Texas A&M University

New Certificate, Bachelors, Masters, or Doctoral Program

• Proposal Checklist •

Requested by the Department or Unit of : College of Engineering (CLEN)
Dwight Look College of Engineering

Program Type, Level, Designation, Title, Description, Hours

Program Type Certificate Program ☐ Degree Program ☒

Program Level Undergrad Certificate ☐ Grad Certificate ☐ Bachelor ☐ Master ☒ Doctoral ☐

Degree Designation *(i.e., BS, BA, MA, MS, MAgr, Med, PhD, EdD, etc.)* MEng

Title of proposed program: Systems Engineering

Proposed CIP Code (*if known*): 47.2701

Brief program description (*provide a catalog description for undergraduate and graduate certificates*):

The Proposed Systems Engineering MEng degree is a 30 hour, non-thesis program which will educate students in state of the art systems engineering concepts as utilized across multiple engineering disciplines. The course work will cover systems thinking, systems modeling, systems engineering tools and systems engineering management.

Minimum program semester credit hours (SCH)	*Certificates - 12 hours**	*Bachelors - 120 hours*	*Masters - 30 hours*
Proposed program hours:	____	____	30

**12 hours minimum to appear on transcript*

Off-Campus or Distance Delivery

% of Program a student can take off-campus or through Distance Education		Program Start Date	SACS Approval**	When Provost needs to inform SACS
☒	25%	Fall 2015	Notification Only	--------
☐	50%	____	Approval Required	6 months before first day of program
☐	80%	____	Approval Required	6 months before first day of program
☐	100%	____	Approval Required	6 months before first day of program

***Notification letter arranged through the Vice Provost for Academic Affairs and sent by TAMU President.*

Program Delivery Mode

		Location
☒	On-campus	College Station
☐	Broadcast / TTVN	____
☐	Specific off-campus location***	____
☐	Distance Education / Internet	In-State ☐ Out-of-State ☐ Start Date ____
☐	Out-of-Country	Will this program be offered with another institution? Yes ☐ No ☐ If yes, contact the Vice Provost for Academic Affairs for additional reporting requirements.

***Is this an approved SACS location? Yes ☐ No ☐ If no, a program prospectus must be sent to SACS.
Approved locations as of March 2012: TAMU-Galveston, TAMU-Qatar, University Center-The Woodlands, CityCentre-Houston, Dubai and Saudi Arabia.

Program Funding

Has program funding been finalized at the department or college level? Yes ☒ No ☐
If no, explain or attach budget: ____

Will new costs for the first five years of the program be under $2 million? Yes ☒ No ☐
If new costs exceed $2 million, coordinating board approval is required.

Submitted by (Contact Person):

John C. Criscione, MD, PhD	JCCriscione@tamu.edu
Name	Email
Asst Dean for Graduate Programs in Engineering	979-862-3946
Title	Phone

Certification Statement

By signing below, the Dean of the College certifies the proposed program complies with coordinating board standards. If the program is delivered through Distance Education, the Dean of the College certifies that they are following the *Principles of Good Practice for Academic Degree and Certificate Programs and Credit Courses Offered Electronically.*

Use additional signature lines if program is between three or more departments or colleges.

Signature, Department Head or Interdisciplinary Program Chair John C. Criscione	Date 3/27/14	Signature, Department Head or Interdisciplinary Program Chair (*if joint program*)	Date
Typed or Printed Name		*Typed or Printed Name*	
Chair, College Review Committee	Date 3/27/14	Chair, College Review Committee	Date
Dean of College	Date 3/27/14	Dean of College	Date
Chair, University Curriculum Committee or Graduate Council	Date 5-16-14	Chair, University Curriculum Committee or Graduate Council	Date

Additional Approvals Required: Faculty Senate and President.

New Bachelor's and Master's Degree
Cover Page/Signature Page

Directions: An institution shall use this form to propose a new bachelor's or master's degree program. In completing the form, the institution should refer to the document *Standards for Bachelor's and Master's Programs*, which prescribes specific requirements for new degree programs. Note: This form requires signatures of (1) the Chief Executive Officer, certifying adequacy of funding for the new program; (2) a member of the Board of Regents (or designee), certifying Board approval, and (3) if applicable, a member of the Board of Regents or (designee), certifying that criteria have been met for staff-level approval. NOTE: Preliminary authority is required for all engineering programs. An institution that does not have preliminary authority for a proposed engineering program shall submit a separate request for preliminary authority prior to submitting the degree program request form. That request shall address criteria set in Coordinating Board rules Section 5.24 (a).

Information: Contact the Division of Academic Affairs and Research at 512/427-6200 for more information.

Administrative Information

1. Institution: **Texas A&M University**

2. Program Name – Show how the program would appear on the Coordinating Board's program inventory (*e.g., Bachelor of Business Administration degree with a major in Accounting*): **Master of Engineering in Systems Engineering**

3. Proposed CIP Code: **14.2701.00**

4. Number of Required Semester Credit Hours (SCHs) (*If the number of SCHs exceeds 120 for a Bachelor's program, the institution must request a waiver documenting the compelling academic reason for requiring more SCHs*): **30 hours**

5. Brief Program Description – Describe the program and the educational objectives:

The MEng in Systems Engineering is a 30 SCH, non-thesis master's program that is intended to provide graduates with the latest cross-discipline concepts, tools, and skills in systems engineering--as required for modern manufacturing, production, and service industries and for governmental and military operations.

6. Administrative Unit – Identify where the program would fit within the organizational structure of the university (*e.g., The Department of Electrical Engineering within the College of Engineering*): **Dwight Look College of Engineering**

7. Proposed Implementation Date – Report the date that students would enter the program (MM/DD/YY): **Fall 2015**

8. Contact Person – Provide contact information for the person who can answer specific questions about the program:

Name: **Dr. John C. Criscione**

Title: **Assistant Dean for Graduate Programs**

E-mail: **JCCriscione@tamu.edu**

Phone: **979-862-3946**

Signature Page

1. Adequacy of Funding – The chief executive officer shall sign the following statement:

   I certify that the institution has adequate funds to cover the costs of the new program. Furthermore, the new program will not reduce the effectiveness or quality of existing programs at the institution.

   _____

   Chief Executive Officer Date

2. Board of Regents or Designee Approval – A member of the Board of Regents or designee shall sign the following statement:

   On behalf of the Board of Regents, I approve the program.

   _____

   Board of Regents (Designee) Date of Approval

3. Board of Regents Certification of Criteria for Commissioner of Assistant Commissioner Approval – For a program to be approved by the Commissioner or the Assistant Commissioner for Academic Affairs and Research, the Board of Regents or designee must certify that the new program meets the eight criteria under TAC Section 5.50 (b): The criteria stipulate that the program shall:

   (1) be within the institution's current Table of Programs;
   (2) have a curriculum, faculty, resources, support services, and other components of a degree program that are comparable to those of high quality programs in the same or similar disciplines at other institutions;
   (3) have sufficient clinical or in-service sites, if applicable, to support the program;
   (4) be consistent with the standards of the Commission of Colleges of the Southern Association of Colleges and Schools and, if applicable, with the standards or discipline-specific accrediting agencies and licensing agencies;
   (5) attract students on a long-term basis and produce graduates who would have opportunities for employment; or the program is appropriate for the development of a well-rounded array of basic baccalaureate degree programs at the institution;
   (6) not unnecessarily duplicate existing programs at other institutions;
   (7) not be dependent on future Special Item funding
   (8) have new five-year costs that would not exceed $2 million.

   On behalf of the Board of Regents, I certify that the new program meets the criteria specified under TAC Section 5.50 (b).

   _____

   Board of Regents (Designee) Date

Request Form for Bachelor's and Master's Degrees

Program Requested:
A new Master of Engineering Degree in Systems Engineering

Unit Requesting Degree:
The office of the Vice Chancellor and Dean of Engineering at College Station, Texas

Degree Requirements: 30 hours of coursework including 18 hours of coursework (6 courses) in the general theory of Systems Engineering; 9 hours of elective coursework; a 1-hour seminar course; and a 2-hour capstone project.

Resources and Funding Required: Faculty from individual engineering departments will teach all courses in the degree program under a cooperative/participative agreement with the Office of the Dean of Engineering, who will administer and oversee the program through the Engineering Academic and Student Affairs (EASA) Office. This new degree program will be a joint effort between all of the engineering departments at Texas A&M University. This program utilizes academic resources that are already funded—i.e., approved courses and mentoring by graduate faculty in the Look College of Engineering.

I. Need

NEEDS ASSESSMENT

A. Job Market Need

Due to the complexities of Manufacturing and Service sector Enterprise Systems, there is an emerging and growing need for Systems Engineers trained in Systems Modeling Methodologies. This need is manifested in industry, government and military operations. *Money Magazine* rated Systems Engineering in 2009 as the top career choice with an expected 45% growth rate in this decade. It was precisely this growing need that prompted the Look College of Engineering to launch this program which will be one of the first in the world to unify the theories and methodologies across most engineering disciplines into a multidisciplinary degree in Systems Engineering, and expose engineering students to the complexities and scope of the applications in System Engineering.

B. Program Structure

Systems Engineers are needed to design, organize, implement and manage large, complex operational, military and industrial organizations. Hierarchical, interactive and socioeconomic systems require special skills and methodologies to implement and sustain. Large, complex systems involve the talents and expertise of many traditional engineering disciplines. This program represents an effort to unify multiple engineering disciplines and expose the student to the wide array of problems and problem structures which are inherent in interdisciplinary systems. Hence, participating teaching faculty will be drawn from a wide range of engineering disciplines and will teach Systems Engineering within a common framework. Over half (18hrs) of the coursework will be in multidisciplinary system engineering concepts, whereas specific applications of Systems Engineering will

be obtained in 9 hours of domain specific systems engineering courses chosen by the student from individual engineering disciplines. To the best of our knowledge, this is the first program to be structured and executed in a multidisciplinary way in the State of Texas. It is unique in both execution and content.

C. *Enrollment Projections*

Once this new Master of Engineering program is launched, it is expected to grow to 100 students within 5 years. The projected growth rate and enrollment projections are shown in the following table.

Year	Change of Major/Transfers	New Students	Attrition	Graduation	Cumulative Headcount	Cumulative* FTES (New only)
1	1	10	1	0	10	10
2	5	15	1	8	21	25
3	5	20	2	13	23	45
4	5	25	2	15	30	70
5	5	30	2	24	40	100

*These numbers will dictate the projected formula income in the funding source portion in Section III, Anticipated New Formula Funding.

FTES = full-time equivalent student.

Per CB guidelines, 1 FTES = 15 sch for UG, 12 sch for M, and 9 sch for D

II. Quality

A. Degree Requirements

1) **Degree** –The degree requires 30 hours of coursework: 9 (3 hr) courses; a seminar course (1 hr) and a capstone project course (2hr).

2) **Number of hours in the major field (Systems Engineering)**
18 hours of required coursework in Systems Engineering Fundamentals

3) **Total number of hours in the degree program** – 30 hours

4) **New and transfer guidelines**- A new student with any BS degree will generally be accepted into the degree program; however, every student will be required to have: 6 hours of calculus, linear algebra and 3 hours of statistics: and an overall GPR of 3.0 or higher. Each applicant is evaluated on his/her own merits, using these general guidelines. Transfer students are subject to the same criteria, but 3 hours of appropriate coursework might be approved as a free elective.

5) **For The Master's degree program in *Systems Engineering*:**

	Non-thesis SCH	Thesis SCH	Clock Hours
a. *Foundation Courses:	0		
b. Required Courses (ISEN 640, ISEN 641, SYEN 642. SYEN 643, SYEN 644, SYEN 645)	18		
c. Prescribed Electives	0		
d. Elective Courses (Any from a selected engineering discipline as approved on degree plans)	9		
e1. Thesis/Dissertation	0		
e2. Other (specify) (seminar SYEN 646, 1 hr, and capstone project SYEN 647, 2 hr)	3		
TOTAL SCH REQUIREMENTS	30		

B. ***Curriculum***

The proposed curriculum is comprised of three blocks of courses. The first is a block of 6 courses (18 hours), 2 that are offered by the Industrial and Systems Engineering Department and 4 that are multidisciplinary and which will be managed by the Engineering Academic and Student Affairs Office. The Second block of courses is 3 elective courses (9 hours) which are "domain specific". Each student in the program will be allowed to choose a set of 3 courses (9 hours) in Systems Engineering application within an engineering field of his/her choice. It is expected that concurrent with this selection, a major advisor will be chosen within that field of interest. All courses which can be selected are currently being taught. The third block of courses is a 1-hour seminar course featuring notable speakers from practicing Systems Engineers, and a 2-hour capstone project course directed by the student's major advisor. The details of this curriculum summary are shown in the following table.

Prefix and Number	Required Courses	SCH
ISEN 640	**Systems Thinking & Architectures**	3
ISEN 641	**Systems Engineering: Methods & Frameworks**	3
SYEN 642	**Systems Performance Modeling**	3
SYEN 643	**Theory of Socio-Technical Systems**	3
SYEN 644	**Decision Making: Risk Analysis and Uncertainty**	3
SYEN 645	**Management of Engineering Systems**	3

Prefix and Number	Prescribed Elective Courses	SCH

D. Faculty

a. Faculty assignments and profiles

The following faculty comprise the initial set of Professors currently teaching in the Look College of Engineering who are expected to teach one of the 6 required Foundation Knowledge courses.

Name of Core Faculty and Faculty Rank	Highest Degree and Awarding Institution	Courses Assigned in Program **	% Time Assigned To Program*
Dr. Lewis Ntaimo Associate Professor	PhD in Industrial and Systems Engineering, University of Arizona	ISEN 641	33%
Dr. Raktim Bhattacharya Associate Professor	PhD in Aerospace Engineering, University of Minnesota	SYEN 643	33%
Dr. Mahmoud El-Halwagi Professor	PhD in Chemical Engineering University of California		33%
Dr. Ramundo Arroyave Associate Professor	PhD in Materials Science, Massachusetts Institute of Technology		33%
Dr. Luca Quadrifoglio Associate Professor	PhD, Industrial & Systems Engineering, University of Southern California	SYEN 642	33%
Dr. Richard Malak Assistant Professor	PhD in Mechanical engineering, Georgia Institute of Technology	SYEN 644	33%

Name of Support Faculty and Faculty Rank	Highest Degree and Awarding Institution	Courses Assigned in Program	% Time Assigned To Program
Dr. Richard Mayer Adjunct Professor	PhD in Industrial Engineering, Texas A&M University	ISEN 641	33 %

Dr. Alex Sprintson Associate Professor	PhD in Electrical Engineering, Technion-Israel Institute of Technology		TBD
Dr. Eduardo Gilden Assistant Professor	PhD in Aerospace Engineering, University of Texas at Austin	SYEN 642	33%
Dr. Ricardo Gutierrez-Osuna Professor	PhD in Computer Engineering, North Carolina State University		TBD
Dr. Don T. Phillips Professor	PhD in Industrial Engineering, University of Arkansas	SYEN 644	33%
Dr. Mark Avnet Assistant Professor	PhD in Systems Engineering, Massachusetts Institute of Technology	SYEN 645 SYEN 643	67%

*The percent of time each professor is assigned to the program is not for every academic semester in the academic year. This percentage of participation is only valid if the professor is teaching a course in any one semester (Fall, Spring or Summer). During that specific semester, the professor's department will be provided support from the college for the designated percentage of equivalent annual salary. It is expected that any one professor will only teach one course per year.
**These are the courses that each faculty member affiliated with the degree program has expressed an interest in teaching.

b. What impact will the new program have on current programs in regards to faculty resources?

1. *How will the teaching load of current faculty be impacted?*

   The *current teaching loads* of existing faculty and the *amount* of dollars spent on faculty salaries will not be affected. This new ME in Systems Engineering is a consolidation of faculty interests and a packaging of newly developed and long-standing courses.

2. *How will the teaching load of faculty assigned a portion of their time to the new program be covered?*

   The faculty previously listed in Part A are already being paid out of State Formula funding. The current assigned teaching load will remain the same in terms of courses being taught by participating faculty. If in any one semester, a particular faculty member from any one department is assigned to teach one of the required Systems Engineering courses, this portion of his or her salary will be paid by funds from the Systems Engineering program administered by the office of the Dean of Engineering.

Comment: Systems Engineering courses are currently being taught by almost every department in the Look College of Engineering. Coursework currently being taught includes a body of *Foundation Knowledge* and *Domain Specific Application Knowledge.*

There is much duplication across the engineering college, particularly in Foundation Knowledge. This new Systems Engineering Master's program will elevate all Foundation knowledge to the college level, and will be ideally taught only one time in the SYEN courses. This eliminates redundancy and duplication in departmental courses currently being taught. This should and will create additional time and resources to teach Application-Domain specific Systems Engineering principles. This new structure is a more efficient and cost-effective way to teach Systems Engineering across all engineering departments.

E. Students

New students who elect to pursue this new ME degree will be recruited using normal and currently existing student recruiting mechanisms. Advertising and program content will be distributed to potential students by (1) Color mail-out brochures and (2) A new COE website constructed for this program. The COE program currently supports a wide range of minority recruiting programs.

F. Library

All necessary library resources are already in place, both at the University level and via internet searches.

G. Facilities and Equipment

Each engineering department currently houses all of the laboratory, computational and pedagogical resources to support this program. Classrooms for program instruction will be assigned to support teaching needs.

H. Accreditation

There is no graduate program accreditation in this new field of study.

I. Evaluation

Normal student course evaluation procedures will be executed for this program. In addition, an internal steering committee will be formed to monitor effectiveness, quality and consistency. In addition, an advisory committee consisting of people from industry and academia will be formed to help guide and review the program.

III. Costs and Funding

New Five-Year Costs and Funding Sources

There are fundamentally no *new faculty costs* associated with teaching this program as (1) all faculty resources are already in place, (2) all software and labs

are already in place, and (3) student recruiting and enrollment will be done through existing mechanisms.

There are some new administrative costs associated with this new program. A new Systems Engineering program office will need to be established to coordinate recruiting ,student inquiries and plan of study monitoring and control. These additional space requirements and program costs will be covered out of the existing budget for the College of Engineering and the Dean's office. A summary of these new program costs are as follows. Course delivery costs are based upon teaching 3 courses each Fall and Spring semester; and one course during the Summer semester (7 courses per year).

Five-Year Costs		Five-Year Funding	
Personnel[1]		Reallocated Funds[6]	$1,200,000
Faculty	$0		
Administration[5]	$0		
Graduate Assistants	$100,000		
Clerical/Staff	$250,000		
Other Personnel	$0		
Facilities, Equipment & IT Resources	$0	Anticipated New Formula Funding[3]	$1,008,546
Supplies and Materials	$100,000	Special Item Funding	$0
Library	$0	Designated Tuition	$0
Other[2]	$10,000	Other[4]	$0
Total Costs	**$460.000**	**Total Funding**	$1,008,546

1...Based upon a 3 course (9 hours) full time annual teaching load per faculty member: a $120k per FTE faculty annual salary: and 7 SEEN courses taught per year.
And a program requirement to teach 6 SYEN courses per year

2...Advertising and website development

3... Based upon the following formula.: Credit hours * Weighting Factors
New Formula Funding = (New students in years1-5) * (24 registered course hours spring & fall semesters) * (7.66) * (54.86)
NFF=(100)*(24)*(7.66)*(54.86

6... . (7 courses/year)/(3 courses FTE) * ($120,000/FTE) * 5 years

FTE Personnel Involved in Delivery of New Program

Personnel		Year 1	Year 2	Year 3	Year 4	Year 5	TOTAL
Program Administration	New	.5	.5	.5	.5	.5	2.50
	Reassignment						0
CORE Faculty*	New						0
	Reassignment	2	2	2	2	2	10
SUPPORT Faculty	New						0
	Reassignment						0
Graduate Student Assts**	New	2	2	2	2	2	5
	Reassignment						0
Clerical/Other Support ***	New	1	1	1	1	1	5
	Reassignment						0
TOTAL	New						0
	Reassignment						0
5-Year TOTAL/TOTAL					New		12.5
					Reassignment		10

* **Reassigned, existing faculty in COE: Based upon 6 courses taught per year; 3 courses per FTE**

** **Two per year to assist program director and clerical staff (50% per FTE)**

*** **Program clerical staff (1) to manage budgets and records**

NEW COSTS TO THE INSTITUTION OF THE PROGRAM/ADMINISTRATIVE CHANGE

Cost Category	Cost Sub-Category	1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTALS
Faculty Salaries	(New)						0
	(Reassignments)						0
Program Administration	(New)						0
	(Reassignments)						0
Graduate Assistants	(New)	$100,000	$100,000	$100,000	$100,000	$100,000	$500,000
	(Reassignments)						0
Clerical/Staff	(New)	$50,000	$50,000	$50,000	$50,000	$50,000	$250,000
	(Reassignments)						0
Supplies & Materials		$10,000	$10,000	$10,000	$10,000	$10,000	$50,000
Library							0
Equipment & IT Resources**							0
Facilities							0
Other (Identify)							0
TOTALS		$160,000	$160,000	$160,000	$160,000	$160,000	$800,000

ANTICIPATED **SOURCES OF FUNDING**

Funding Category	1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTALS
I. Formula Income*			$231,966	$302,564	$403,419	$937,949
II. Other State Funding			None			
III. Reallocation of Existing Resources			None			
IV. Federal Funding (In-hand only)			None			
V. Other Funding			None			
TOTALS						$937,949

Based upon the following formula: Credit hours * Weighting Factors

*** New Formula Funding = (New students in years1-5) * (24 registered course hours spring & fall semesters) * (7.66) * (54.86)**

For example, Year1: NFF=(10)*(24)*(7.66)*(54.86)

•

NON-FORMULA SOURCES OF FUNDING

Funding Category	Non-Formula Funding Sources
II. Other State Funding*	**#1 N/A**
	#2 N/A
III. Reallocation of Existing Resources*	**#1 N/A**
	#2 N/A
IV. Federal Funding*	**#1 N/A**
	#2 N/A
V. Other Funding*	**#1 N/A**

	#2 N/A