October 21, 2015

Dr. Abigail Panter, Senior Associate Dean
Undergraduate Education
UNC College of Arts & Sciences
Campus Box 3504
3018 Steele Building Chapel Hill, NC 27599-3100

Dear Dean Panter:

The School of Information and Library Science strongly supports this proposal for a dual degree BS/MSIS with the School of Information and Library Science (SILS). The proposed dual degree will provide an educational pathway that prepares students to become leaders in data management and information processing in a range of environmental and energy fields. In collaboration with ENEC faculty we propose a dual degree program that leverages the instructional excellence in both ENEC and SILS. We already see ENEC students taking the SILS BSIS minor or in some cases doing the BSIS as a second major. Our faculty have team taught courses (e.g., a freshman seminar on 'smart cities'; a capstone seminar on 'a food algorithm for the Triangle'), so we see this dual degree program as a natural extension of common interests of our programs under a generic umbrella of environmental informatics.

The program spells out a plan that enables BS students to work with SILS faculty early in their bachelor's program to plan electives that prepare them for the MSIS or to earn a minor in information science as part of the BS in ENEC. The plan is for ENEC BS students to apply conditionally for this program before their junior year so that time remains to take the courses needed for entry to graduate school in SILS.

Dr. Cable notes that students in environmental fields work in interdisciplinary teams and increasingly depend on data science techniques and tools, while at the same time grappling with complex social, political, and economic issues related to energy, food, and the environment. The SILS MSIS degree is inherently interdisciplinary, attracting students from undergraduate programs in the social, physical, and life sciences as well as arts and humanities. The program engages students in team-based projects that apply information technologies and tools to real world problems. We strongly believe that graduates of the proposed dual program will not only secure important positions in companies and government agencies, but will also be prepared to become thoughtful leaders who value evidence-based decision making and policy setting.

The dual degree program will provide Carolina students to graduate with the knowledge, skills, and perspectives to be leaders in the emerging environmental informatics field. We are strongly enthusiastic about this partnership.

Sincerely,

Gary Marchionini
Dean and Cary C. Boshamer Professor

October 29, 2015

Abigail Panter, Senior Associate Dean
Undergraduate Education
UNC College of Arts and Sciences
Campus Box 3504
3018 Steele Building
Chapel Hill, NC 27599

Dear Dean Panter:

I am writing to you to endorse the proposal for the dual degree BS/MSIS program with the School of Information and Library Sciences. The program, which represents a partnership between SILS and the College's Curriculum in Environment and Ecology, with support from Honors Carolina, will allow BS students in Environmental Sciences to progress directly into an MSIS in Information Sciences.

As Senior Associate Dean for the Natural Sciences I am pleased to support this program, which would be an excellent parallel program for the BS students in ENEC. Similar to the current ENEC-JOMC collaboration with their BS-MSIS dual degree program, this BS-MSIS involves degrees from two distinct disciplines. The inherent interdisciplinary nature of environmental fields makes this program beneficial to our undergraduate students, allowing them to emphasize data management and informatics alongside science in recognition of the need to have a workforce with the tools to manage data and the background to understand its meaning. At the same time, the program not only responds to student demand but also makes our graduates more marketable by training them to share their knowledge and information in a unique approach.

Please do not hesitate to contact me should you have any questions or require further information.

Sincerely,

Kevin M. Guskiewicz, PhD, ATC
Kenan Distinguished Professor, Exercise and Sport Science
Senior Associate Dean, Natural Sciences

cc: College of Arts and Sciences Administrative Board

20 October 2015

Abigail Panter, Senior Associate Dean
Undergraduate Education
UNC College of Arts & Sciences
Campus Box 3504
3018 Steele Building
Chapel Hill, NC 27599-3100

Dear Dean Panter:

The Curriculum in Environment and Ecology (ENEC) is pleased to support this proposal for a dual degree BS/MSIS with the School of Information and Library Science (SILS). The proposed dual degree would facilitate the progression of our BS students in environmental sciences into an MSIS in Information Science. We have negotiated a path with SILS faculty that will allow flexibility for our students as undergraduates while also fulfilling their prerequisites for entering graduate school in SILS. ENEC students pursuing a BS degree would have the option to work closely with advisors in SILS and ENEC to take the necessary courses through an informal selection of critical courses or a more prescribed minor in SILS. ENEC students would be asked to apply conditionally for this program before their junior year so that time remains to take the courses needed for entry to graduate school in SILS. This step would place them with an advisor in SILS so that course schedules could be guided.

The benefits of this proposed dual degree program are threefold: (1) environmental fields are inherently interdisciplinary and we see this program as an important mechanism to enhance our undergraduate experience; (2) the emphasis on data management and analytics is increasing at UNC and globally as a result of "big data"; (3) student demand is increasing for courses and programs that enhance their job marketability while still providing a quality liberal arts education. It is critical that we train environmental students knowledgeable about importance of climate change, sea level rise, droughts, fracking, food scarcity, genetically modified food, and other critical issues facing the US and world who can also manage the immense amount of data generated by continuous monitoring records, energy production and distribution, smart grid management of transportation/energy/utilities. This proposed dual degree offers our BS-seeking environmental science students the opportunity to begin their studies in the professional setting of the School of Information and Library Sciences while still undergraduates.

Sincerely,

Jaye E. Cable
Chair, Curriculum for Environment and Ecology
University of North Carolina-Chapel Hill

The Dual BS-MSIS in Environmental Sciences and Information Science

The proposed dual-degree program in the area of Environmental Informatics represents a unique partnership between the School of Information and Library Science (SILS) and the Curriculum in Environment and Ecology. Unlike most existing dual bachelor/master degree programs at UNC-CH, where both degrees are conferred from the same entity, the proposed program would involve degrees from two distinct disciplines, a BS in Environmental Sciences and an MS in Information Science.

The dual BS-MSIS in Environmental Sciences and Information Science offers students the opportunity to gain a thorough knowledge of environmental science and the skills and preparation for managing data in a variety of applications by taking advantage of existing expertise in both units without creating a new degree. The dual degree is particularly compelling in this age when data management and smart grid technology industries depend on a knowledgeable workforce to meet their needs.

The program is designed to prepare students for careers in a variety of institutions, including the government, not for profit groups, businesses and corporations, and research organizations. The MSIS will provide UNC graduates a unique advantage when entering the job market or applying for doctoral work in natural science, information sciences, or other fields. Further, the dual degree program can be marketed as a unique differentiator to attract exceptional applicants to the undergraduate program at UNC-CH.

Faculty members in the information school (SILS) and in environmental sciences have observed a growing interest among students in the field of data management, smart grid, data analytics, smart cities, and continue to develop innovative classroom experiences to meet this demand:

- In 2014, 3 SILS undergraduates joined an ENEC 698 capstone team to perform research on a sustainable living project. Students from SILS were joined by 5 students from CEE and one business school student. They worked together with ECOLAND Institute, a not-for-profit organization in Cary, NC, to develop a crop-choice algorithm. The algorithm drew data from a database designed by the team. These data were derived from a variety of sources and automatically added to the database through PHP coding. This experience was grounded in real-world needs and scientific validation and demonstrated the advantages of cross-disciplinary teamwork.

- In 2015, SILS and CEE collaborated on a First Year Seminar, INLS 089 Smart Cities, to demonstrate to incoming UNC students how information science and environmental science intersect. Twenty-four (24) students worked with a faculty member from SILS on data management and a CEE expert on sustainable living to imagine more efficient and sustainable ways to integrate UNC students

into the local city economy. The web site for the course is http://projectchapelhill.web.unc.edu. We have plans to develop a new INLS 089 FYS course next spring 2016 working together on sustainability and data management.

- In fall 2015, SILS and CEE will again collaborate on a joint undergraduate capstone project, ENEC 698, to understand "food deserts" and the consequences that low income inner city families face regarding access to fresh, nutritious food. Health care costs, transportation, and city planning are integral components to data management and how they will understand the problems families face in this project.

- These collaborative courses at the first and fourth year level have been transformative for students, opening their eyes to the connectivity between environmental and information sciences and stretching them to integrate their knowledge bases. One student commented that the course instructor "was not shy about pushing us to do our best, because he knew we would be frustrated with anything less", and he "challenged each of us to step up to leadership roles in different areas or take on new challenges to push ourselves out of our comfort zone." The students clearly enjoyed these opportunities for crossing disciplines and integrating ideas.

- SILS operates the EPA Research Library in RTP under contract to the EPA. Historically, SILS library science degree students have worked in the library as interns, however as the Library begins to support EPA scientists as they manage their research data, it is feasible that MSIS students in the dual degree program will be selected as interns as well.

- As part of their studies, students are encouraged to examine global environmental issues through programs abroad. The UNC Study Abroad Office operates a network of field sites in places such as the Galapagos and Thailand as well as a number of North Carolina-based field sites, using UNC courses offered through the Curriculum in Environment and Ecology. Students participating in these field sites are required to complete a research project or internship; students planning to complete the BS-MSIS program will be encouraged to create a data management-oriented project that is grounded in environmental sciences or sustainable practices. SILS, for its part, has active exchange programs with the SKKU in Seoul, National University of Singapore, King Charles III University in Madrid, and Charles University in Prague, and new programs are emerging in Santiago, Chile and Wuhan and Peking Universities in China. SILS also has selected projects in Africa and all of these programs offer possibilities for environmental informatics students to study and work abroad.

In advising meetings associated with annual registration, experiential, and career planning, Environment and Ecology faculty members have already identified several students who would like to pursue a program like this proposed BS-MSIS. Students currently majoring in Environmental Sciences are looking to the future and how they might use their science and math backgrounds in both public and private career options. Some ENEC B.S. students have shown their own initiative in pursuing INLS courses, particularly the prerequisite courses needed to take upper division INLS courses. These students would be well-positioned to choose the BS-MSIS option as soon as it is available. In fact some of our recent BS alumni have gone to NC State in the Data Analytics graduate program.

Should the program be approved, we plan to market the program clearly to students by synchronizing efforts among INLS and ENEC. First steps would include the creation of a web page dedicated to the program. The program would be prominently featured on both the Information Science and Environmental Studies websites with a link to the dedicated dual degree program website. Further, the Honors College intends to promote the dual degree program, if approved, to top-tier undergraduate applicants as a reason to select UNC-CH as their preferred choice.

Procedure

Ensuring successful completion of this dual degree program in less time than doing the two degrees independently may require a few minor deviations from the procedures for several existing UNC-CH dual degree programs. Because the degrees in this program will be discrete and conferred from two different entities, overlap of coursework must not exist between the two degrees. Thus, the same coursework used to satisfy requirements for the BS in ENEC can not be used towards the graduate program in MSIS in SILS. We anticipate that the advantages of this proposed dual degree will be enjoyed by students who have entered UNC with many AP credits and complete the BS degree requirements with time to spare for exploring additional electives. These students often have the flexibility to spend part of their senior year taking graduate level courses, not to exceed 12 credit hours or 30% of the master's degree credits, that could then be transferred into a graduate program. However, our proposed program transcends campus disciplinary silos and offers students an uncommon opportunity to take courses with long-term benefits in job training and professional development.

Inquiry and advising: Because strong advising will be central to successful completion of both programs, we will name specific dual degree program advisors in both Environment and Ecology and Information and Library Sciences. Undergraduate students at UNC interested in the dual BS-MSIS program should speak to undergraduate faculty advisors in Environmental Sciences and in Information Science no later than the beginning of their third year in order to plan their program of study and be sure that they will be able to meet the requirements. It is strongly recommended that students intending to complete the dual BS-MSIS program meet with their advisors once per

semester until their admission to the graduate level. Program advisors have already been identified and are highly committed to supporting applicants throughout this process. Ideally we would identify and recruit students in the second semester of the sophomore year or first semester of the junior year. At SILS, all students are advised by a faculty advisor assigned upon admission and SILS will designate at least two faculty advisors for the environmental informatics program.

Application: The School of Information and Library Science will work in concert with Environment and Ecology to develop a conditional pre-admission process that allows students to begin taking MSIS courses in their 4th year. At present, the Graduate School does not have a mechanism for conditional admission in the Apply Yourself process. What SILS does for its dual BSIS/MS degree is to ask that students file a letter of intent (to apply for the Masters). This activates the advising/planning. Our pre-admission process would be an internal mechanism for our programs to evaluate students wishing to pursue this dual degree option and set up a formal advising program for these students. We recommend that students apply for conditional pre-admission no later than their 5th semester of undergraduate school. Pre-admission does not guarantee admission to Graduate School, but it does allow us to maintain an enrollment count for the program each year and manage the program size.

Students planning to start the masters in the fall semester should officially apply in the fall or early spring of their senior year. Students in their senior year would follow the traditional application procedures of the UNC Graduate School to be considered for admission to the SILS MSIS program.

The GRE is not required for conditional pre-admission but is required for official admission to the master's program. At the formal graduate application stage, students must meet all admissions requirements of the UNC Graduate School and the UNC School of Information and Library Science MSIS program.

Course requirements

The diverse offerings of the dual BS-MSIS program include courses at the baccalaureate level and the post-baccalaureate level. Concentrations in Environmental Sciences at the baccalaureate level are "Water and Climate," "Energy and Sustainability," "Environmental Health," and "Ecology and Natural Resources." The B.S. in ENEC is undergoing some proposed changes, including the addition of a quantitative track, which is designed to facilitate the transition of students wishing to pursue the BS-MSIS in environmental informatics.

Applicants for the dual-degree program should major in Environmental Sciences. Students may consider three options for obtaining the necessary INLS prerequisites for formal admission to the graduate program, listed in order from least demanding to most

demanding:
       (1) taking at least three related INLS courses as approved by their dual degree
           program adviser,
       (2) minoring in Information Science, or
       (3) obtaining a second major in BSIS.

We recognize that the minor/double major options may be more difficult to achieve for all students, but we provide them here to show there is no limit to the level of participation students may choose. The obvious most straightforward approach is to take option one based on the advice of a faculty member familiar with the dual degree. In any case, it is our goal to prepare the students for the MSIS program as well as position them to take some credits at the graduate level while still in the BS Environmental Science degree. No more than 30% of required graduate credit hours in a master's program can be transferred into the graduate program. The MSIS graduate program requires 48 credits, which means that students could take 3 to 12 graduate credit hours as undergraduates to be transferred. We will encourage students to try to maximize this opportunity. In doing so, students may take upper level INLS courses as soon as they begin the MSIS degree without having to take additional introductory skills courses, which may extend the program beyond five years. This is a point of departure from the practices of other dual BA-MA or BA-MS programs, but a recommended one given that the degrees are conferred by two different disciplines, rather than building upon the expertise achieved in an undergraduate program from the same discipline. To illustrate, a BS student could take INLS 523 (Introduction to Database Concepts and Applications) as an 'extra' course (beyond the BS requirements) during their undergraduate years and transfer in the 3 credits upon admission to the MSIS. This would allow them to take INLS 623 (Database Systems II: Intermediate Databases) as early as the first semester of the MSIS program.

Two important caveats for this dual degree are that none of the minor courses may count toward the MSIS degree, and any courses used to fulfill the BS degree may not be transferred into the Graduate Program.

Relevant courses in INLS at the undergraduate level include, but are not limited to:

       INLS 089, "First Year Seminar – Special Topics."
       INLS 151, "Retrieving and Analyzing Information,"
       INLS 161, "Tools for Information Literacy."
       INLS 201, "Foundations for Information Science."
       INLS 202, "Retrieval and Organizing Systems."
       INLS 203, "Human Information Behavior."
       INLS 318, "Human Computer Interactions."
       INLS 382, "Information Systems Analysis and Design."
       INLS 384, "Information and Computer Ethics."
       INLS 385, "Information Use for Organizational Effectiveness."

Students in this dual BS-MSIS program will acquire theoretical grounding in Environmental and Information sciences as well as specific data management skills by completing the following requirements:

- ✓ 120 semester credit hours at the baccalaureate level, which will conform to the requirements for a B.S. from the College of Arts and Sciences and the major in Environmental Sciences, and recommended coursework in information science.

- ✓ 48 credit hours at the post-baccalaureate level. This will consist of 24 hours of required coursework in Information Science, 19.5 hours of electives, and 4.5 hours of thesis substitute credits. In their last semester, students will produce an MSIS paper or project (see description below). Courses will be chosen in consultation with advisors in Environmental Sciences and in Information Science.

- ✓ Typically students will begin taking courses at the MSIS level in their fourth year in college. While they are still officially in the baccalaureate program, they may take up to twelve post-baccalaureate-level credit hours (some combination of 3 and 1.5 credit courses) that will subsequently be transferred to the MSIS program, as long as they take enough courses in addition to these graduate level courses to meet the 120-credit BS graduation requirement. Students entering UNC with college credit through placement tests may be able to complete the undergraduate degree requirements in less than four years. It will be important for students to work with advisors in both CEE and SILS to coordinate the timing of courses. Entering the MSIS program a semester or year early is possible, as well as taking longer than five years to complete the BS-MSIS dual degree. In the majority of cases, by the end of their fourth year, students will have taken 123-132 credit hours, three to twelve of which will be at the graduate level and do not count toward the BS degree requirements. The MSIS courses students take as undergraduates should be comprised of up to four of the following:

  - INLS 500 Human Information Interactions
  - INLS 509/COMP 487 Information Retrieval
  - INLS 520 Organization of Information
  - INLS 523 Introduction to Database Concepts and Applications
  - INLS 539: Going the Last Mile: Information Access for Underserved Populations
  - INLS 560 Programming for Information Professionals
  - (or other MSIS core course as recommended by the advisor)

Sample program

For a student with 60 hours of undergraduate credit who has attained a cumulative GPA of 3.0 in his or her first four semesters at the university

Fourth Semester	Students conditionally apply/submit a letter of intent.
Fifth semester	INLS 161, INLS 201, GEOG 370, ENEC concentration, Upper-level perspective – 15 hours BS in ENEC
Sixth semester	INLS 318, INLS 384, ENEC 698, Upper-level perspective, ENEC concentration, – 15 hours BS ENEC
Seventh semester	INLS 500, INLS 523, Upper-level perspective - ENEC concentration - 6 hours BS, 6 hours MSIS
Eighth semester	INLS 509/COMP 487, INLS 520 2 courses in ENEC concentration – 6 hours BS, 6 hours MSIS Student applies to graduate with their BS.[1]
Ninth semester	INLS 560, INLS 581, INLS 582, INLS 585 – 12 hours MSIS
Tenth semester	INLS 781 (1.5 credits), INLS 795, INLS 720, INLS 760, INLS 613—13.5 hours MSIS
Eleventh semester	INLS 992 (Masters' Project), INLS 690-163 (Information Analytics 1.5 credits), INLS 623, INLS 723

(Note: students may elect to take summer classes to shorten their time to degree.

PROJECT or PAPER

In the semester before students expect to graduate (tenth semester in the example above, students will register for 1.5 hours of INLS 781 Proposal Preparation and Presentation in order to complete a final project or research paper appropriate to their area of specialization and outlined course of study. For example, a student might develop a web-based database for a smart cities project. Students register for 3 credits of INLS 992 in their final semester and complete and present their research paper or research project to their advisor.

CONCLUSION

The opportunity of a joint BS-MSIS in Environmental Sciences and Information Science comes at an important time in the life of the university. Students are increasingly seeking degrees that will provide increase their skill sets, smart grid/energy data

---

[1] Students may wish to graduate before their 8th semester to take advantage of graduate funding opportunities. For example, SILS faculty may have research funding that supports undergraduates (e.g., NSF REU supplements) and these students are often excellent candidates for graduate funding on those research grants because they are already familiar with the research projects.

management in the United States is a rapidly growing need, and renewable energy technologies necessarily require data management to distribute power from multiple smaller production facilities. A program in Environmental Informatics that allows students to integrate their environmental and information science backgrounds will meet the growing demand in the energy and data management sectors.

The primary goal of the dual degree is to transform the next generation of young scientists so that they are able to apply their natural and physical science understanding into real world solutions through information science. This proposed dual degree aligns with the university's focus on equipping faculty to better translate and communicate their research and engaged scholarship to a variety of constituencies. The joint BS-MSIS in Environmental Sciences and Information Science broadens UNC's ability to recruit top undergraduate students to the University through innovative educational models.