NURS 889 Seminar (6 credits)	NURS 889 Seminar (6 credits)	NURS 889 Seminar (6 credits)
Dissertation (18 Credits)	Dissertation (18 Credits)	Dissertation (18 Credits)
<b>Total = 36 credits</b>	<b>Total = 36 credits</b>	<b>Total = 36 credits</b>

**\*Note: For BS students, cognate electives may be used for research project hours.**

**++Interdisciplinary students who desire this option will be referred to the PhD Genetics program**

**Table 3.2 Sample Schedule, Student entering with a masters degree and all prerequisites completed**

<b><i>Fall I</i></b>		<b><i>Spring I</i></b>	
GEN 610	3(3,0)	GEN 620	3(3,0)
Core	3(3,0)	Bioch 805	3(3,0)
Qualit.Methods	3(3,0)	GEN 640	3(3,0)
9 credits		9 credits	
<b><i>Fall II</i></b>		<b><i>Spring II</i></b>	
NURS 905	3(3,0)	NURS 903	1(1,0)
NURS 901	3(3,0)	Cognate courses	
MTH SC 805	3(3,0)	Elective courses	
9 credits		6-9 credits	
<b><i>Fall III</i></b>		<b><i>Spring III</i></b>	
PSYCH 810	3(3,0)	PSYCH 811	3(3,0)
Cognate courses		Cognate courses	
Elective courses		Elective courses	
Seminar hours	3(3,0)	Seminar hours	3(3,0)
6-12 credits		6-12 credits	
<b><i>1<sup>st</sup> Summer Session</i></b>		<b><i>2<sup>nd</sup> Summer Session</i></b>	
Dissertation credits	3(3,0)	Dissertation credits	3(3,0)
<b><i>Fall IV</i></b>		<b><i>Spring IV</i></b>	
Dissertation hours		Dissertation hours	
Cognate courses		Cognate courses	
Elective courses		Elective courses	
6-9 credits		6-9 credits	
<b><i>1<sup>st</sup> Summer Session</i></b>		<b><i>2<sup>nd</sup> Summer Session</i></b>	
Dissertation credits	3(3,0)	Dissertation credits	3(3,0)

Students admitted to candidacy must pass a comprehensive examination. Candidates for the PhD in Healthcare Genetics will develop and conduct an independent research study that makes a contribution to the body of knowledge in their cognate specialty. This process culminates with the writing of a dissertation and dissemination of the findings. Graduates of this program will be prepared to pursue careers as bench scientists, ethicists/health policy, academicians and researchers.

New Courses to be added:

NURS 901 3(3,0) Advances in Human Genetics: Focuses on an overview of the disciplines and content areas related to advances in human genetics/genomics. Topics will include aspects of biochemical, molecular, population Genetics and cytogenetics as they relate to genomic healthcare. Bioinformatics will be addressed, incorporating the use of genetic databases for research and clinical settings.

NURS 903 1(1,0) Interdisciplinary Research: Examination of interdisciplinary research in the life sciences as a means of integrating information, data, techniques, tools, perspectives, concepts, and/or theories from two or more disciplines or bodies of specialized knowledge to advance knowledge development or solve problems.

NURS 905 3(3,0) Genetics Ethics and Health Policy: Designed for healthcare professionals. Analyzes relationships among political climate, policy design and government action as related to ethical, legal and social issues surrounding availability of genetic information. Ethical perspective, outcomes on health policies relating to genomic issues will be examined as well as contemplated actions based on new medical techniques.

**Table 4. Faculty**

List Staff by Rank (e.g. Professor #1, Professor #2, Associate Professor #1, etc)	Highest Degree Earned	Field of Study	Teaching in Field (Yes/No)
<b><i>SON Faculty</i></b>			
Professor #1	PhD	Nursing & Health Policy	Yes
Professor #2	PhD	Sociology, Health Disparity	Yes
Professor #3	EdD	Higher Education & Administration	Yes
Professor #4	DNS	Nursing Science	Yes
Professor #5	PhD	Health Policy	Yes
Associate Professor #1	PhD	Nursing	Yes
Associate Professor #2	PhD	Nursing	Yes
Associate Professor #3	PhD	Microbiology, Genetics	Yes
Assistant Professor #1	DHA	Health Administration	Yes
<b><i>INTERDISCIPLINARY Faculty</i></b>			
Professor #1	PhD	Developmental Psychology	Yes
Professor #2	PhD	Economics	Yes
Assoc. Professor #1	PhD	Experimental Psychology, Human	Yes
Assoc. Professor #2	PhD	Microbiology	Yes

Assistant. Professor #1	PhD	Genetics	Yes
Assistant. Professor #2	PhD	Genetics	Yes
Assistant. Professor #3	PhD	Biological Sciences	Yes
Assistant. Professor #4	PhD	Cellular Biology	Yes
Assistant Professor #5	PhD	Statistics	Yes
Adjunct Faculty #1	MD	Clinical Geneticist	Yes
Adjunct Faculty #2	MD	Clinical Geneticist	Yes

Faculty qualifications. The coordinator of the PhD program holds a PhD in microbiology and is a master's prepared nurse, with a research program in the area of genetics, DNA activity. She has completed two post-doctoral programs in Genetics. One was an eight-week post-doctoral fellowship at the Summer Genetics Institute provided through a joint partnership of the National Institute of Nursing Research and Georgetown University. The second focused on high risk assessments of inherited or familial cancers. She has served as consultant and advanced practice nurse for the new Cancer Risk and Screening Program (CriSP) program at St. Francis-Bon Secours Hospital in Greenville.

As an interdisciplinary program, faculties from six Clemson University departments, centers or institutes, two Clinical Geneticists with Adjunct Faculty status, and an internationally known genetic nurse scholar will bring their expertise and experience to the "classroom". This enables graduate students in this new PhD program to immerse themselves in a curriculum lead and taught by individuals who are knowledgeable and experienced in their disciplines.

New Faculty. One faculty FTE is funded for 3 years through a Duke Endowment grant in collaboration with AnMed Hospital, Oconee Memorial Hospital (OMH), Palmetto Baptist Easley, Cannon Memorial and Tri-County Technical College(TCTC). Based on the projected program enrollment over the next 6 years and the interdisciplinary approach additional faculty needs are not anticipated. Replacement for faculty retirements will focus on recruiting faculty to fill gaps in genetics research expertise among senior faculty members.

In addition, a doctorally prepared Research Associate position was added, funded for 2 years through a Duke Endowment grant in collaboration with AnMed, OMH, Palmetto Baptist Easley, Cannon and TCTC to manage a collaborative bench research laboratory in Jordan Hall. This individual has 15 years experience coordinating and supervising facilities, including staff and graduate students. He has technical expertise in physical mapping and DNA sequencing of plant genome, BAC DNA libraries, culturing of blood and immortal cell lines, and application of a variety of assays in both human and food technology research. Because of his education and experience he will also be able to provide lectures for some of the genetics technology related course content.

Current faculties who elect to increase their expertise in the target areas will be supported. Opportunities for further development include:

- 8 week NIH/NINR Summer Genetics Institute (SGI)
- 18-week online web-based Genetics Institute(WBGI) with The Cincinnati Children's Hospital Medical Center

Other genetics instructional resources include: GEPN curriculum resources with links to instructional resources used in GSI and WBGI at [www.gepn.cchmc.org](http://www.gepn.cchmc.org); Self-paced genetics modules based on NCHPEG competencies at [www.gepn.cchmc.org](http://www.gepn.cchmc.org) ; Practice-based genetics curricula for nurse educators at [www.fbr.org](http://www.fbr.org) ; Genetics and your practice online module at

<http://www.marchofdimes.com/gyponline/index.bm2> ; Genetics in Clinical practice at <http://www.acmg.net/resources/cd-rom-01/intro.asp>; Dolan DNA learning center at <http://www.dnalc.org/>; NCHPEG education resources at [www.nchpeg.org](http://www.nchpeg.org); Kansas Genetics Education Center at <http://www.kumc/edigec>; Centre for Genetics Education at <http://www.genetics.com.au/>; GedEd Project at <http://www.medicine.man.ac.uk/GenEd/>; Centre for Education in Medical Genetics at <http://www.bwhct.nhs.uk/cemg/index.htm>; and, Six weeks to Genomic Awareness at <http://www.genomicawareness.org/>

Tenured and tenure-track faculty are provided 25% release of an academic semester for research and scholarly activities with additional time granted with funded research release. Provision for consultation is addressed in the university *Faculty Manual* and negotiated for individual faculty members as the need arises. Time to attend conferences is based on indirect monies received from grants that can be used for attendance. In addition, each faculty member is provided an equal amount of continuing education monies.

**Table 5**

UNIT ADMINISTRATION/FACULTY/STAFF SUPPORT						
YEAR	NEW		EXISTING		TOTAL	
	Headcount	FTE	Headcount	FTE	Headcount	FTE
<b>Administration</b>						
2008-09	0	-	1	.5	1	.5
2009-10	0	-	1	.5	1	.5
2010-11	0	-	1	.5	1	.5
2011-12	0	-	1	.5	1	.5
2012-13	0	-	1	.5	1	.5
<b>Faculty</b>						
2008-09	0	-	4	1.0	4	1.0
2009-10	0	-	4	1.0	4	1.0
2010-11	0	-	6	1.5	6	1.5
2011-12	0	-	8	2.0	8	2.0
2012-13	0	-	8	2.0	8	2.0
<b>Staff</b>						
2008-09	0	-	2	1.5	2	1.5
2009-10	0	-	2	1.5	2	1.5
2010-11	0	-	2	1.5	2	1.5
2011-12	0	-	2	1.5	2	1.5
2012-13	0	-	2	1.5	2	1.5

\*\*Faculty student ratios reflect the 1:10 national standard for graduate students. In addition, 1 course= 25% faculty assignment.

Increasing numbers of faculty members reflects replacement of retiring faculty to correlate with increasing numbers of doctoral students with preferred ratios of 1 faculty member to 10 students.

### **Physical plant**

There will be minimal added demand on the physical plant. While classroom space will be needed to accommodate the new doctoral courses, classes will be of such size as to be accommodated in current small classrooms and existing conference rooms. Office space needed for PhD students with assistantships will become available as those students holding graduate teaching assistantships replace temporary clinical instructors who are hired, as needed, each academic year. As these temporary instructors are replaced, the vacated space will be available to doctoral students. Computer support now available through the College and University will be adequate for use in the doctoral program. The facilities available in the Clinical Learning and Resource Center in Edwards and the Division of Computing and Information Technology computer labs available across campus will be adequate for the additional doctoral students. All offices in the School of Nursing have computers, and these computers will become available to the doctoral students with assistantships who occupy such offices.

Additional laboratory space, now available through Jordan Hall, will be required as the program grows and space needs for wet laboratory research increase. Currently the designated laboratory includes adequate space and equipment to meet the requirements for tissue culture experiments. The facilities allow space for one researcher to work under the hood and two other individuals to work on the tabletops with other experiments or preparation.

### **Equipment**

Primary equipment needs will be determined by new technologies that require specialized bench laboratory equipment that will be shared by nursing and microbiology faculty and their graduate students. Because this is an interdisciplinary program, including the human genetics department, many other laboratories and their equipment are available for the use by doctoral students in nursing.

### **Library Resources**

Clemson University Libraries are evaluated routinely as part of the University's accreditation by the Southern Association of Colleges and Schools (SACS), and the Libraries have been found to meet or exceed recommended standards. Currently the Libraries hold some 1,087,535 volumes and provide access to over 30,000 print and electronic journal titles. This places Clemson University Libraries well above the median for Doctorate-Granting Institutions as reported by the Association of College and Research Libraries (2004 Academic Library Trends and Statistics, copyright 2005).

In the broad area of "Genetics or Genomics" Clemson currently holds some 2425 items of which approximately 516 have been published in the past five years (2001 -2006). In the somewhat narrower field of "Human or Medical Genetics" Clemson's holdings exceed 770 items of which 137 have been published between 2004 and the present. Clemson's holdings in the area of genetics and genomics also include 247 serial titles.

In the broad scope of "nursing or human health care" Clemson Libraries hold over 7000 titles and has acquired in excess of 150 new titles per year over the each of the past five years. In addition to monographic works, Clemson's holdings in the area include 468 serial titles.

Publication of monographic works dealing with nursing and human genetics has been limited as indicated by a search of OCLC's WorldCat database yielding only 54 works world wide. It would

appear that no more than eleven titles have been published on this subject between 2003-2006. Clemson currently holds four of these eleven titles and can acquire the others through purchase or interlibrary loan.

Acquisitions of materials dealing with genetics, nursing, and healthcare are made by selectors in the areas of Human Health and Life Sciences. Selectors work with Departmental faculty in determining the most appropriate topics and titles for collection. Current combined annual funding for these areas are in the range of \$150,000 and have kept ahead of inflationary trends for the past five budgetary cycles. No budgetary reductions are expected in the foreseeable future. In addition to normal annual expenditures, current Library policy allocates a \$5,000 budget for the exclusive purchase of materials for newly approved doctoral programs. Expenditure of these funds is made by selectors in consultation with the faculty from the new programs.

### **Accreditation, Approval, Licensure, or Certification**

While the Clemson University School of Nursing has received full accreditation by the CCNE for the bachelor's and master's level programs, the proposed doctor program is not subject to specialized or professional accreditation or approval by any state agency other than the Commission.

**Table 6. NEW COSTS TO THE INSTITUTION AND SOURCES OF FINANCING**

<b>ESTIMATED COSTS BY YEAR</b>						
<b>CATEGORY</b>	<b>1<sup>st</sup></b>	<b>2nd</b>	<b>3rd</b>	<b>4th</b>	<b>5th</b>	<b>TOTALS</b>
Program Administration	34,450	35,828	37,261	38,751	40,301	<b>186,591</b>
Faculty Salaries	0	60,375	116,340	141,924	146,801	<b>465,440</b>
Graduate Assistants	44,904	47,148	109,500	101,978	104,582	<b>398,112</b>
Staff	67,998	70,717	73,546	76,488	79,548	<b>368,297</b>
Supplies and Materials	22,000	22,000	22,000	22,000	22,000	<b>110,000</b>
Library Resources	0	0	0	0	0	<b>0</b>
Equipment	30,000	30,000	30,000	10,000	10,000	<b>110,000</b>
Facilities	0	0	200,000	200,000	200,000	<b>600,000</b>
Other (Identify)	0	0	0	0	0	<b>0</b>
<b>TOTALS</b>	<b>199,352</b>	<b>266,068</b>	<b>578,647</b>	<b>591,141</b>	<b>603,232</b>	<b>2,238,440</b>
<b>SOURCES OF FINANCING BY YEAR</b>						
Estimated FTE Revenue Generated from the State*	122,862	122,862	122,862	61,431	122,862	<b>552,879</b>
Tuition Funding (New students only)**	28,860	28,860	28,860	14,430	28,860	<b>129,870</b>
Other State Funding (Legislative Approp.)	0	0	0	0	0	<b>0</b>
Reallocation of Existing Funds###						
Federal Funding***; #	0	41,544	41,544	41,544	41,544	<b>166,176</b>
	5,000	100,000	100,000	300,000	500,000	<b>1,005,000</b>
Endowment+	375,000	0	0	0	0	<b>375,000</b>
<b>TOTALS</b>	<b>551,722</b>	<b>293,266</b>	<b>293,266</b>	<b>417,405</b>	<b>693,266</b>	<b>2,248,925</b>

**Budget Table Footnotes:**

\* Calculations for estimated FTE revenue generated is based on the 2006-07 MRR formula (\$30,477) with 6 new students in FY 2008-09, 6 new students FY 2009-10, 3 new students FY 2010-11 and 6 new students in FY 2011-2012. See Table 1 on page 7.

\*\* Calculations for student tuition generated are based on the 2007-08 approved full-time tuition for Clemson graduate tuition programs (\$3,960/semester) and 2007-08 projected student's fees (\$850/semester) at Clemson University. This includes 6 new students in FY 2008-09, 6 new students FY 2009-10, 3 new students FY 2010-11 and 6 new students in FY 2011-2012. See Table 2 on page 9.

\*\*\*Projected funding for doctoral student: F31 for minority students; National Research Service Award (NRSA) @ \$20,772

+Duke Endowment funding for the "LPN-Professor" partnership with AnMed Hospital, Oconee Memorial Hospital and Tri-County Technical College

#Other federal funding

##Reallocation of funds from School of Nursing during times with absence of federal funding.

**Budget Narrative**

**Program Administration Coordinator of Doctoral Program.** One full time faculty member will allocate 50% effort to the administration of the program. The position is fully funded by Duke Endowment for first year. As the Duke Endowment funding ends, the School of Nursing will reallocate funds as necessary.

**Salaries of Faculty** (Reflects FT MS-PhD Schedule). Salary reflects assisting the psychology department to add a .5 FTE faculty member to teach an additional section of PSYCH 810/811 for students due to the consistently high level of enrollment. This faculty member is not reflected in Table 4 because they are not an FTE within the college. The extra salary has been added to the budget for faculty salaries in Table 9.

**Graduate Assistants.** Students (6) will have the option of participating as graduate teaching assistants or graduate research assistants pending availability of grant funding.

**Staff.** A Research Associate position will provide genetic laboratory management and oversight of student research in the lab. The position is fully funded by Duke Endowment for first year. A Student Services Coordinator (50%) to work with prospective and current students is proposed. The coordinator also will work with master's level programs in the school.

**Supplies and Materials.** Reflects laboratory costs associated with tissue culture and genetic technologies. (Examples include fluorescent cell markers and cell flow cytometry.) This will be supplemented with collaborative partnerships and federal funding.

**Library Resources** (see Library Resources)

**Equipment.** Initial equipment to be purchased includes luminometer plate reader, light microscopy and cell isolation instruments. Equipment will be funded by federal monies or reallocation of School of Nursing funds as necessary. Please refer to earlier section on equipment and shared interdisciplinary laboratories available to faculty and students across the campus.

**Facilities.** Costs in year three and afterwards reflect rental and renovation costs in new facilities. This will be paid for by federal funding, other donations and/or reallocation of School of Nursing funds as necessary.

**Institutional Approval**

Board of Trustees	Date: January 18, 2006
College Curriculum Committee	Date: September 5, 2006
College Dean	Date: September 5, 2006
University Curriculum Committee	Date: October 13, 2006, March 9, 2007, revisions
University Provost	Date: November 8, 2006, September 26, 2007 revisions
University President	Date: November 8, 2006, September 26, 2007 revisions