

**DATE:** November 7, 2019

**SUBJECT:** New Academic Program  
Middle Tennessee State University  
Data Science, Bachelor of Science  
(CIP 11.0802: Data Modeling/Warehousing and Database Administration)

**ACTION RECOMMENDED:** Approval

**PROGRAM DESCRIPTION**

The proposed Data Science, Bachelor of Science (BS) at Middle Tennessee State University (MTSU) is an interdisciplinary program comprised of courses from areas such as Computer Science, Math, Information Systems, Economics, and Finance. Upon completion of the program, students will be competent computer programmers, have experience constructing and using databases, modeling solutions based on data, and using business intelligence tools that aid in the presentation of data. The proposed program will be housed in the College of Basic and Applied Sciences and will work collaboratively with MTSU’s Data Science Institute. A Data Sciences Coordinating Committee is responsible for the coherence of the curriculum and research activities of the proposed program with the Program Director of the Data Science program serving as the chair. Other committee members will include a representative from the Data Science Institute and faculty members from the departments of Mathematics, Computer Science, Information Systems and Analytics, and Economics and Finance.

**INSTITUTIONAL GOVERNING BOARD APPROVAL**

The proposed Data Science, BS program was approved by the Middle Tennessee State University Board of Trustees on September 18, 2019.

**PROPOSED IMPLEMENTATION DATE**

Fall 2020

**RELEVANCE TO INSTITUTIONAL MISSION AND STRATEGIC PLAN**

The proposed Data Science, BS program aligns with the mission of Middle Tennessee State University as expressed in the university’s Academic Master Plan goals such as advancing academic quality; student-centered learning; and developing purposeful and sustainable partnering relationships and outreach. The proposed program specifically creates a collaborative teaching environment which leverages strengths from various disciplines; provides students an opportunity to specialize in areas of interest; and intentionally aligns the Data Science Institute to position students to engage in external projects.

This academic program aligns with the State Master Plan to prepare Tennesseans for careers in high need areas such as data science which is one of the largest potential growth sectors in the state.

## **CURRICULUM**

The curriculum for the proposed program consists of 120 credit hours and includes a data science core and three tracks: Business Intelligence, Machine Learning, and Inferential Thinking. Additionally, students are strongly encouraged to select a minor which relates to their area of content interest. Students will be required to participate in a capstone project or internship prior to graduation.

The program’s learning outcomes are as follows:

- Students will be competent computer programmers and will be familiar with more than one computer programming language.
- Students will understand the mathematical and statistical background underpinning the work of a data scientist.
- Students will have experience constructing and using databases.
- Students will be familiar with the main concepts of machine learning and its application to data.
- Students will have experience with data management.
- Students will have experience modeling solutions based on data.
- Students will have experience with business intelligence tools that aid in the presentation of data.
- Students will be familiar with an ethical framework for the use of data to address important questions.

## **PROGRAM PRODUCTIVITY**

The program will be primarily offered on-campus and will target both full-time and part-time students. The program projects attrition rates to be 10 percent each year. Projected enrollment and graduation rates for the first five years are as follows:

	<b>2020-21</b>	<b>2021-22</b>	<b>2022-23</b>	<b>2023-24</b>	<b>2024-25</b>
<b>Enrollment</b>	29	47	56	64	73
<b>Graduates</b>	--	--	4	9	14

## **PROGRAM DUPLICATION**

Currently, the only undergraduate degree in data science offered in Tennessee is offered at Lipscomb University. Tennessee Technological University and the University of Tennessee, Chattanooga both offer concentrations in data science through engineering programs. Additionally, the University of Tennessee, Knoxville and Tennessee State University offer undergraduate options in business and data analytics.

## **EXTERNAL JUDGEMENT**

An external review of the proposed program was conducted during an institutional site visit on July 11, 2019 by Dr. Hriday Rajan, Professor-in-Charge of Data Science and Professor in Computer Science at Iowa State University. Dr. Rajan commented, “one of the most

significant, and unique, strengths of the program is its potential to have close collaboration with industry partners” and “the program structure itself is very strong”. Furthermore, Dr. Rajan recommended approval of the program and encouraged MTSU to recruit the three new faculty members for year one due to the anticipated enrollment in the proposed program based on his experience at Iowa State University.

### **STUDENT DEMAND**

Student interest was assessed based on surveys administered to MTSU undergraduate students enrolled in various STEM disciplines. Thirty-one percent of respondents (N=64) indicated they were “likely” or “very likely” to major in data science if it was offered at MTSU. Similar programs at other universities have seen rapid growth as confirmed by the external reviewer. For example at Iowa State University, initial enrollment was 15 students with the number of majors increasing to 40 by year six.

### **OPPORTUNITIES FOR PROGRAM GRADUATES**

The feasibility study conducted by MTSU researchers in the Business and Economic Research Center commented, “There is virtual unanimity that data science is increasingly important and that employment demand will continue to be very robust.” Furthermore, letters of support for the proposed program were provided by Juice Analytics, SwitchPoint Ventures, Digital Reasoning, Think Data Insights, Nashville Chamber of Commerce, Rutherford Chamber of Commerce, and Williamson Chamber of Commerce.

Nationally, the 2018 Jobs Rated Almanac lists “data scientist” as seventh best among 220 rated occupations. Additionally, Glassdoor – a large job recruiting site – lists “data science” first among the “50 Best Jobs in America for 2019”.

### **INSTITUTIONAL CAPACITY TO DELIVER THE PROGRAM**

The proposed program involves departments in the Jennings A. Jones College of Business and the College of Basic and Applied Sciences. The majority of the required courses already exist and are offered frequently. However, the anticipated enrollment will require the hiring of additional faculty. Per the recommendation of the external reviewer, three new faculty members will be hired in year one. It is anticipated that these new faculty positions will be advertised as a “cluster-hire” and will bring increased visibility to the proposed Data Science, BS program. The department of appointment for the faculty will be negotiated based on the faculty credentials and it is anticipated at least two appointments will be in the Department of Computer Science. Attachment A outlines the five year budget for the proposed Data Science, BS program.

### **ASSESSMENT AND POST-APPROVAL MONITORING**

An annual performance review of the proposed program will be conducted for the first five years following program approval. The review will be based on benchmarks established in the approved proposal. The benchmarks include, but are not limited to, enrollment and graduation, program cost, progress toward accreditation, and other metrics set by the institution and THEC staff. The monitoring period may be extended if additional time is needed to achieve the benchmarks. If benchmarks are not met, the Commission may recommend that the institutional governing board terminate the program.

**Tennessee Higher Education Commission  
Attachment A: THEC Financial Projections  
Middle Tennessee State University  
B.S. in Data Science**

Seven-year projections are required for doctoral programs.  
Five-year projections are required for baccalaureate and Master's degree programs  
Three-year projections are required for associate degrees and undergraduate certificates.  
Projections should include cost of living increases per year.

	Planning Year	Year 1	Year 2	Year 3	Year 4	Year 5
<b>I. Expenditures</b>						
<b>A. One-time Expenditures</b>						
New/Renovated Space		\$ -	\$ -	\$ -	\$ -	\$ -
Equipment		20,000		-		5,000
Library	\$ -					
Consultants						
Travel	\$ -					
Other	\$ 10,000					
<b>Sub-Total One-time</b>	<b>\$ 10,000</b>	<b>\$ 20,000</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ 5,000</b>
<b>B. Recurring Expenditures</b>						
<b>Personnel</b>						
<b>Administration</b>						
Salary		\$ 14,200	\$ 18,400	\$ 18,400	\$ 18,400	\$ 18,400
Benefits						
<b>Sub-Total Administration</b>		<b>\$ 14,200</b>	<b>\$ 18,400</b>	<b>\$ 18,400</b>	<b>\$ 18,400</b>	<b>\$ 18,400</b>
<b>Faculty</b>						
Salary		\$ 381,000	\$ 391,800	\$ 411,324	\$ 422,782	\$ 483,583
Benefits		108,000	111,240	114,577	118,015	142,555
<b>Sub-Total Faculty</b>		<b>\$ 489,000</b>	<b>\$ 503,040</b>	<b>\$ 525,901</b>	<b>\$ 540,796</b>	<b>\$ 626,138</b>
<b>Support Staff</b>						
Salary		\$ 32,000	\$ 32,960	\$ 33,949	\$ 34,967	\$ 36,016
Benefits		\$ 9,600	\$ 9,888	\$ 10,185	\$ 10,490	\$ 10,805
<b>Sub-Total Support Staff</b>		<b>\$ 41,600</b>	<b>\$ 42,848</b>	<b>\$ 44,133</b>	<b>\$ 45,457</b>	<b>\$ 46,821</b>
<b>Graduate Assistants</b>						
Salary						
Benefits		-	-	-	-	-
Tuition and Fees* (See Below)		-	-	-	-	-
<b>Sub-Total Graduate Assistants</b>		<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>
<b>Operating</b>						
Travel		\$ 5,000	\$ 7,500	\$ 7,500	\$ 10,000	\$ 10,000
Printing		750	750	1,000	1,000	1,000
Equipment						
Other		10,000	11,000	14,500	15,000	15,000
<b>Sub-Total Operating</b>		<b>\$ 15,750</b>	<b>\$ 19,250</b>	<b>\$ 23,000</b>	<b>\$ 26,000</b>	<b>\$ 26,000</b>
<b>Total Recurring</b>		<b>\$ 560,550</b>	<b>\$ 583,538</b>	<b>\$ 611,435</b>	<b>\$ 630,654</b>	<b>\$ 717,359</b>
<b>TOTAL EXPENDITURES (A + B)</b>	<b>\$ 10,000</b>	<b>\$ 580,550</b>	<b>\$ 583,538</b>	<b>\$ 611,435</b>	<b>\$ 630,654</b>	<b>\$ 722,359</b>

**\*If tuition and fees for Graduate Assistants are included, please provide the following information.**

Base Tuition and Fees Rate  
 Number of Graduate Assistants

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
<b>II. Revenue</b>						
Tuition and Fees <sup>1</sup>		\$ 254,016.00	\$ 436,320.00	\$ 527,880.00	\$ 625,128.00	\$ 728,640.00
Institutional Reallocations <sup>2</sup>	\$ 10,000.00	\$ 326,534.00	\$ 147,218.00	\$ 83,554.64	\$ 5,525.68	\$ (6,280.83)
Federal Grants <sup>3</sup>		0	0	0	0	0
Private Grants or Gifts <sup>4</sup>		0	0	0	0	0
Other <sup>5</sup>		0	0	0	0	0
<b>BALANCED BUDGET LINE</b>	<b>\$ 10,000.00</b>	<b>\$ 580,550.00</b>	<b>\$ 583,538.00</b>	<b>\$ 611,434.64</b>	<b>\$ 630,653.68</b>	<b>\$ 722,359.17</b>

**Notes:**

**(1) In what year is tuition and fee revenue expected to be generated and explain any differential fees. Tuition and fees include maintenance fees, out-of-state tuition, and any applicable earmarked fees for the program.**

Year 1 (2019) tuition is estimated at \$392 per credit hour. Tuition in subsequent years has a 3% inflation factor.  
 Year 1: 25 students x 12 hours x 2 semesters x \$392 = \$235,200 + 4 students x 6 credits x 2 semesters x \$392 = \$18,816 (Total = \$254,016)  
 Year 2: 43 students x 12 hours x 2 semesters x \$404 = \$416,928 + 4 students x 6 credits x 2 semesters x \$404 = \$19,392 (Total = \$436,320).  
 Year 3: 50 students x 12 hours x 2 semesters x \$415 = \$498,000 + 6 students x 6 credits x 2 semesters x \$415 = \$29,880 (Total = \$527,880).  
 Year 4: 58 students x 12 hours x 2 semesters x \$427 = \$594,384 + 6 students x 6 credits x 2 semesters x \$427 = \$30,744 (Total = \$625,128).  
 Year 5: 65 students x 12 hours x 2 semesters x \$440 = \$686,400 + 8 students x 6 credits x 2 semesters x \$440 = \$42,240 (Total = \$728,640).

**(2) Please identify the source(s) of the institutional reallocations, and grant matching requirements if applicable.**

One-time expenses in the planning year will be covered through reallocation within Academic Affairs.  
 Institutional Reallocations in years 2-4 are attributed to the cluster hire of faculty in year one and are funded through transfer of existing faculty lines

**(3) Please provide the source(s) of the Federal Grant including the granting department and CFDA(Catalog of Federal Domestic Assistance) number.**

No Federal grants are used to fund this degree.

**(4) Please provide the name of the organization(s) or individual(s) providing grant(s) or gift(s).**

No external grants or gifts are used to fund this degree.

**(5) Please provide information regarding other sources of the funding.**

With the exception of the planning year, this degree is funded entirely through tuition revenue.

NOTE: One-time expenses (Other) includes costs associated with program implementation (e.g., promotion/advertising expenses)  
 One-time Equipment expenses are for the purchase of computers/equipment for new admin and faculty hires  
 Recurring expenses (Other) are for direct expenses (e.g. instructional materials, faculty development, and promotion).

**Administration Personnel**

Administration Salary in Years 1 - 5 are for a Program Director - for reassigned time in the Fall and Spring and stipend (\$10,000) in the Summer  
 Faculty Personnel (Full-time faculty costs include a 3% annual increase in salary while adjunct costs are fixed.)

Year 1: 3 new Tenure-Track Faculty Members & 10 courses (\$21,000) by adjuncts for Math, Computer Science, and/or Info. Systems & Analytics.  
 Year 2 continues 3 Tenure-Track lines from Year 1 and 10 courses (\$21,000) by adjuncts for Math, Comp. Science, and/or Info. Sys. & Analytics.  
 Year 3 continues 3 Tenure-Track lines plus 14 courses (\$29,400) covered with adjuncts for Math, Comp. Science, and/or Info. Sys. & Analytics.  
 Year 4 continues 3 Tenure-Track lines plus 14 courses (\$29,400) covered with adjuncts for Math, Comp. Science, and/or Info. Sys. & Analytics.  
 Year 5 adds 1 new Full-time Instructor to the existing full-time lines with a reduction to 4 courses (\$8,400) covered by adjuncts.

**Support Staff Personnel (each year includes a 3% increase in salary)**

Support Salary in Years 1 through 5 for (1) Executive Aide for the program.

NOTE: Tuition revenue in excess of direct & indirect program costs is included in Institutional Reallocation to support other programs.