Graduate Certificate in Business Analytics
North Carolina State University

This request has been reviewed and approved by the appropriate campus committees and authorities.

Endorsed By:

H. Sebastian Heese
Head, Department/Director of Graduate Program (Printed Name and Signature) 9/11/2019

Recommended By:

D. Scott Stewart
Chair, College Graduate Studies Committee (Printed Name and Signature) 9/30/19

Endorsed By:

Steven G. Allen
College Dean (Printed Name and Signature) 9/12/19

Recommended By:

Thomas K. Miller
Vice Provost, DELTA (if DE degree) (Printed Name and Signature) 8/26/19

Approved By:

Peter J. Harrington
Dean of the Graduate School (Printed Name and Signature) 12/20/20

Recommended By:

Duane Kharek
Dean's Council (Printed Name and Signature)

Approved By:

Executive Vice Chancellor and Provost (Printed Name and Signature) 3/12/20

Approved By:

Chancellor (Printed Name and Signature) Date

(revised August 2015)
NC State University
Certificate Proposal Form

Certificate Title: ____Graduate Certificate in Business Analytics_____________________
   New:  ☒
   Revision:  ☐

Classification of Instructional Programs (CIP) Discipline # (6 digits): ____52.1302____
*Please ensure that you select the appropriate CIP code for your certificate program. Please consult this website for more information about CIP codes: https://nces.ed.gov/ipeds/cipcode/default.aspx?y=55

Certificate Type:
   On-Campus:  ☐
   Distance:  ☐
   On-Campus & Distance:  ☒

Proposed Effective Date: ____Fall 2020_____________________

Director of the Certificate Program: ____William Rand_____________________________
Program Coordinator (if different from Director): ____Jenny Champ____________________
Graduate Services Coordinator: ______Kiresten Branch_____________________________
College: ____Poole College of Management__________________________
Department/Program: ____Business Management__________________________

Catalog Description:

The Graduate Certificate in Business Analytics is a one- to two-year program that is designed for working professionals in the Research Triangle community. They will learn to make business decisions by applying techniques in applied statistics, data management, forecasting, optimization, and visualization.

Enrollment:

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<th>On-Campus</th>
<th>Distance</th>
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<td>Yr. 1-5 Yr. 2-10 Yr. 3-15 Yr. 4-15</td>
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Attachments:

☒ Proposal Document
☒ Statement of other departments likely to be affected and summary of consultation with those departments
☒ Program-level assessment
☒ Campus Routing Form
☒ Signature Page
PROPOSAL DOCUMENT:
GRADUATE CERTIFICATE IN BUSINESS ANALYTICS

Program justification

The Poole College of Management proposes the creation of a Graduate Certificate in Business Analytics (GCBA). The certificate program is designed to provide access to graduate training in business analytics to working professionals in the community with baccalaureate degrees.

Certificates in analytics are already being provided by the business schools at Colorado State, Indiana, Iowa State, Michigan State, MIT and Penn State and have proven to draw significant interest from students. Appalachian State, UNC-Chapel Hill, UNC-Charlotte, and UNC-Greensboro all currently offer graduate certificates in analytics through their business schools.

The program supports the goals of NC State's strategic plan:

1. Enhance student success: Skills in business analytics are highly valued in today's labor market. PCOM initiated a business analytics track for its undergraduates two years ago; the graduates of that track have multiple offers from employers and are earning significantly more than other PCOM graduates.
2. Invest in faculty: Expanded opportunities to engage with graduate students will allow us to attract and retain research-oriented faculty. GCBA will include a practicum where faculty will supervise students working as consultants for an organization with a challenge that can be met through business analytics.
3. Enhance local engagement: PCOM has already engaged with First Citizens, Red Hat and Teradata for consulting projects and expects to widen this circle of engagement considerably with this new program.

Description

The Graduate Certificate in Business Analytics is a one- to two-year program that is designed for working professionals in the Research Triangle community. They will learn to make business decisions by applying techniques in applied statistics, data management, forecasting, optimization, and visualization.

Who should enroll

Enrollment is open to the following:

i) All full-time, part-time and on-line MBA students who wish to signal their business analytics expertise to the job marketplace

ii) Lifelong education students, including managers, executives and entrepreneurs, who aspire to gain or improve their decision making with expertise in business analytics

Benefits to enrolled students

i) Learn about the latest tools and techniques in business analytics

ii) Learn how to apply these tools and techniques to actual business situations, using real company data

iii) Learn in small classes that foster an intellectually stimulating environment

iv) Improve prospects for career advancement

v) Benefit from networking opportunities with other business students/executives enrolled in the program

Program Structure
Management  The program will be housed in the Poole College of Management for administrative purposes. The DGP will be Professor William Rand.

Curriculum  Students must complete fourteen hours of courses with grades of B— or better in every course. MBA 506 and 507 must be taken before any other courses.

1. Required courses (8 hours)
   - MBA 506 Data-Driven Managerial Decisions 1 (1 hour)
   - MBA 507 Data-Driven Managerial Decisions 2 (1 hour)
   - MBA 551 Predictive Analytics for Business and Big Data (3 hours)
   - MBA 552 Data Engineering, Management and Warehousing for Business (3 hours)

2. Required practicum (3 hours)
   Select one of the following options:
   
   OPTION A: MBA 559 Business Analytics Practicum (3 hours)
   
   OPTION B: Students can select one of the following practicum course options, provided that the project they complete in the course has an analytics focus. Students will need approval from the certificate director before enrolling in one of these courses for analytics certificate credit.
   
   - MBA 519 Enterprise Risk Management Practicum (3 hours)
   - MBA 524 Equity Valuation (3 hours)
   - MBA 549 Supply Chain Management Practicum (3 hours)
   - MBA 590 Jenkins Consulting Practicum (3 hours)

3. Elective courses selected from the following list: (3 hours)
   
   - ECG 561 Applied Econometrics I (3 hrs.)
   - ECG 562 Applied Econometrics II (3 hrs.)
   - MBA 545 Decision Making under Uncertainty (3 hrs.)
   - MBA 590 Digital Marketing (3 hrs.)
   - MBA 590 Marketing Analytics (3 hrs.)
   - MBA 590 Analytical Supply Chain Management (3 hrs.)
   - MBA 590 Innovation and the IoT Marketplace (3 hrs.)

Admission requirements

Graduate students in PCOM must be in good standing and must submit an application to the certificate program that will be reviewed and approved by the coordinator.

Students not attending NC State must have completed a baccalaureate degree from a regionally accredited institution. It is open to all majors. Evidence of strong quantitative skills will be a factor in admissions decisions. A minimum GPA of 3.0 in undergraduate and graduate work combined is required.
for admission to the program. Those with less than a 3.0 may be admitted provisionally. Provisionally admitted students must initially take MBA 506 and 507 and earn a grade of B (3.0) or better in both.

Because this is a premium tuition program, it will not be available to graduate students at NC State outside the Poole College of Management.

**Standards for the certificate**

Students must complete the required credit hours with an aggregate GPA of 3.0 or higher. Credit toward the certificate in a particular course will be given only if a grade of B- or better is given in the course. All courses in the program must be taken for a letter grade. No transfer credits will be accepted into the program, and it must be completed within three years.

**Relationship to admission to other degree programs:**

Applicants will be notified in all applications and promotional materials that “Academic success might have a strong bearing on admission to a degree program BUT completion of a certificate program in no way guarantees entry into a graduate degree program, which is done through a separate application process.”

**Relationship to other programs at NC State:**

The certificate will complement the existing MS in Analytics by providing an option for working professionals who are unable to spend 10 months in a full-time program. Certificate students will be able to choose when they take the courses and select the learning platform (face-to-face or online). It also will have a different academic focus by putting more stress on business applications and exposing students to a more limited range of data science techniques.

The new certificates in Applied Statistics and Data Management and Data Science Foundations target working professionals, but the academic requirements do not overlap. The required courses in those two certificate programs are offered by the Computer Science and Statistics departments.

**Graduate Faculty:**

Full professors: Sebastian Heese, Jon Bohlmann, Richard Warr
Associate professors: Denis Pelletier, Bill Rand, Jeffrey Stonebraker
Assistant professor: Donnie Hale, Sherry Fowler, Rishika Rishika

**Responsibility for Administration and Resources**

This certificate program will reside in the Department of Business Management in the Poole College of Management. The certificate coordinator will be a graduate faculty member from that department. Existing resources will be used to support the administration of this program.

The certificate coordinator will:

- Make all admission decisions to the certificate program
- Notify the Dean of the Graduate School of the student's completion of certificate requirements
• Function as liaison with academic departments and the Graduate School
• Convene faculty as needed to review the program and discuss possible changes in admission requirements and curriculum

**Program or Policy Changes for this Certificate**

Changes in the GCBA will be determined by the faculty and channeled through the appropriate departmental/college committees. Changes will be reported to the Graduate School.

**Statement of other departments likely to be affected and summary of consultation with those departments**

The following departments and graduate programs had the opportunity to review earlier versions of this proposal and to provide feedback:

Computer Science  
Financial Mathematics  
Institute for Advanced Analytics  
Operations Research  
Statistics  
Mathematics

**Summary of consultation with Institute for Advanced Analytics:**

Dean Frank Buckless of the Poole College of Management had a 3:30 p.m. conversation on December 13 2019 with Professor Michael Rappa, founding director of the Institute for Advanced Analytics, Distinguished University Professor, and director of the Master of Science in Analytics program. Professor Rappa carefully reviewed an earlier version of this proposal. He provided feedback regarding program leadership, curriculum design and the relationship between the proposed certificate and the existing MS program.

All of this feedback was incorporated into this document. Professor William Rand, a tenured professor and member of the Graduate Faculty, will be the certificate program director. The language and process for the practicum requirement has been revised. A section has been added to the proposal to discuss the relationship between this proposed certificate and other analytics programs on campus.

**Summaries of other consultations**

All other consultations were handled electronically. Email messages confirming the consultation and support appear below.
From: George Rouskas rouskas@ncsu.edu  
Subject: Re: Consultation for certificate proposal  
Date: November 15, 2019 at 12:19 PM  
To: Steve Allen sgallen@ncsu.edu 
Cc: Kayla Anima mnanima@ncsu.edu, George N Rouskas rouskas@ncsu.edu

Dear Steve,

I have reviewed the proposal, and there is minimal, if any, overlap with Computer Science programs. Therefore, I have no objections and I am happy to support this certificate.

Best regards, George

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George Rouskas,  
IEEE Fellow  
Professor and Director of Graduate Programs  
NC State Computer Science  
rouskas@ncsu.edu  
http://rouskas.csc.ncsu.edu/

On Nov 14, 2019, at 1:31 PM, Steve Allen <sgallen@ncsu.edu> wrote: Dear George:  

The Poole College of Management is proposing to start a graduate certificate in Business Analytics. As part of the Graduate School process, I am reaching out to you to obtain feedback regarding the proposal. We also will be reaching out to the Institute for Advanced Analytics and the Departments of Mathematics and Statistics.

I would appreciate it if you could complete your review within the next couple of weeks. Ideally we would like to start the certificate program in the spring. Kayla Anima from the Graduate School should receive a copy as well.

Of course I would be more than happy to meet in person or talk on the phone before you provide any formal feedback. Best regards,  
Steve

Steven Allen  
Associate Dean for Graduate Programs Poole College of Management  
NC State University  
Raleigh NC 27695-7229  
(919) 515-6941 office
From: Michael Kay kay@ncsu.edu
Subject: Re: Consultation on proposed new graduate certificate
Date: November 25, 2019 at 11:08 AM
To: Steve Allen sgalen@ncsu.edu
Cc: Kayla Anima mnanima@ncsu.edu

Dear Steve,

Thank you for sending me the information about your new graduate certificate in business analytics. In the last few years, analytics has definitely been the most popular area for master students in operations research. Companies are realizing that they need people trained to effectively use data as part of their decision-making processes. It looks like the certificate program you're proposing fit very nicely into the range of analytics type activities on campus.

Best regards, Mike

On Thu, Nov 21, 2019 at 11:41 AM Steve Allen <sgalen@ncsu.edu> wrote: Dear Mike:

The Poole College of Management is proposing to start a graduate certificate in Business Analytics. The Graduate School asked me to consult with the Operations Research program, so I am reaching out to you to obtain feedback regarding the proposal.

I would appreciate it if you could complete your review within the next couple of weeks. Ideally we would like to start recruiting students for the certificate program in the spring. Kayla Anima from the Graduate School should receive a copy of your reply to me as well.

Of course I would be more than happy to meet in person or talk on the phone before you provide any formal feedback. Best regards, Steve

Steven Allen
Associate Dean for Graduate Programs Poole College of Management
NC State University
Raleigh NC 27695-7229
(919) 515-6941 office

Michael G. Kay
Interim Director, Operations Research Assoc. Professor of Industrial Engineering North Carolina State University
Raleigh, NC 27695-7908, USA
(919) 515-2008, http://go.ncsu.edu/kay
From: Wenbin Lu wlu4@ncsu.edu
Subject: Re: Consultation on graduate certificate proposal
Date: November 25, 2019 at 11:19 AM
To: Steve Allen sallen@ncsu.edu
Cc: Kayla Anima nnanima@ncsu.edu

Dear Steve,

Both Justin and I have reviewed the proposal of the graduate certificate in Business Analytics. Overall, we think the proposal looks fine. Justin made a comment that the wording in the description should be updated to emphasize the business part in the following sentence:

"They will obtain advanced skills in applied statistics, data management, forecasting, optimization, and visualization."

Best,

Wenbin

On 11/14/2019 1:34 PM, Steve Allen wrote:
Dear Professor Lu:

The Poole College of Management is proposing to start a graduate certificate in Business Analytics. As part of the Graduate School process, I am reaching out to you to obtain feedback regarding the proposal.

I would appreciate it if you could complete your review within the next couple of weeks. Ideally we would like to start the certificate program in the spring. Kayla Anima from the Graduate School should receive a copy as well.

Of course I would be more than happy to meet in person or talk on the phone before you provide any formal feedback. Best regards,
Steve

Steven Allen
Associate Dean for Graduate Programs Poole College of Management
NC State University
Raleigh NC 27695-7229
(919) 515-6941 office

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Wenbin Lu
Professor & Director of Graduate Program North Carolina State University
5112 SAS Hall, 2311 Stinson Drive Raleigh, NC 27695-8203
phone: 919-515-1915
web: http://www.stat.ncsu.edu/people/lu/
From: Tao Pang tpang@ncsu.edu
Subject: Re: Consultation on graduate certificate proposal
Date: December 5, 2019 at 4:35 PM
To: Steve Allen sgallen@ncsu.edu
Cc: Kayla Anima mnanima@ncsu.edu

Dear Steve,

Thanks for your email.

I have reviewed the proposal, and I think it is a great idea to offer this certificate at NC State University. The proposed program looks fine to me and I do not have any further comments.

If there is anything that the FM program or I can do to help, please feel free to let me know. Thanks and good luck with the certificate program!

Best, Tao.

Tao Pang, Ph.D., CFA, FRM
Professor and Director
Master of Financial Mathematics Department of Mathematics
North Carolina State University
Raleigh, NC 27695-8205
Tel: (919) 513-2110
Email: tpang@ncsu.edu

On Fri, Nov 22, 2019 at 12:39 AM Steve Allen <sgallen@ncsu.edu> wrote: Dear Professor Pang:

The Poole College of Management is proposing to start a graduate certificate in Business Analytics. The Graduate School asked me to consult with the Financial Mathematics program, so I am reaching out to you to obtain feedback regarding the proposal.

I would appreciate it if you could complete your review within the next couple of weeks. Ideally we would like to start recruiting students for the certificate program in the spring. Kayla Anima from the Graduate School should receive a copy of your reply to me as well.

Of course I would be more than happy to meet in person or talk on the phone before you provide any formal feedback. Best regards,

Steve

Steven Allen
Associate Dean for Graduate Programs Poole College of Management
NC State University
Raleigh NC 27695-7229
(919) 515-6941 office
Hi Steve,

I looked over the proposal and I don’t see any issues from the math department side.

Best, Seth

On Thu, Nov 14, 2019 at 1:38 PM Steve Allen <sgallen@ncsu.edu> wrote:

Dear Seth:

The Poole College of Management is proposing to start a graduate certificate in Business Analytics. As part of the Graduate School process, Pierre Gremaud asked me to contact you to obtain feedback regarding the proposal.

I would appreciate it if you could complete your review within the next couple of weeks. Ideally, we would like to start the certificate program in the spring. Kayla Anima from the Graduate School should receive a copy as well.

Of course, I would be more than happy to meet in person or talk on the phone before you provide any formal feedback. Best regards,
Steve

Steven Allen
Associate Dean for Graduate Programs
Poole College of Management
NC State University
Raleigh NC 27695-7229
(919) 515-6941 office

Seth Sullivan
Distinguished Professor of Mathematics
Director of Graduate Programs
North Carolina State University
smsuli2@ncsu.edu
Office: SAS Hall 3114
Office Phone: 919-513-7445
Gender Pronouns: he, him, his
LEARNING ASSESSMENT

1. At the time they complete this certificate program, graduates are expected to
   • be satisfied with the usefulness of the certificate program in enabling them to achieve their professional goals
   • be sufficiently satisfied with the certificate program to recommend it to others with the same professional goals
   • be satisfied with the appropriateness of the courses in providing the knowledge or training they anticipate needing for their professional goals
   • be satisfied with the frequency and timeliness of the courses offered for the certificate
   • be satisfied with the quality of teaching in certificate courses
   • be satisfied with the overall educational experience of the certificate program

Metrics: Exit Survey administered by Graduate School

2. Students will have the skills to manage and analyze a large data project. They will
   • demonstrate the critical thinking skills needed to successfully frame and solve business problems using data analytics.
   • apply the appropriate technical data analytic skills to solve business problems.
   • visualize and present analytic results in a way that is compelling.
   • demonstrate team-based, deadline-driven skills necessary to complete data-driven analytic projects.

Metrics: Rubric completed each semester for each certificate student in the analytics practicum project.