PROGRAM REVIEW

Dakota State University

Proposed Doctor of Philosophy (PhD) in Cyber Defense

Review Conducted March 5, 2019 by:

Dr. Rayford B. Vaughn, Jr.
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PART 1: Executive Summary

This program review was conducted remotely on March 5, 2019. Areas to be reviewed were included in a Charge Letter dated February 11, 2019 which read in part, "Your charge is to 1) examine the program proposal and supporting documents; 2) interview faculty, staff, and administrators of the university; 3) evaluate related services; and 4) prepare a written report…". Overall, the proposed program does meet national standards for a PhD granting degree program and it does meet a national need for graduates of such a program. Dakota State University has an excellent national level reputation for producing a variety of cybersecurity graduates with a strong technical background. The proposed program should complement the current PhD program in Cyber Operations. The proposal does adequately differentiate between the two PhD programs. The DSU faculty are exceptionally dedicated and well qualified to deliver the course material required. The facilities dedicated to this program appear to be adequate as best I could judge in a remote evaluation. Given that DSU already has successful distance learning programs, I would assume that this program would continue to deliver quality instruction through that same means.

Strengths of the program include a strong and experienced faculty as well as a good pipeline of student applications. During my interviews, I came to believe that the faculty also have strong administration support for the program but a concern is whether or not they have adequate time to guide PhD student research outside their normal teaching/service responsibilities. Additionally, I do not know of a competing program of the same quality that offers this sort of curriculum that nicely combines technical subjects with a managerial and business focus that will produce the kind of graduates that business and government needs other than one program at NOVA Southeastern which should be reviewed and compared against the DSU program (see https://cec.nova.edu/doctoral/dia/index.html).

Areas of concern that could be addressed would include having two "Principles of" courses (701 and 702) and one "Introductory" course (803) in the curriculum. Students in a PhD program should already have the principles and introductory background. This would be appropriate for a Masters level program, but not a PhD. My recommendation would be to make these courses pre-requisites and replace them with courses from your list of electives. Other areas of concern are the current teaching loads of the faculty, the numbers of PhD students advised, and a lack of definition concerning pre-requisites for entering the program. These concerns are more fully address in the report that follows.

Overall, I would recommend that the South Dakota Board of Regents approve this program and that it be implemented at DSU.

Interviews Conducted for the
External Review of Proposed
PhD in Cyber Security
Dakota State University
March 5, 2019
Madison, SD

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Consultant: Ray Vaughn

9:00 am – 10:00 am Central	**University Leadership** ●Scott McKay, Provost and Academic Vice President ●Mark Hawkes, Dean, Graduate Studies ●Dick Hanson, Dean, Beacom College of Computer and Cyber Sciences ●Jeannette McGreevy, Director of Assessment ●Jay Perry, Board of Regents Interim VP for Academic Affairs
10:30 am – 11:30 am Central	**Program Faculty** ●Mark Hawkes, Dean, Graduate Studies ●Kevin Streff, Program Coordinator and Professor ●Ashley Podhradsky, Associate Dean, Associate Professor ●Wayne Pauli, Professor ●Houssain Kettani, Professor ●Kyle Cronin, Assistant Professor ●Pam Rowland, Assistant Professor ●Joshua Stroschein, Assistant Professor ●Yong Wang, Associate Professor ●Jay Perry, Board of Regents Interim VP for Academic Affairs
12:00 pm – 1:00 pm Central	**Program Leadership** ●Kevin Streff, Program Coordinator and Professor of Information Assurance ●Ashley Podhradsky, Associate Dean, Beacom College of Computer and Cyber Science, Assoc. Professor, Information Assurance and Forensics ●Mark Hawkes, Dean, Graduate Studies ●Jay Perry, Board of Regents Interim VP for Academic Affairs

Note: Those highlighted in yellow were not present in the meeting. Dr. Hanson was contacted by telephone later on March 5.

PART 2: PROGRAM EVALUATION

1. Introduction: This document provides details concerning the program evaluation of the proposed PhD program in Cyber Defense at Dakota State University conducted on March 5, 2019 by Dr. Rayford Vaughn.   Overall, the program appears to be consistent with national standards and Dakota State University has an outstanding national reputation for teaching information assurance graduate programs to its students and is recognized by national level credentials.   The faculty are exceptionally dedicated to this program and well qualified to deliver the technical material required.   The facilities dedicated to these programs are more than adequate and have been improved quite dramatically over the past several years.

2. Program resources. Overall, the technical resources appear to be adequate for the proposed curriculum and its distance students.   The new Madison Cyber Lab will certainly be a welcome addition to the resources available to the students and from discussion with University leadership, no issues were identified in staffing the lab.   DSU has recently hired a Director of Assessment that will work with the faculty to insure that learning objectives are appropriate and are being met.   The Beacom Institute also offers superb facilities for the faculty and the laboratory resources needed for this proposed program as well as existing programs.   DSU appears to have the full support of the South Dakota Board of Regents.

3. Program Curriculum. The program does appear to be consistent with what others are delivering nationally.   A similar program that offers a PhD in Information Assurance exists at NOVA Southeastern which I compared to the DSU program. NOVA Southeastern is also primarily a distance delivery school.   I found the two programs reasonably consistent. An advantage of the DSU program is that it has a very good mix of managerial/leadership courses with technical courses.   Positions such as CISO, IT Auditor, cybersecurity engineer, and others will attract graduates of this program.   Since PhD degrees come from research oriented programs, I would recommend that several of the required courses be retitled.   INFA 701 and 702 are "Principles of …" courses and CSC 803 is "An Introduction …" course.   I don't believe introductory or principles courses should be at the PhD level and should instead be pre-requisite courses.   I had difficulty determining what the actual pre-requisites are for this PhD program. It appears that those decisions are being made in an ad hoc manner at present, so some definition could be advantageous here.   I would think that some list of courses (or their equivalent) that serve as pre-requisites should be defined and student backgrounds evaluated against that list prior to admittance to the PhD program.   I would also recommend that additional detail be provided in terms of pathways to the program for students coming from a BS or MS program at DSU or externally.   Many of the courses listed as required for the PhD are also required for a MS at DSU – so it should be clear as to whether or not these count in both degree programs (I suspect they do).   I would also recommend some additional definition be given to the requirement to attend "in residence" courses.   While physical attendance at DSU is required for

these seminars (i.e., CSC890), there needs to be a defined waiver process for certain situations (student's military service, natural disasters, weather related, etc.).   Without such a waiver, a student will lose a full year in the program which seems extreme.   Lastly, I believe the proposed program will provide students with sound preparation for their careers and serve them well as they seek employment.

4. Faculty. I have the advantage of being acquainted with most of the faculty that teach cybersecurity courses at DSU and I have great confidence in their abilities.   DSU has an excellent National reputation for its cybersecurity programs and I believe that will continue with strong support from NSA and NSF.   Having visited DSU for program reviews in the past, I have the advantage of having seen the facilities and having discussed faculty concerns just a few years ago.   Some of those concerns remain.   It seems to me that the teaching loads are rather high for a PhD granting program. Most programs I'm familiar with have no more than a 2/2 split for faculty guiding PhD students and generally faculty guide the research for about 5 to 7 PhD students.   Speaking with the faculty at DSU, it appears that course teaching loads are still in the 3/4 or 3/3 split range in addition to guiding upwards of 10 or more PhD students.   As this new program comes online, I would suspect that the numbers of PhD students that faculty are chairs for will increase.   This will affect the quality of guidance provided to the student as well as important areas such as faculty retention, research productivity (both funded research as well as publications), and time spent updating online courses.   DSU recently created the position of Vice President for Research and Economic Development which indicates to me that the university values funded research and intends to grow in that area.   In fact, looking at the data available on the DSU web site as well as the NSF HERD survey – funding awards and research expenditures have grown significantly since 2016.   Adding PhD students and leveraging their research results can result in institutional funded research growth – but only if the faculty have the time and resources to understand the research of their students and translate that into competitive proposals.   I believe the current teaching loads, service requirements, and student guidance requirements that the faculty currently have are limiting this growth.   It appears that the cyber programs are continuing to experience growth at DSU which would lead me to advocate for additional cybersecurity faculty hires (a very difficult hire in today's market).   That having been said, I must applaud the efforts of your current faculty that do all they currently do and achieve the results they achieve.

5. Services. I did not visit the campus for this review, so I was not able to review services in any great depth.   I did ask this question of each of the groups I interviewed and the consensus opinion was that there were no issues with any of the DSU services provided.   Student outreach and assistance was outstanding and the physical infrastructure to support the program was excellent.   The new Director of Assessment had plans to facilitate the faculty in determining whether or not course outcomes were being met and reviewing student feedback.   It was brought

to my attention that the university is transitioning to having a research track for faculty and that some services to facilitate that transition would be helpful.   It appears to me that DSU is noteworthy in this area.

6. Other Issues. There were no additional issues brought to my attention.

7. Summary Recommendation. I recommend approval of this program and believe it addresses a National need for such graduates.   I recommend that additional attention be given to developing more definition of pre-requisites for the program – at the current time, this appears to be accomplished by subjective opinion of the program coordinator.   A defined set of pre-requisite courses will insure that students entering the program have a somewhat common background and increase their likelihood of success. There is no doubt in my mind that this program will experience growth beyond that seen in the PhD Cyber Operations program and that growth will place additional burden on the current faculty's workload and their research expectations.   I would recommend that the administration strongly consider additional hires of cybersecurity faculty (I was given to understand that this is the plan).   These are very difficult hires to make in today's market, so pursing these early makes sense if DSU is in a position to do so.