

PROPOSED PROGRAM SUMMARY

Institution: University of Kentucky

Program Name: Lean Systems Engineering Technology

Degree Designation: BACHELOR OF SCIENCE (BS)

Degree Level : Baccalaureate

Program Description

The proposed Bachelor of Science (BS) in Lean Systems Engineering Technology (LST) degree offers students opportunities to acquire the knowledge, skills and strengths to develop the engineering and operations management acumen for becoming technical leaders. It prepares them with advanced skills in continuous improvement processes design to improve efficiency and gives students the skills needed to improve quality output, streamline operations and reduce waste. It focuses on developing lean manufacturing skills of students, training them how to deliver advanced, competitive products that exceed customer expectations and providing them with the ability to deliver the right product to the right place at the right time. The focus on lean systems engineering is imperative because requirements for lean operations and manufacturing skills will continue to grow in the short and long term.

The proposed four year BS in LST is designed as a feeder-completer program in which students earn an Associate in Applied Science (AAS) in Integrated Engineering Technology (IET) from the Bluegrass Community and Technical College (BCTC), and then a BS in LST from the University of Kentucky (UK). In this arrangement, the UK will offer only Junior and Senior level coursework.

The proposed curriculum provides in-depth knowledge and practical training of lean systems operations. It prepares students for thriving in the highly competitive global marketplace by developing advanced skills in Just-In-Time manufacturing, problem-solving, project management, lean enterprise development, logistics, and material and information flow charts (MIFC). The curriculum is based on a solid academic foundation, with intensive classroom and laboratory experiences, and in-depth instruction in Just-In-Time processes, built-in-quality and productivity improvement.

Will this program replace or enhance any existing programs(s) or tracks, concentrations, or specializations within an existing program? If yes, please specify

No

CIP Code: 15.9999

Credit Hours: 127

Institutional Board Approval Date: 2/18/2021

Implementation Date: 8/16/2021

Student Demand

Year 1 - 10

Year 2	- 34
Year 3	- 86
Year 4	- 130
Year 5	- 145

Market Demand

The Kentucky Council on Postsecondary Education (KY CPE) recently published in April 2020 its Engineering Sector Analysis in Kentucky. The report assesses and discusses labor market information along with program demand gap and migration analyses. It evaluates the effectiveness of Kentucky institutions in meeting workforce demand in the engineering sector. The KY CPE report identifies a large gap existing in the areas of Manufacturing Engineering Technology and Engineering Technology, both of which are considered critical for meeting highly-demanding manufacturing job openings and in-state BS educational opportunities.

The KY-CPE findings are consistent with a national trend in which the skills shortages in manufacturing have been well documented. The following highlights a few examples.

In November 2017, McKinsey Global Institute published a report titled “Making it in America: Revitalizing US manufacturing.” The report outlined how multiple technology advances are converging and changing manufacturing industries, driven by an explosion in the volume of available data, developments in analytics and machine learning, new forms of human-machine interactions, intelligent robots, interconnected supply chains, and an ability to transmit digital instructions to the physical world. These complementary technologies can run smart, cost-efficient and automated plants that produce large volumes or highly-customized products. Concomitantly, increased knowledge and technology skills are required on factory floors.

In a December 2019 article published in the Wall Street Journal, entitled “American Factories Demand White-Collar Education for Blue-Collar Work,” the authors defined how new manufacturing jobs that require more advanced skills are driving the education level needed by factory workers. For the first time, manufacturers are on track to employ more college graduates than workers with a high-school degree or less education; this change, in part, coincides with manufacturing shifts toward automation that has increased factory output.

Deloitte and the Manufacturing Institute have been tracking skills shortages for the past 17 years. They have documented how skill shortages continue to swell and threaten to impede the current growth and productivity in the US manufacturing industry. In their November 14, 2018 report entitled “The jobs are here, but where are the people?”, Deloitte and the Manufacturing Institute explored the depths of today’s talent shortage in manufacturing and how jobs are changing due to technology and automation. They predicted a 53% shortage of skills in the US manufacturing industry by 2028.

In response to local, state and national skills needs, the proposed program partners the UK with the BCTC and creates a unique, joint feeder-completer educational opportunity within Kentucky.

Employment Demand

	Regional	State	National
Type Of Job	Continuous Improvement Engineers/specialists*		
Avg. Wage	\$77,526	\$77,629	\$79,744
# Jobs (Postings)	259	111	6108
Expected Growth	0%	0%	0%
Type Of Job	Lean Manufacturing Specialists		
Avg. Wage	\$99,320	\$78,591	\$77,956
# Jobs (Postings)	4	2	431
Expected Growth	0%	0%	0%
Type Of Job	Manufacturing Engineers		
Avg. Wage	\$71,573	\$70,897	\$71,181
# Jobs (Postings)	605	377	31330
Expected Growth	8%	11%	8%
Type Of Job	Manufacturing Production Technicians/technologists		
Avg. Wage	\$40,777	\$59,274	\$43,963
# Jobs (Postings)	147	88	9294
Expected Growth	7%	4%	9%

Indicate source of market demand information

Data was collected from Burning Glass; they represent actual job postings in the last twelve months and BLS projections from 2019-2028.

*Continuous Improvement Engineers/Specialists & Lean Manufacturing Specialists represent specific job titles and do not have BLS growth projections which are at the occupational level. Wage data is the median job salary from job postings over the last 12 months and the # of job openings is the number of job postings over the last 12 months. Nationally, there were 4,903 postings for job titles in “Continuous Improvement” advertised at Bachelor’s Degree levels with a mean salary of \$92,354; these nearly 5,000 job postings were in comparison to 137 job posting advertised at an Associate’s Degree level with a mean salary of \$64,204. Similarly, a Bachelor’s Degree was requested in 322 of the 431 job postings in “Lean Manufacturing” nationally.

Academic Demand

NA

Unnecessary Duplication

Similar Program(s):

Program Id	Inst code	Inst Description	Degree Designation	Program Title	Report year
2086	00197600	Morehead State University	BS	Technology Management Area	2015
2278	00197700	Murray State University	BS		2015
12061	00927500	Northern Kentucky University	BS	Mechatronics Engineering Technology	

Comparison of Objectives/Focus/Curriculum to Similar Programs:

The proposed Bachelor of Science in Lean Systems Engineering Technology program (BS-LST) will be the first of its kind in North America. The program prepares students with the knowledge and skills for a career advancing professional engineering technology within manufacturing technology fields, with an emphasis on Lean Manufacturing Engineering and Lean Operations Management. It includes Just-In-Time (JIT) manufacturing, problem-solving, project management, lean enterprise development, logistics, material and information flow charts (MIFC), and standardized work. The BS-LST graduates will have titles such as Lean?Continuous Improvement Engineer,?Lean Engineer,?Manufacturing?Engineer,? Lean?Process Improvement?Engineer, Supplier Quality?Engineer, Lean Manufacturing Specialist and Quality Engineer.

The Core Courses for the BS-LST include:

Introduction to Just-in-Time?Operations

Manufacturing Simulations, and Material and Information Flow Charts

Introduction to Abnormality Management (Jidoka)

Introduction to Productivity Improvement

System of Quality Assurance and Built-in-Quality

Kaizen of Standardized Work

Problem Solving

Production Instruction, Small Lot?Production and Change over Processes

Logistics

Managing the Shop Floor and Leading kaizen

The programs offered at Morehead State University (MSU) and Northern Kentucky University (NKU) are distinctively different from what is proposed by the University of Kentucky. Below is a summary of the Bachelor of Science in Technology Management at Morehead State University and the Bachelor of Science in

Mechatronics Engineering Technology:

Morehead State University BS in Technology

The Bachelor of Science in Technology Management (BSTM) at Morehead State University is an online completter degree program for people who have an associate degree in a technology-related field. The two-year program is offered completely online, allowing working professionals the convenience to earn a degree at their own pace. Students can choose between a technology systems option and an information systems option. The BSTM online completter program offers the scheduling flexibility that many working professionals require to complete a 120-hour bachelor's degree with a blend of communication and technology.

Northern Kentucky University BS in Mechatronics Engineering Technology

The Bachelor of Science in Mechatronics Engineering Technology at Northern Kentucky University provides graduates real-world experiential education combined with personalized undergraduate experiences in mechanical, electrical and computer control systems, as well as engineering design and management. This Bachelor's degree program is designed to provide students with the knowledge and skills needed to succeed as technological engineers in today's highly integrated computer controlled manufacturing. Students are required to complete the core plus one track. A minor is not required.

Comparison of Student Populations:

The target audience for the proposed BS-LST undergraduate program includes students seeking distinctive career paths and opportunities in creative industrial design, production and service. Its focus and strengths will be students who learn best by visualizing concepts through hands-on practice by using the strengths of learning-by-doing, and who would thrive with an integrated education involving extensive industrial practicums and participation. Specific, targeted groups include:

- (a) high school STEM majors considering careers in manufacturing as a lean? continuous improvement engineer, ?lean engineer, ?manufacturing?engineer, lean? process improvement?engineer, supplier quality?engineer, lean manufacturing specialist, and quality engineer;
- (b) high-school students contemplating a career in engineering but who do not realize the myriad possibilities within or have not yet been exposed to Engineering Technology; and
- (c) entering UK engineering students who are uncommitted to a particular field of engineering.

The collaborative UK and BCTC Program will also establish a unique path for students to attain a four-year BS degree in Engineering Technology and provide an attractive alternative for students who currently leave the UK-COE before graduating

with their BS. Even though these targeted student population may overlap, the BS-LST provides a distinctive career pathway that is different from what both MSU and NKU offer.

Access to Existing Programs:

The existing programs provide different career pathways from what the proposed BS-LST program offers.

Feedback from Other Institutions:

Feedback from NKU:

Dear Dr. Akafuah,

I hope you and family are keeping well. Thanks for reaching out to us about your new? program. Comparing our MET program's objectives and outcomes with your new LST program, we do not see any duplicities. Nevertheless, we always value collaboration with other institutes. Good luck with your LST program. Please let me know if I can be of further assistance.

Regards,

Seyed

Seyed M. Allameh, PhD

Professor and Director

Engineering Technology Programs

Northern Kentucky University

BC231 Nunn Drive

Highland Heights, KY 41099

+1(859) 572-5759

allamehs1@nku.edu

www.nku.edu/~allamehs1

Feedback from Morehead State University:

Dr. Akafuah,

Our faculty do not have concerns regarding your new proposal, Lean Systems Engineering Technology.? We think, this programs graduates can enroll in our Master of Science in Engineering and Technology Management (ETM).??? Thank you,

Ahmad Zargari, Ph.D., CSTM, Professor and Associate Dean

School of Engineering and Computer Science
Smith College of Business and Technology
Morehead State University, Morehead, KY 40351
Voice: (606) 783-2425 Fax: (606) 783-5030
E-mail: ahmad.zargari@moreheadstate.edu
<https://www.moreheadstate.edu/secs>

Cost

Projected Revenue over Next Five Years (\$) : 3875977

Projected Expenses over Next Five Years (\$) : 2857211

Will Additional faculty be needed? Yes

The Engineering Technology Department will collaborate with the Institute of Research for Technology Development (IR4TD) and will share resources. IR4TD will make available \$1.5 million for the Engineering Technology Department. Also, Toyota Motor North America (TMNA) is donating \$4.25 million to support the new Department and per the donor's requests the TMNA funds will be allocated as follows:

A \$2 million endowment to create the Toyota Engineering Technology Diversity Scholarship

A \$1 million endowment to create the Toyota Engineering Technology Distinguished Professorship

\$1.25 million for Engineering Technology Laboratory Enhancement, faculty recruitment and general expenses.

This TMNA funding will support both the CPT and LST programs.

Provide a budgetary rationale for creating this new program

The BS in LST is expected to increase revenue by attracting a new pool of students to UK. It is also projected to increase retention rates and generate tuition income.

Faculty in the LST program will be engaged in activities with industry partners through consulting services, lean implementation coaching and applied research. These activities are estimated to generate income projected as follows: Yr2: \$100K, increasing \$25K yearly after that.