NEW PROGRAM PROPOSAL
ILLINOIS INSTITUTE OF TECHNOLOGY

The following information is required to approve a new program. When using this template, move the cursor a little to the right of label, click to place the cursor there, and then type or paste in as much information as needed. Typing or pasting in text will move subsequent labels farther down the page. Each main section (General Information, Marketing Information, and Academic Information) begins a new page.

College Lewis College of Human Sciences
Department: Psychology/Social Sciences/Humanities/Stuart School of Business
Date: 4/20/2013

Approvals Required

(1) Academic Unit Head: Scott Morris - approved by Department of Psychology 3/28/2013

(2) Dean:

(3) Other:

GENERAL INFORMATION

Program Title: Bachelor of Science in Applied Analytics

Program Scheduling *(Next to the appropriate semester, click on the blank and type in the year):*

> Fall __X__   Spring __   Summer   __

Program Level: Undergraduate X___   Graduate ___

Total Program Credit Hours: __130_____

Program Description: *Provide a brief narrative of the program content (use as much space as needed)*

The Bachelor of Science in Applied Analytics combines training in using quantitative research methods and communicating their results.

Program Purpose: *Provide details on the intent of the program and its relation to other programs.*

Students pursuing a Bachelor of Science in Applied Analytics learn not only how to collect, curate, and analyze data but to communicate that data and its implications to various audiences and applications. The Bachelor of Science in Applied Analytics prepares students for the workplace and/or advanced research in statistics or fields in which knowledge of statistics is required, particularly careers in data science, market analysis, business analysis, bioinformatics, psychometrics, and public relations. Students who successfully complete the Applied Analytics degree will be able to manage and analyze data using an array of statistical approaches. Our career advising is based on the close monitoring of the types of analytics needed today and in the future.

Program Benefits: *State the impact of the program for students and for IIT.*

Multiple sources have identified analytics and data science as lucrative careers with thousands of openings. The Lewis College Applied Analytics program will appropriately prepare students to pursue these new careers and will provide expertise in communicating data and understanding human behavior that are lacking from analytics-like programs housed in areas of computer science and statistics.

The Applied Analytics degree highlights existing strengths across the university and particularly in Lewis College and allows IIT to swiftly enter the market for analytics-minded undergraduates.

The degree will be advised and taught by faculty members in the Lewis College of Human Sciences and the Stuart School of Business. Faculty members in both colleges currently teach undergraduate classes in the proposed core curriculum or specializations.

Lewis College faculty working in applied analytics-related fields: Matthew Shapiro (Public Policy Analysis & Econometrics); Libby Hemphill (Social Network Analysis, Communication); Alan Mead (Psychometrics); Kemp Ellington (Psychometrics); Ron Landis (Methodology); Jahna Otterbacher (Statistics, Communication); Scott Morris (Statistics); Mike Young (Statistics); Jennifer Miller (Social Network Analysis); Matt Bauer (Linguistics, Communication).

Stuart School faculty working in applied analytics-related fields: Krishna Erramilli (Program Director for Marketing Analytics and Communication); Weslynne Ashton (Environmental Economics); Siva Balasubramanian (Econometrics and Marketing Analytics); Haizhi Wang (Econometrics); Mike Gorham (Econometrics); Solomon Kang (Econometrics); Li Cai (Econometrics); Navid Sabbaghi (Optimization Expert); Liad Wagman (Microeconomics); plus adjuncts.

Eventually, this undergraduate degree could function as a co-terminal degree program with masters programs that are in existence and under development at IIT including: Masters of Science in Technology and Development Policy, Masters of Personnel and Human Resource Development (PHRD), Masters of Business Administration, Master of Science in Technical Communication and Information Design. A co-terminal degree (BS/MS in Marketing Analytics and Communication) is also a likely outcome once majors in Applied Analytics have sufficiently grown.

MARKETING INFORMATION

Competitive Programs: *Indicate other similar programs locally and nationally detail their success.*

A number of universities offer analytics degrees at the graduate level[1] (e.g., DePaul, Drexel, Michigan State, North Carolina State, Northwestern, Rutgers, Univ of Denver) but only a few undergraduate programs are available. They include Ferris State, Rutgers, Univ of Tennessee-Knoxville[2]. Other universities are reviewing or planning undergraduate Analytics programs or majors: Miami Univ[3], Univ of Kentucky[4].

We met with Will Krohn from IBM/SPSS to discuss the market for analytics degrees, and he agreed we have an opportunity to lead in undergraduate education. Will has done extensive research on the market at both the MS and BS levels and found great potential for growth at the BS level.

Market Analysis: *Detail the results of any market analysis performed; if none, provide justification for the program including (potential) employment opportunities for graduates.*

There is significant market demand for the Applied Analytics degree. The Applied Analytics degree emphasizes the knowledge and skills required for a number of bachelor's-level jobs listed on O*NET as having high growth and high income opportunities. This is further confirmed in two landmark reports: the McKinsey Global Institute's "Big data: The next frontier for innovation, competition, and productivity" and the IBM Institute for Business Value's "Analytics: The new path to value".

In addition, the demand for analytics is currently high but will also increase in the medium term as shown in Figures 1 and 2 below. The foci of the Applied Analytics degree include those sectors with the greatest potential as presented in Figure 1: information, finance, government, and health.

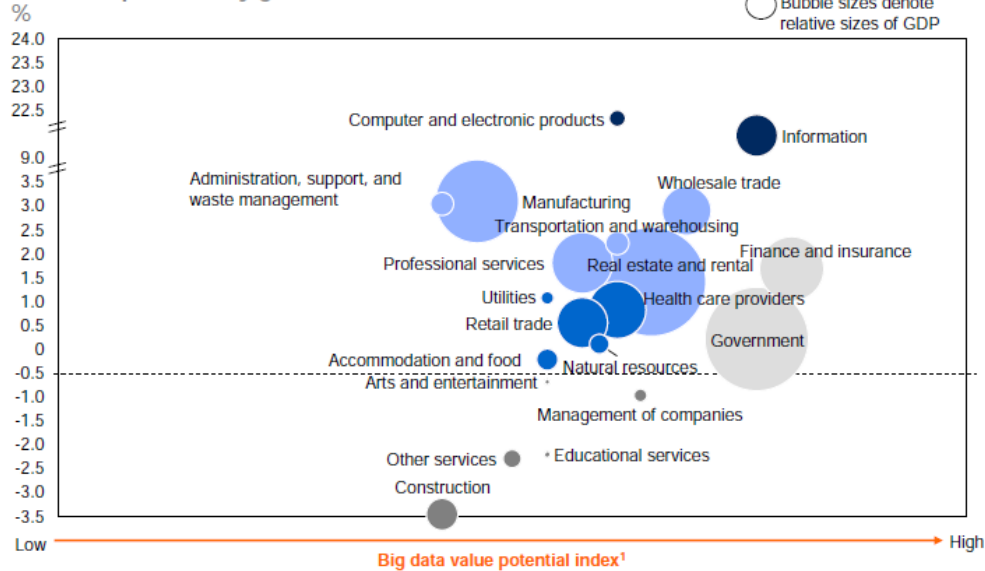[1] http://analytics.ncsu.edu/?page_id=4184
[2] http://bus.utk.edu/soms/prospective/undergrad/index.htm
[3] http://www.fsb.muohio.edu/departments/isa
[4] http://gatton.uky.edu/undergraduates/Content.asp?PageName=UDSIS

Figure 1

Some sectors are positioned for greater gains from the use of big data

Historical productivity growth in the United States, 2000–08
%

Legend:
- Cluster A
- Cluster B
- Cluster C
- Cluster D
- Cluster E
- Bubble sizes denote relative sizes of GDP

Y-axis: 24.0, 23.5, 23.0, 22.5, 9.0, 3.5, 3.0, 2.5, 2.0, 1.5, 1.0, 0.5, 0, -0.5, -1.0, -1.5, -2.0, -2.5, -3.0, -3.5

Data labels:
- Computer and electronic products
- Information
- Administration, support, and waste management
- Wholesale trade
- Manufacturing
- Transportation and warehousing
- Finance and insurance
- Professional services
- Real estate and rental
- Utilities
- Health care providers
- Retail trade
- Government
- Accommodation and food
- Natural resources
- Arts and entertainment
- Management of companies
- Other services
- Educational services
- Construction

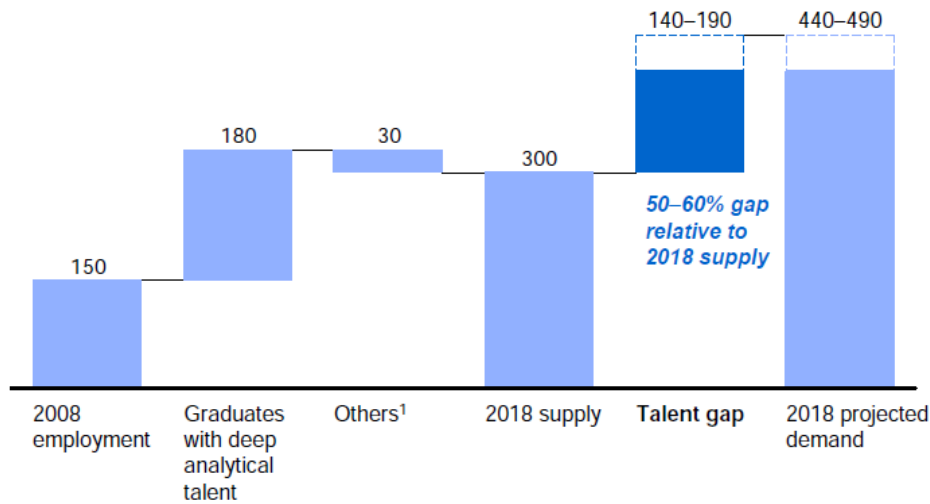Low — Big data value potential index[1] — High

1 See appendix for detailed definitions and metrics used for value potential index.
SOURCE: US Bureau of Labor Statistics; McKinsey Global Institute analysis

Figure 2

Demand for deep analytical talent in the United States could be 50 to 60 percent greater than its projected supply by 2018

Supply and demand of deep analytical talent by 2018
Thousand people

- 2008 employment: 150
- Graduates with deep analytical talent: 180
- Others[1]: 30
- 2018 supply: 300
- Talent gap: 140–190 (50–60% gap relative to 2018 supply)
- 2018 projected demand: 440–490

1 Other supply drivers include attrition (-), immigration (+), and reemploying previously unemployed deep analytical talent (+).
SOURCE: US Bureau of Labor Statistics; US Census; Dun & Bradstreet; company interviews; McKinsey Global Institute analysis

Marketing and Advertising: *List the strategies to be employed for the program.*

A high priority for the university is to build programs and majors in the Lewis College of Human Sciences. Strategies for the program will be developed in consultation with the Admissions office.

ACADEMIC INFORMATION

Enrollment Estimates: *Provide estimates for initial enrollments (first three years) and for steady state including justification.*

We are targeting 25 students in the first year.

Retention Estimates: *Provide estimates for retention including justification.*

We expect retention rates to be on par with other departments in the college (roughly 90% retention for years 1-2).

Course Requirements: *Detail the courses needed for the program including courses currently offered, new courses to be developed, and dependence on courses from other academic units with their commitments to provide these courses on a long-range basis. Include descriptions of laboratories that will need to be developed along with equipment and facilities requirements.*

Core

3 hours: *NEW* AANA100 - Introduction to the Professions

9 hours: Data Structures and Management (DSM)
  Choose from the following:
  - CS 331 - Data Structures (prereq CS 116 or 201)
  - CS 422 - Data Mining (prereq CS 331 or 401 or 403)
  - CS 425 - Database Organization (prereq CS 331 or 401 or 403)
  - ITM 421 - Data Modeling & Applications
  - ITM 422 - Advanced Database Management (prereq ITM 421)
  - ITM 428 - Database Security (prereq ITM 421)

12 hours: Data Analysis (DA)
  Choose one of the following routes:
  Psychology
  - PSYC 203 – Undergraduate Statistics for the Behavioral Sciences
  - PSYC 204 – Behavioral Sciences
  - PSYC 221 or 222 – Human Behavior, Growth & Learning
  - PSYC 380 – Advanced Statistics
  Business/Economics
  - BUS 221 – Statistics for Managerial Decision Making
  - ECON 151 – The Economics of the Firm
  - ECON 152 – National & Global Economics
  - *NEW* ECON XXX – Applied Economics
  Social Sciences/Humanities
  - PSYC 203 OR BUS 221 – (see titles above)
  - PS/SOC 209 – Research Methods for the Social Sciences
  - COM 381 OR *NEW* PS/SOC XXX – Analyzing and Communicating Quantitative Data OR Advanced Statistics for the Social Sciences
  - *NEW* COM XXX – Social Network Analysis

12 hours: Communicating about Data (CAD)
  Choose from the following:
  - ITM 301 OR COM 423 - Communication for the Workplace
  - COM 421 – Technical Communication
  - COM 428 – Verbal & Visual Communication
  - COM 430 – Intro to Web Design

- COM 424 – Document Design
- COM 4XX – Information Visualization
- *NEW* PHIL XXX - Ethics in Data Science
- PHIL 351 – Science and Values
- PHIL 374 – Ethics in Computer Science
- ITM 415 – Advanced Software Development
- EG 425 – Computer Graphics for Non-engineers

3 hours: *NEW* AANA 4XX Capstone

	Total Hours **39**

Mathematics
MATH 151 and 152

	Total Hours **10**

Computer Science
All students must take CS 115 and 116

	Total Hours **04**

Natural Sciences
General Education Guidelines
2 different sciences, 2 from same discipline

	Total Hours **11**

Humanities and Social Sciences
Humanities (3)(3)(3)*
Social Science (3)(3)(3)**
Humanities or Social Science Elective (3)
Cannot count toward major

	Total Hours **21**

Interprofessional Projects
IPRO (3)(3)

	Total Hours **06**

Free Electives
Free Electives (39 hours)
   Suggestions for Applied Analytics majors:
- Any of the DSM or CAD options not taken for major credit
- MATH 474 – Probability and Statistics
- MATH 475 – Probability
- MATH 476 – Statistics
- MATH 478 – Numerical Methods for Differential Equations
- CS 422 – Data Mining
- CS 482 – Information and Knowledge Management Systems
- COM 380 – Online Social Networks
- SOC 362 – Technology and Social Change
- SOC 480 – Modeling Complexity
- PSYC 310 – Social Psychology
- PSYC 409 – Psychological Testing

	Total Hours **39**
	Total Hrs to be Completed 130

*Humanities: courses that fulfill this requirement are marked with an (H) in the bulletin. 9 cr must be distributed as follows:
1 HUM 100-level course, 2 courses marked with (H) at the 300-level or above.
** Social Sciences: courses that fulfill this requirement are marked with an (S) in the bulletin. 9 cr must be disturbed as follows: 1 course at 300-level or above, 2 courses in a single field, courses must be chosen from two different fields.

SAMPLE CURRICULUM /PROGRAM REQUIREMENTS

Provide below a sample curriculum and the program requirements, as they would appear in the IIT Undergraduate Programs bulletin or Graduate Programs bulletin as appropriate.

Course Plan: Applied Analytics (Psych)

Semester 1			Semester 2		
Course number	Course Title	Credit Hours	Course number	Course Title	Credit Hours
AANA 100	Introduction to the Professions	3	MATH 152	Calculus II	5
MATH 151	Calculus I	5	CS 116	Object-Oriented Programming II	2
BIOL 107	General Biology	3	Social Sciences 200-level elective		3
CS 115	Object-Oriented Programming I	2	BIOL 115	Human Biology	3
Humanities 100-level elective		3	PSYC 203 (DA prereqs)	Undergraduate Statistics for the Behavioral Sciences	3
	Total	16		Total	16
Semester 3			Semester 4		
PSYC 221	Human Behavior, Growth & Learning	3	PSYC 204 (DA Req #1)	Behavioral Sciences	3
Free elective		3	DSM Elective #1		3
Humanities or Social Sciences elective		3	Humanities or Social Sciences elective		3
PHYS 211	Basic Physics I	3	CAD Elective #1		3
PHYS 212	Basic Physics II	3	Free elective		3
Free elective		3	Free elective		3
	Total	18		Total	18
Semester 5			Semester 6		
CAD Elective #2		3	CAD Elective #3		3
DSM Elective #2		3	IPRO #1		3
PSYC 380-1 (DA Req#2)	Advanced Statistics	3	DSM Elective #3		3
Free elective		3	DA Elective #1		3
Free elective		3	Humanities or Social Sciences elective		3
			Humanities or Social Sciences elective (300+)		3
	Total	15		Total	18
Semester 7			Semester 8		
CAD Elective #4		3	AANA 4XX	Capstone	3
IPRO #2		3	Free elective		3
DA Elective #2		3	Free elective		3
Humanities or Social Sciences Social Science elective (300+)		3	Free elective		3
Free elective		3	Free elective		3
	Total	15		Total	15

Total credit hours 131

Course Plan: Applied Analytics (Bus/Econ)

Semester 1			Semester 2		
Course number	Course Title	Credit Hours	Course number	Course Title	Credit Hours
AANA 100	Introduction to the Professions	3	MATH 152	Calculus II	5
MATH 151	Calculus I	5	CS 116	Object-Oriented Programming II	2
BIOL 107	General Biology	3	Social Sciences 200-level elective		3
CS 115	Object-Oriented Programming I	2	BIOL 115	Human Biology	3
Humanities 100-level elective		3	BUS 221 (DA prereqs)	Statistics for Managerial Decision Making	3
	Total	16		Total	16
Semester 3			**Semester 4**		
ECON 151 (DA prereqs) OR Free elective	The Economics of the Firm	3	ECON 152 (DA Req #1)	National & Global Economics	3
Free elective		3	DSM Elective #1		3
Humanities or Social Sciences elective		3	Humanities or Social Sciences elective		3
PHYS 211	Basic Physics I	3	CAD Elective #1		3
PHYS 212	Basic Physics II	2	Free elective		3
Free elective		3	Free elective		3
	Total	18		Total	18
Semester 5			**Semester 6**		
CAD Elective #2		3	CAD Elective #3		3
DSM Elective #2		3	IPRO #1		3
PSYC 380-1 (DA Req #2)	Advanced Statistics	3	DSM Elective #3		3
Free elective		3	DA Elective #1		3
Free elective		3	Humanities or Social Sciences elective		3
			Humanities or Social Sciences elective (300+)		3
	Total	15		Total	18
Semester 7			**Semester 8**		
CAD Elective #4		3	AANA 4XX	Capstone	3
IPRO #2		3	Free elective		3
DA Elective #2		3	Free elective		3
Humanities or Social Sciences Social Science elective (300+)		3	Free elective		3
Free elective		3	Free elective		3
	Total	15		Total	15

Total credit hours 131

Course Plan: Applied Analytics (Soc Sci/Hum)

Semester 1			Semester 2		
Course number	Course Title	Credit Hours	Course number	Course Title	Credit Hours
AANA 100	Introduction to the Professions	3	MATH 152	Calculus II	5
MATH 151	Calculus I	5	CS 116	Object-Oriented Programming II	2
BIOL 107	General Biology	3	Social Sciences 200-level elective		3
CS 115	Object-Oriented Programming	2	BIOL 115	Human Biology	3
Humanities 100-level elective		3	PSYC 203 OR BUS 221 (DA prereqs)	Statistics for Managerial Decision Making	3
	Total	16		Total	16
Semester 3			Semester 4		
PS/SOC 209 (DA prereqs) OR Free elective	Research Methods for the Social Sciences	3	COM 381 OR PS/SOC XXX (DA Req #1)	Advanced Statistics for the Social Sciences	3
Free elective		3	DSM Elective #1		3
Humanities or Social Sciences elective		3	Humanities or Social Sciences elective		3
PHYS 211	Basic Physics I	3	CAD Elective #1		3
PHYS 211	Basic Physics II	3	Free elective		3
Free elective		3	Free elective		3
	Total	18		Total	18
Semester 5			Semester 6		
CAD Elective #2		3	CAD Elective #3		3
DSM Elective #2		3	IPRO #1		3
COM XXX (DA Req #2)	Social Network Analysis	3	DSM Elective #3		3
Free elective		3	DA Elective #1		3
Free elective		3	Humanities or Social Sciences elective		3
			Humanities or Social Sciences elective (300+)		3
	Total	15		Total	18
Semester 7			Semester 8		
CAD Elective #4		3	AANA 4XX	Capstone	3
IPRO #2		3	Free elective		3
DA Elective #2		3	Free elective		3
Humanities or Social Sciences Social Science elective (300+)		3	Free elective		3
Free elective		3	Free elective		3
	Total	15		Total	15

Total credit hours 131

ECONOMIC ANALYSIS

This degree program can be established in the short term with very few resources. Most of the courses are currently taught or can be taught by an existing faculty member.