

UNDERGRADUATE COUNCIL

Request for New Program

Originating unit requesting program: Department of Mathematics and Computer Science

New Program title: BS Degree Program in Data Science

Proposed CIP Code: 30.7001

*for reference please visit: <https://nces.ed.gov/ipeds/cipcode/resources.aspx?y=56>

- I. By university policy all programs must have a Program Assessment Plan approved by the Director of Assessment. Please include a copy of the assessment plan for this program or a letter from the Director of Assessment verifying that the assessment plan has been approved. NOTE: No assessment plan is required for new minors.

Guidelines for preparation of a Program Assessment Plan are available from the Office of Assessment or at www.ie.tcu.edu.

See Attached

- II. If this program is to be delivered online, include a letter from the Koehler Center stating that program administrators and identified faculty are working with the Koehler Center to fulfill TCU Distance Learning requirement.
- III. Need and comparisons:
Demonstrate the need for the program (surveys, professional data, area programs or lack thereof, student inquiries, programs at other universities).

The proposed BS degree program in Data Science is designed to prepare graduates for a broad set of careers involving the analysis of data. TCU has seen recent demand from employers for students with these skills. This demand for high level data analysis skills, has been observed by the College of Science and Engineering career consultant, Gabriela Pineider:

- *When speaking with prospective employers [on behalf of students], such as Lockheed Martin, many state that though they would accept our mathematics undergraduates in their data analytics roles, they did have preference for data science due to the way data scientists “are taught to look for the questions that do not exist yet and to solve problems with the data”.*
- *[M]any students do not complete the data science minor already offered because many employers do not feel the coursework is “enough” for employment opportunities.*

This demand is not limited to employers, as Ms. Pineider also notes, students are looking for opportunities to develop data analysis skills too:

- *Since the 2016 academic year, students in one on one appointments have inquired about degrees in data science...many continued onto graduate degrees in this arena.*
- *In 2018-2019, per the request of 30 students within the College of Science & Engineering, SMU did two information sessions with students for their graduate degree. Half of the students attending likely would have majored in Data Science...had that been an option.*

Further evidence of both employer and student demand comes in the form of similar programs at other regional institutions and national universities. The list of universities that have such programs is rapidly growing and includes nearby institutions such as UNT and UT Dallas, and national universities such as UC Berkeley and Yale.

IV. Resources:

- A. Explain how the unit will provide faculty support for this offering and any other impact this program will have on other current departmental listings, (e.g. change in teaching assignment, part-time faculty).

Both the Computer Science and Mathematics Departments will provide faculty to support the program. No additional resources will be required to support the program. With the exception of one course, COSC/MATH 30103 Introduction to Data Science, the program requirements consist entirely of existing courses or courses that were slated to be created to support existing programs (e.g., COSC 40523 Deep Learning, MATH 40853 Regression and Time Series, and MATH 40883 Predictive Modeling).

- B. How will faculty support for this offering impact offerings for other units?

All courses are taught by existing faculty.

- C. Will additional resources be required?

(If yes, provide the appropriate information requested below). ☐ YES ☒ NO
Space:

Equipment:

Library:

Other:

V. Proposal items:

- A. Catalog copy for new program as it would appear in the Undergraduate Studies Bulletin.
See Attached

- B. New course proposals (see Undergraduate Council's form for new courses).
- COSC/MATH 30103 Introduction to Data Science (already approved)
 - COSC 40523 Deep Learning (already approved)
 - MATH 40853 Regression and Time Series (already approved)
 - MATH 40883 Predictive Modeling (concurrent with this proposal)

- C. Changes in existing courses, if any.

VI. Letters of support from any affected units or programs:

VII. Effective date for proposed program (semester, year): Fall 2020

 

Approval signature of chairperson of originating unit

Catalog copy

The BS degree program in Data Science is designed to prepare graduates for a broad set of careers involving the analysis of data. The program of study requires a minimum of 39 hours in Computer Science and 27-28 hours in Mathematics, on a 124-hour degree, consisting of:

COMPUTER SCIENCE (39 hours)

CITE 30103	Unix Linux Sys Admin
COSC 10403	Introduction to Programming
COSC 20203	Techniques in Programming
COSC 20803	Data Structures
COSC/MATH 30103	Introduction to Data Science
COSC 30603	Database systems
COSC 40023	Data Mining and Visualization
COSC 40403	Analysis of Algorithms
COSC 40503	Artificial Intelligence
COSC 40523	Deep Learning
COSC 40943	Software Engineering
COSC 40993	Senior Design Project

3 Additional hours of approved computer science electives at the 30000 level or above

MATHEMATICS (27-28 hours)

MATH 10524	Calculus I
MATH 20123	Discrete Mathematics I
MATH 20524	Calculus II
MATH 30123	Discrete Mathematics II
MATH 30224	Linear Algebra
MATH 30803	Probability
MATH 30853	Statistics

3-4 Additional hours to be selected from

MATH 30524	Calculus III
MATH 40223	Applied Linear Algebra
MATH 40663	Numerical Analysis
MATH 40853	Regression and Time Series
MATH 40883	Predictive Modeling

Department of Computer Science/Mathematics
Undergraduate Data Science Program
Assessment Plan

Program Mission Statement: To guide students in developing skills to use data as a means to explore problems, develop solutions, and communicate results in an increasingly data driven world.

SLO 1: Recognize and evaluate potential ethical risks in using data and data science methods.

Measurement/Artifacts

- Student ability to identify ethical issues involving the use of data and data science methods. This will be measured by exam questions in COSC 30103 Introduction to Data Science.

Targets

- 70% of students will be able to identify ethical risks in scenarios presented.

SLO 2: Demonstrate a proficiency with standard mathematical tools for the analysis of data.

Measurement/Artifacts

- Student ability to solve linear systems as measured by exam questions in MATH 30224 Linear Algebra.

Targets

- 70% of students will be able to solve a system of linear equations.

SLO 3: Demonstrate a proficiency with standard statistical methods for the analysis of data.

Measurement/Artifacts

- Student ability to conduct a hypothesis test and communicate its conclusion as measured by exam questions in MATH 30853 Statistics.

Targets

- 70% of students will be able to conduct a hypothesis test and state an accurate conclusion.

SLO 4: Analyze a problem and apply fundamental data science processes and practices to collect, clean, process, explore, model, evaluate, and communicate results.

Measurement/Artifacts

- Student ability to apply the data science life cycle in their capstone project in COSC 40993 Sr Design Project.

Targets

- 80% of data science students in COSC40993 complete the capstone project with a grade of B or above.

SLO 5: Understand, create, and effectively deliver technical communications both verbally and in writing.

Measurement/Artifacts

- Oral Communication Skills Rubric – this rubric is completed for oral presentations of each student of the capstone course (COSC 40993) by the capstone instructor based on feedback from faculty, clients, and peers.
- Written documents submitted in the capstone course.

Targets

- 80% of the students should meet “standards” designated on the Oral Communication Skills Rubric.
- 80% of the students should receive a B or better on all required written documentation.

SLO 6: Function effectively in a team environment.

Measurement/Artifacts

- Teamwork Skills Rubric – this rubric is completed for each student of the capstone course (COSC 40993) by the capstone instructor based on feedback from faculty, clients, and peers of each student’s ability to work effectively with his team.

Targets

- 80% of the students should meet “standards” designated on the Teamwork Rubric by the completion of the capstone course.

Assessment Schedule:

2020-2021: (none the first year)

2021-2022: Assess SLO 1,2,3

2022-2023: Assess SLO 4,5,6

Following years – repeat this 2-year assessment cycle



INSTITUTIONAL EFFECTIVENESS

March 3, 2020

Donnell Payne
Associate Professor of Computer Science and Department Chair
Data Science Bachelor of Science Degree
College of Science and Engineering

Dear Dr. Donnell Payne,

I am delighted to approve the assessment plan that you have submitted with some minor changes for the new Data Science Bachelor of Science Program.

As you know, assessment planning is crucial for the process of gathering appropriate and meaningful data for the purpose of enhancing student learning. It is only with the careful creation of assessment plans that we can continue to collect and analyze information about what and how much our students are learning. With this type of assessment data, we can then use that information to systematically enhance the educational outcomes for students.

Please contact me if you have any questions concerning the assessment of this program.

Sincerely,

A handwritten signature in black ink, appearing to read 'Chris Hightower', is written over the word 'Sincerely,'.

Christopher Hightower, Ed.D
Interim Director, Institutional Effectiveness