University of Louisville
New Academic Program Proposal Template

Certificate Programs

After approval of the Letter of Intent, certificate programs are to complete the New Academic Certificate Program Proposal template.

All forms are available at:
http://louisville.edu/oapa/new-academic-program-approval-page/new-academic-program-approval

Please ensure all questions are addressed clearly and completely to avoid unnecessary delays. Questions can be directed to the Office of Academic Planning and Accountability through the Program Approval Service Account (PROGAPPR@louisville.edu).

Send the following materials to the
Program Approval Service Account (PROGAPPR@louisville.edu):

- Completed Proposal Template
- Proposed Program Curriculum (complete the table found in Appendix A of this proposal template)
- Course syllabi for any new course offerings
- SACSCOC Faculty Roster Form
- CV for Program Director/Coordinator
- Proposal Budget Form
- Letter of Support from the unit Dean
- Letter of Support from the UofL Libraries
- Letter(s) of Support from any units, departments, or internal or external entities that will be supporting the certificate program
- Notice of Intent to Offer a Certificate Program Eligible for Financial Aid (Stand-alone Certificates Only – See Section D.5) – Optional

The program approval process will not begin until all of the above documents are received. Please submit all materials listed above at the same time.

General Program Information	
Date: 11/29/2022	
Program Name:	
Degree Level: graduate certificate	Undergraduate: _____ Graduate (select one of the following): Post-Baccalaureate __x___ Post-Master's _____ Post-Professional _____
Minimum and Maximum Number of Credit Hours required:	9 (min); 9 (max)
Accreditation or Licensure Requirements (if applicable):	N/A
CIP Code:	14.3501 Industrial Engineering
Department and Department Chair:	Industrial Engineering, Pratik Parikh, Ph.D.
School/College:	J. B. Speed School of Engineering
Program Director and Contact (if different); (please also include title):	Jason Saleem, Ph.D. (jason.saleeem@louisville.edu) Associate Professor
Is an approval letter from the Education Professional Standards Board (EPSB) required for this program? If so, attach a copy to this proposal.	N/A
Proposed Implementation Date for Program (semester and year):	Fall 2023
Program Length (1 semester, 1 year or Average time to Completion)	2 semesters
Anticipated Date for Granting First Degree:	May, 2024 (certificate)
Identify whether the program is 100% online, 100% face-to-face, or a combination of the two:	Offered both full 100% online and full face-to-face.
If the program plans to offer the certificate program as a stand-alone credential eligible for Title IV Financial Aid – See Section D.5	Complete Notice of Intent Form - http://louisville.edu/oapa/gainful-employment-policy

A. Centrality to UofL's Mission and Strategic Plan

The certificate program is to adhere to the role and scope of the University of Louisville as set forth in its mission statement and as complemented by UofL's strategic plan.

1. Provide a brief description of the program (copy the abstract provided in the program's Letter of Intent here).
The purpose of the certificate is to provide a focused study of industrial engineering skills and methods as applied to healthcare delivery systems and processes. The intended audience for this certificate program is our current students in the Department of Industrial Engineering, the UofL

Schools of Medicine, Nursing, and Public Health and Information Sciences, and healthcare professionals currently working at local healthcare institutions (e.g., Norton, Baptist, Humana) as well as outside of Louisville. This is envisioned to be a graduate-level certificate program, 9 credit hours, offered to both in-residence students as well as online. Students who complete the certificate program will acquire skills in healthcare engineering, quality of care, patient safety, health IT, clinician support, healthcare analytics, and data visualization. The relationship of this proposed program is complementary to the general field of industrial engineering by offering a focused program of study in the healthcare domain. Conversely, this program offers healthcare professionals an opportunity to acquire industrial engineering skills.

2. Explain how the proposed program relates to the institutional mission and academic strategic plan.

The Healthcare Systems Engineering Certificate aligns with the J.B. Speed School of Engineering's mission, which includes "To serve the University, the Commonwealth of Kentucky, and the engineering profession by providing high quality educational programs to all students…". The proposed certificate also supports Goal 1 of the School of Engineering's strategic plan, which is 'Educational Excellence'. Specifically, the proposed certificate will help attract motivated, prepared, and talented individuals and engage them with a state-of-the-art certificate program designed to provide a focused study of industrial engineering skills and methods as applied to healthcare delivery systems and processes.

Similarly, the proposed certificate program aligns with UofL's mission, which includes "teaching diverse undergraduate, graduate, and professional students in order to develop engaged citizens, leaders, and scholars…". Further, the proposed certificate program supports UofL's goal of being "a great place to learn" in UofL's strategic plan by helping to attract and enroll capable, diverse, and engaged students that will be responsive to the workforce needs of the future.

3. List the objectives of the proposed program.
Explain how the objectives support the university and unit mission, strategic priorities, and institutional and societal needs.

The objectives of the proposed program are:

- Provide a focused study of industrial engineering skills and methods as applied to healthcare delivery systems and processes.
- Offer a focused program of study for our Industrial Engineering and other UofL students in the healthcare domain.
- Offer healthcare professionals an opportunity to acquire industrial engineering skills.

The objectives are service-oriented; that is, the objectives serve the University and the Commonwealth of Kentucky by providing a high-quality educational program to both current UofL students as well as healthcare professionals. This aligns with the J. B. Speed School's mission as described in #2. Further, the proposed certificate program supports UofL's goal of being "a great place to learn" in UofL's strategic plan by helping to attract and enroll capable, diverse, and engaged students that will be responsive to the workforce needs of the future. Specifically, there is a growing need in the healthcare industry for those with skills that students will learn as part of our certificate program, including patient safety methods (e.g., root cause analysis, healthcare failure modes and effects analysis, probabilistic risk assessment), usability assessment of health IT, and predictive analytics to support healthcare decision-making.

4. Clearly state the admission, retention, and degree completion standards designed to encourage high quality. Please be clear and specific.
Applicants should have previously taken a probability and statistics course such as 'fundamental topics in probability and statistics'. Students who may not have the expected background may be required to take a refresher course (also available online for the online students who may need it). The successful applicant will typically have an undergraduate degree with a GPA of 2.75 or above (on a 4.00 scale). Only a transcript showing the undergraduate degree awarded is required for the application (i.e., letters of reference or GRE scores will not be required). Students whose native language is not English or whose degree is from a non-US accredited institution are required to demonstrate proficiency in the English language as specified by the admission policies of the Speed School of Engineering. Instructors of the certificate program courses will focus on student retention by monitoring data for warning signs (e.g., missing assignments, poor scores on submitted assignments, lack of engagement in Blackboard, etc.) and reach out to students who may need additional support. Students will need at least a 3.0 GPA to be awarded the certificate.

B. Program Quality and Student Success

1. What are the intended student learning outcomes of the proposed program?
Student Learning Outcome 1 (SLO1): Graduates will demonstrate that they can apply healthcare systems engineering skills learned, including root cause analysis, failure modes and effects analysis, probabilistic risk assessment, usability assessment of health IT, and predictive analytics to support healthcare decision-making. Student Learning Outcome 2 (SLO2): Graduates will demonstrate an ability to function on multidisciplinary teams.

2. Describe how each program-level student learning outcome will be assessed (including when data will be collected and how assessment results will be used to improve the program.
For SLO1, assignments from each of the three certificate courses will be given that correspond to these skills: root cause analysis (IE 682), healthcare failure modes and effects analysis (IE 682), probabilistic risk assessment (IE 682), usability assessment of health IT (IE 684), and predictive analytics to support healthcare decision-making (IE 662). Success will be defined as observing 80% or more of students achieving 80% or higher score on these assignments. For SLO2, student will complete a term-long project in IE 684 that shows their ability to function on multidisciplinary teams. Specifically, the semester project will focus on design, prototyping, and evaluation of a health IT system. Each component of the project will be graded throughout the term. Success will be defined as observing 80% or more of students achieving 80% or higher score on the project assignments.

3. For each learning outcomes, provide direct indicators (and indirect, where possible) of achievement of the outcome, target(s) for the outcome, and frequency of data collection.

For SLO1, the direct indicator of achievement of the outcome will be based on the assessment of the assignments by the instructors.

As an example, for the root cause analysis assignment, assessment will consist of 4 components:

- 25%: Creation of an initial event flow diagram
- 25%: Identification of information gaps and how the necessary information will be collected
- 25%: Updated event flow diagram that shows the final sequence of events
- 25%: Composition of three root cause/contributing factor statements and corresponding controls

Target: 80% of students achieve 80% or better.
Frequency of data collection: every year.

A similar direct assessment will be conducted for the remaining 4 assignments for SLO1.

For SLO2, the direct indicator of achievement of the outcome will be based on the assessment of the project by the instructor. Assessment of the Health IT project will consist of two components:
50%: Design & Prototyping
50%: Evaluation

Target: 80% of students achieve 80% or better.
Frequency of data collection: every year.

4. Course Delivery Methods.

Please answer the following:

a) Will this be a 100% distance learning program? Yes ☒ No ☐

b) Will this program utilize alternative learning formats (e.g. distance learning, technology-enhanced instruction, evening/weekend classes, accelerated courses)? Yes ☒ No ☐

If yes, please check all that apply below.

☑ Distance Learning

☐ Courses that combine various modes of interaction, such as face-to-face, videoconferencing, audio-conferencing, mail, telephone, fax, e-mail, interactive television, or World Wide Web

☑ Technology-enhanced instruction

☐ Evening/weekend/early morning classes

☑ Accelerated courses

☐ Instruction at nontraditional locations, such as employer worksite

- ☐ Courses with multiple entry, exit, and reentry points
- ☐ Courses with "rolling" entrance and completion times, based on self-pacing
- ☐ Modularized courses

5. Is there a specialized accrediting agency related to this program? Yes ☐ No ☒
a. If yes, please identify the agency.
b. If yes, will the program seek accreditation?

N/A

6. Describe the library resources available to support this program.

Please also submit a letter of support from the UofL Libraries.

Access to the qualitative and quantitative library resources must be appropriate for the proposed program and should meet recognized standards for study at a particular level or in a particular field where such standards are available.

No additional specialized library resources are required for the Healthcare Systems Engineering certificate program as the library already possesses sufficient resources to support the certificate. A letter from UofL Libraries is attached.

C. Program Demand/Unnecessary Duplication

1. Provide the projected enrollment and graduation numbers for the first five years.

Academic Year	Certificates Conferred	Headcount Enrollment (Fall term)
2023-2024	3-5	3-5
2024-2025	8-10	8-10
2025-2026	12-15	12-15
2026-2027	15-20	15-20
2027-2028	15-20	15-20

2. Indicate any efforts to address student educational and workforce needs or to maximize student success, for both traditional and non-traditional students.

Include any data on student demand; career opportunities at the regional, state, and national levels; and any changes or trends in the discipline(s) that necessitate a new program.

Demand from students is driven by demand from the economic development of the region and the nation According to the U.S. Bureau of Labor Statistics, employment in the healthcare sector is projected to grow 15% from 2019 to 2029, much faster than the average for all occupations, adding about 2.4 million new jobs. The healthcare sector is projected to add more jobs than any of the other occupational groups. Earning a certificate in Healthcare Systems Engineering is expected to make our students more competitive for jobs in the healthcare sector. Furthermore, MS in Industrial Engineering students (both on-campus and online) are expected to have strong interest in the

certificate program and to be able to complete the certificate without additional financial cost by taking certificate courses as electives towards their degrees.

The table below shows statistics of employer demand information for some relevant positions.

Table 2. Recent statistics for relevant positions

Type of Job	State Avg Wage	State # of openings (Annual)	State Growth Projections (%)	Regional Avg Wage	Regional # of openings (Annual)	Regional Growth Projections (%)	National Avg Wage	National # of openings	National Growth Projections (%)
Management Analysts	$77,780	1,020	18.78%	$84,753	4,564	16.39%	$95,560	99,900	13.5%
Business Operations Specialists	$69,010	921	9.29%	$70,633	5,745	9.00%	$80,220	119,600	6.3%
Industrial Engineers	$80,480	727	0.69%	$80,877	2,619	9.36%	$93,660	22,600	8.3$

Data gathered from the Bureau of Labor Statistics' Occupational Outlook Handbook and Occupational Employment Statistics; and the Projections Managing Partnership's State Occupational Projections (2016-2026). Please note that national projections are for the period of 2016-2026.

3. Specify/highlight any distinctive qualities of the proposed program.

Students who complete the certificate program will acquire skills in healthcare engineering, quality of care, patient safety, health IT, clinician support, healthcare analytics, and data visualization. The relationship of this proposed program is complementary to the general field of industrial engineering by offering a focused program of study in the healthcare domain. Conversely, this program offers healthcare professionals an opportunity to acquire industrial engineering skills. Our proposed certificate program is distinctive in that it provides a focused study of industrial engineering skills and methods as applied in healthcare delivery systems and processes. We primarily focus on human factors concepts and models, patient safety approaches, survey of healthcare IT and novel platforms, and predictive modeling techniques for decision making.

4. Does the proposed program serve a different student population (e.g., students in a different geographic area, non-traditional students, etc.) from existing programs?
If yes, please explain.

The certification program will be open to students and working professionals given that they satisfy the admission requirements. Students enrolled in our MSIE and PhD programs are currently the only population of students with access to all of the courses within the Certificate, and they are not currently awarded a University Certificate for completion. The Healthcare Systems Engineering Certificate will serve a multitude of students who are currently finishing bachelor's degree and professionals who already hold a bachelor's degree, and work in the healthcare field. The ability of students to complete the Certificate in a 100% online format will expand the geographic reach and provide access to new geographic markets not currently served.

5. Will this program replace or enhance any existing program(s) or tracks, concentrations, or specializations within an existing program? Yes ☒ No ☐
If so, please specify.

In addition to drawing a large number of external Certificate-seeking students and professionals, this Certificate will provide an additional Academic Credential to students currently enrolled in our MSIE and PhD programs who complete this set of courses.

6. How will the program support or be supported by other programs and/or units within the institution? Please also describe potential for collaboration with other programs within the institution.

The Healthcare Systems Engineering Certificate will be supported by the IE department. While any UofL or non-UofL student can apply for admission to our program, we will explore collaboration with UofL's College of Business and School of Public Health & Information Sciences who, we believe, may benefit from this Certificate.

7. Describe the proposed program's relationship with programs at other institutions or external organizations (if applicable).

N/A

D. Cost

1. Will this program require additional resources? Yes ☒ No ☐

If so, please provide a brief summary of new or additional resources that will be needed to implement this program over the next five years. Document the expected cost/expenditures in the table below.

The proposed certificate program will require additional marketing support resources ($5000/yr). The marketing expenses will include an escalation factor of 3%. All courses are already developed in the existing IE PhD program and there is no cost for course development or offering. The tables below show how the certificate will generate additional revenue while incurring marketing costs.

Current cost per credit hour is $737 for graduate programs at UofL. With 9 credit hours to complete the certificate over the course of 1 year, expected annual revenue per student enrolled is $6,633 (to the University). Speed School receives 75% of these funds, or approximately $4,975 per student. This calculation is for "certificate only" students who would not already be enrolled in one of our graduate programs.

The certificate program is expected to generate $263,675 in marginal revenue over the first 5-year period. This is based on conservative bottom range estimates from 'headcount enrollment' (Section C, part 1). SSoE expects to retain 75% of graduate tuition or about $197,756 total over the 5-year period.

Table 3. Project revenue retained by SSoE from the certificate program

	Year 1	Year 2	Year 3	Year 4	Year 5	Five-year total
Revenue (from tuition)	$14,925	$39,800	$59,700	$74,625	$74,625	$263,675
Revenue retained by SSoE (from tuition)	$11,194	$29,850	$44,775	$55,969	$55,969	$197,756

Table 4. Annual expenses for the certificate program

	Year 1	Year 2	Year 3	Year 4	Year 5	Five-year total
Expenses - Marketing	$5,000	$5,150	$5,304.50	$5,463.64	$5,627.54	$26,545.68
Total Expenses	$5,000	$5,150	$5,304.50	$5,463.64	$5,627.54	$26,545.68

2. Complete the SACS Faculty Roster Form found at the link below and submit it with this proposal.

Found at:
http://louisville.edu/oapa/new-academic-program-approval-page/new-academic-program-approval

Also submit a copy of the program director's CV.

3. Are new or additional faculty needed? Yes ☐ No ☒

a) If yes, please explain, indicating the number and role of each new faculty member and whether they will be part-time or full-time. Specify if graduate assistants are included in the additional faculty resources needed.

b) If new faculty are needed, please provide a plan to ensure that appropriate faculty resources are available, either within the institution or externally, to support the program.

c) What is the projected faculty/student ratio for the program?

No additional faculty will be needed for the certificate program as all the courses have been developed are already being taught in the IE PhD program (IE 662 and IE 682 were offered for the first time in Fall 2022 and IE 684 is being offered for the first time in Spring 2023) and there is ample space to add more students to these courses. The anticipated faculty/student ratio is expected one faculty member for every 20 students.

4. Will this program impact existing programs and/or organizational units within UofL?
Yes ☒ No ☐

If so, please describe the impact.
(examples: reallocation of resources, faculty or staff reassigned, changes to other programs and/or course offerings, reduction or increase in students served, any other possible impact) .

The Healthcare Systems Engineering Certificate will create opportunities for students and professionals to have access to a continuing education program. We expect the certificate program will increase enrollments in each of the three courses from students and professionals that that not currently in our IE PhD program.

- Complete the New Program Budget Spreadsheet.

Found at:
http://louisville.edu/oapa/new-academic-program-approval-page/new-academic-program-approval

Notes for completing the Budget Spreadsheet:

- Provide an estimate of the level of new and existing resources that will be required to implement and sustain the program.
- Any existing resources reallocated to support this new offering should be estimated as an "internal reallocation" in both the Funding Sources and Expenses sections of the budget.
- Any new resources for which the unit/department plans to allocate funding should be listed as "allocation" in both the Funding Sources and Expenses sections of the budget.
- The program proposal is to be developed without the expectation of tuition-sharing or recovery agreements with the Provost. This approach ensures that the "cost" of operating the program is somewhat reflective of reality.
- For every place you add numbers (in both the Funding Sources and Expenses spreadsheet) provide a written explanation for the numbers, including how they were calculated. The CPE system won't let us submit the proposal without explanations for the budget numbers.
- The budget for the proposed program is to be in alignment with the latest budget assumptions (provided below as of 10/7/19) from the Budget Model Workgroup.

Undergraduate*
70% (net of mandatory student fees) of resident per credit hour tuition rate (i.e., the listed rate on the bursar's website) charged to undergraduate students is allocated to the academic unit where the instruction takes place. Every credit hour is treated the same under the model.

Graduate/Professional*
Graduate: 75% (net of mandatory student fees) of tuition review revenue allocated according to a student's home academic program.
Professional: 85% of tuition revenues generated from professional degree (law, dentistry, medicine) programs allocated to the student's home academic program. For purposes of the budget model, doctoral programs fall in the Professional category.

*These definitions of the Budget Model are as of 10/7/19 and are subject to change.

Note that there are three tabs to the Budget spreadsheet.

Funding Sources tab:

- Indicate funding to be supplied by the unit (include direct funding & In-kind support):
- Internal allocation and reallocation are those estimated dollars needed to fund the start-up and support the new academic program – typically defined as faculty, administrative/staff, and operational expenses.

- When calculating funding, consider the impact on current faculty workloads.
- Include the expected tuition revenue generated by anticipated student enrollment.
- If the program will use existing faculty or other existing resources, the amount of funding represented by those resources are to be listed in the Funding Sources table as reallocation of funds.
- If reallocation of "existing" funds are included in the Funding spreadsheet, the numbers should also be reflected in the Expenses spreadsheet.
- If the unit has allocated funds for any new expenses in the Funding Sources spreadsheet, the numbers should also be added to the Expenses spreadsheet.

Expenses tab:

- You do not have to estimate classroom space unless you believe that existing space is not sufficient to support the academic program.
- Any expenses identified as "existing" funds in the expenses spreadsheet should also be added to the Funding Sources spreadsheet as either internal reallocation or internal allocation.

Funding Source/Expenses Combined tab:

- This spreadsheet will pre-populate based upon the numbers entered into the Funding Sources and Expenses spreadsheets. The goal is to have more funding than expenses.

5. Financial Aid for Certificate Programs

Does the unit plan to offer this program as a stand-alone certificate eligible for Title IV Financial Aid?

Yes √ No ☐

If yes, please review the following information:

Effective July 1, 2020, University of Louisville (UofL) students enrolled (half-time or more) in stand-alone certificate programs designated as financial aid eligible can be awarded funds. In order for a UofL certificate program to be deemed eligible for Title IV federal aid, it must:

- be one academic year in duration;
- be at least 24 credit hours for undergraduate certificates; be at least 9 credit hours for graduate certificates; and
- prepare students for gainful employment in a recognized occupation.

Academic units offering certificate programs must certify these credentials as Title IV eligible programs by submitting a Notice of Intent to Offer a Certificate Program Eligible for Financial Aid. See the Gainful Employment Policy website for the intent form and other information - http://louisville.edu/oapa/gainful-employment-policy

Appendix A
Program Curriculum

In the table below, provide the program curriculum and any options; indicate total number of credit hours required for degree completion.

- Include full course names and course descriptions.
- Where they exist you should report actual course numbers, titles, and descriptions in the course template. If the program has no specific course numbers required under a particular heading, provide a description of the type of course(s) required in the "course title" column and the number or range of credit hours required.
- Provide a copy of the course syllabus for any new courses developed.

Prefix & Number	Course Title	Course Description	Credits	Required?	New	Existing	Revised	Offered Online?
IE 682	Quality of Care and Patient Safety	This course provides students an overview of the healthcare system and the different types of healthcare delivery, as well as factors that determine quality of care. This course also exposes students to tenets of patient safety from a human factors engineering perspective. Students will learn models of patient safety and incident analysis tools, including Root Cause Analysis (RCA) and Healthcare Failure Mode and Effects Analysis (HFMEA).	3	Yes	No	Yes	No	Yes
IE 684	Health IT and Clinician Support	This course provides students an overview of various types of health information technology (IT) systems, as well as strategies, methods, and tools used to support the work and health of clinicians. This course also exposes students to applied tools and guidelines of the design and evaluation of health IT systems. Students will learn to use software to prototype high-fidelity, interactive user interfaces, and to conduct human factors evaluation on health IT systems based on the FDA guidelines. Documentation of such design and	3	Yes	No	Yes	No	Yes

		evaluation process will also be practiced with the semester project.						
IE 662	Predictive Analytics for Decision Making I	This course focuses on predictive analytics methods applied to industrial engineering application areas, such as manufacturing and healthcare systems. Different data types (e.g., streaming data, sensor data, etc.) from real-world scenarios will be shown. Specifically, students will learn how to use the different data types for efficient predictive methods implementation that will support smart decision-making in various manufacturing and healthcare scenarios. For example, predictive analytics in an industrial engineering manufacturing problem ensures that every single detail of a manufacturing process can be tracked and this helps to minimize waste and project future trends related to the project to inform decision making.	3	Yes	No	Yes	No	Yes
TOTAL CREDITS			**9**					