CATALOG YEAR __2011-2012_____
(Please use separate form for each add/change)

COLLEGE/SCHOOL/SECTION: ____College of Arts and Sciences_____
Current Catalog Page(s) Affected: pp.   __On Line_____

Course: Add:____   Delete: _____ Change: Number ____ Title _____
(check all that apply)   SCH _____ Description _____ Prerequisite _____

If new, provide Course Prefix, Number, Title, SCH Value, Description, prerequisite, lecture/lab (hours if applicable) and **student learning outcomes**. If in current catalog, provide change and attach page with changes in red and provide a brief justification.

Program: Add: _____   Change: _X___   Attach new/changed Program of Study description and 4-year plan. If in current catalog, provide change and attach page with changes in red.
                B.S. Major in Systems Engineering (see the attached sheets for details)

Minor: Add: _____Delete: _____ Change: _____   Attach new/changed minor.
If in current catalog, provide change and attach page with changes in red.

Faculty: Add: _____   Delete: _____   Change: _____   Attach new/changed faculty entry.
If in current catalog, provide change and attach page with changes in red.

College Introductory Pages: Add information: _____ Change information: _____
Attach new/changed information. If in current catalog, provide change and attach page with changes in red.

Other: Add information: _____ Change information: _____
Attach new/changed information. If in current catalog, provide change and attach page with changes in red.

Approvals:	Signature	Date
Chair Department Curriculum Committee	_____	_____
Chair Department	_____	_____
Chair College Curriculum Committee	_____	_____
Dean	_____	_____

Department of Engineering, Mathematics and Physics
Systems Engineering Curriculum
Summary of Changes – Academic Year 2010-2011

1. Changed ENGR 1201 course description to match the requirements with TAMU.
2. Changed ENGR 1202 course description to match the requirements with TAMU.
3. Changed ENGR 1204 course description to match the requirements with TAMU.
4. Revised ENGR 2303 course description for modified SENG curriculum.
5. Changed ENGR 2305 course prerequisite from ENGR 1202, Math 2414 to **PHYS 2326**.
6. Changed ENGR 2372 course prerequisite from ENGR 1202 to **MATH 2414**.
7. Changed SENG 3300 course prerequisite from ENGR 2372 to **MATH 2414**.
8. Changed title of SENG 3301 from "Technical Reports and Project Management" to "**Engineering Project Management and Proposals**," revised course description and modified prerequisites for SENG curriculum.
9. Revised SENG 3310 course description and added prerequisite **COSC 1336**.
10. Revised SENG 3320 course description and changed prerequisite from ENGR 2372 to **COSC 1336**.
11. Revised SENG 3340 course description.
12. Changed SENG 3350 course prerequisite from SENG 3330 to **MATH 3310**.
13. Revised SENG 3370 course description.
14. Revised SENG 3380 course description.
15. Revised SENG 4195-4395 course description.
16. Revised SENG 4199-4399 course description.
17. Added SENG 4315 course in SENG curriculum in Systems Engineering Track.
18. Changed SENG 4340 course prerequisite from SENG 3370 to **SENG 3340**.
19. Revised SENG 4350 course description and changed prerequisite from ENGR 2372 to **SENG 3330**.
20. Changed SENG 4360 course prerequisite from COSC 1336 and COSC 1136 to **SENG 3380**.
21. Revised SENG 4370 course description.
22. Changed title of SENG 4380 from "Total Quality Engineering" to "**Quality Control and Reliability**," and modified the course description.
23. Revised SENG 4390 course description and modified prerequisite to **SENG 3301**.
24. Added SENG 4152-4352 in SENG curriculum.
25. Added **Lab Fee of $35** for ENGR 2103 and ENGR 2105
26. Added **Course Fee of $35** for ENGR 1201, ENGR 1202, ENGR 1204, ENGR 2372, SENG 3340, SENG 3370, SENG 4315, SENG 4360, SENG 4390

*See Appendix A *Core Curriculum and Optional Course Information.*

FALL			HOURS	SPRING			HOURS
FRESHMAN YEAR				**FRESHMAN YEAR**			
ENGL	1301	English Composition I	3	ENGL	1302	English Composition II	3
ENGR	1201	Foundations of Engr I	2	ENGR	1202	Foundations of Engr II	2
PSCI	2305	American National Govt	3	PSCI	2306	American State Govt	3
MATH	2413	Calculus I	4	MATH	2414	Calculus II	4
COSC	1136	Fundtls of Progrmg Lab	1	PHYS	2125	University Phys I Lab	1
COSC	1336	Fundtls of Progrmg	3	PHYS	2325	University Physics	3
Total			**16**				**16**
SOPHOMORE YEAR				**SOPHOMORE YEAR**			
PHYS	2126	University Phys II Lab	1	ENGR	2105	Electrical Engr Lab	1
PHYS	2326	University Physics II	3	ENGR	2305	Electrical Engineering	3
ENGL	2311	Technical Writing	3	ENGR	2372	Intro Design Exps	3
ENGR	1204	Engineering Graphics	2	ENGR	2376	Cons Prins Thrml Engr	3
ENGR	2103	Statics & Dynamics Lab	1	MATH	3310	Intro to Linear Algebra	3
ENGR	2303	Statics & Dynamics	3			Visual/Perform Arts*	3
MATH	2415	Calculus III	4				
Total			**17**				**16**
JUNIOR YEAR				**JUNIOR YEAR**			
HIST	1301	The U.S. to 1877	3	HIST	1302	The U.S. Since 1877	3
SENG	3300	Engineering Economics	3	SENG	3330	Operations Research I	3
SENG	3310	Intro to Control Systems	3	SENG	3350	Prod Plang & Control	3
SENG	3320	Engr Modeling & Design	3	SENG	3340	Robotics & Automation	3
SENG	3380	Engineering Statistics	3			Soc/Behavioral Sci*	3
		Activity/Wellness*	1	ENGL		Survey of Literature*	3
Total			**16**				**18**
SENIOR YEAR				**SENIOR YEAR**			
SENG	3301	Engr Proj Mgt & Proposal	3			BUS/SENG Track[1]	3
		BUS/SENG Track[1]	3			BUS/SENG Track[1]	3
		BUS/SENG Track[1]	3			BUS/SENG Elective[2]	3
		BUS/SENG Track[1]	3	SENG	4390	SE Senior Dgn Proj	3
		BUS/SENG Track[1]	3				
Total			**15**				**12**

TOTAL SEMESTER CREDIT HOURS: 126

[1]Business Track: BA 4390, MIS 3310, MKT 3310, TIL 3310, TIL 3311 and TIL 3340; Systems Engineering Track: SENG 3370, SENG 4330, SENG 4340, SENG 4350, SENG 4360 and SENG 4315 ~~4390~~.

[2]Business/Systems Engineering electives, select ~~6~~ 3 SCH from BA 3320, BA 4199-4399, MKT 4310, MKT 4390, SENG 4370, SENG 4380, SENG 4385, SENG 4195-4395, SENG 4199-4399, SENG 4152-4352.

Degree Requirements for the BS with a Major in Systems Engineering

1. **Hours Required:** A minimum of **126** semester credit hours (SCH): 45 hours must be advanced, and fulfillment of degree requirements as specified in the "Requirements for Graduation" section of this catalog.
2. **University Core Curriculum: 42** SCH as outlined in the suggested plans and as specified in the "Requirements for Graduation". MATH 2413 must be taken as part of the core.
3. **Major:** ~~48~~ 51 SCH including COSC 1136, COSC 1336, ENGR 1201, ENGR 1202, ENGR 1204, ENGR 2103, ENGR 2303, ENGR 2105, ENGR 2305, ENGR 2372, ENGR 2376, SENG 3300, 3301, 3310, 3320, 3330, 3340, 3350, 3380, and SENG 4390.
4. **Required Prescribed Track: 18** SCH from Business or Systems Engineering. Business Track: BA 4390, MIS 3310, MKT 3310, TIL 3310, TIL 3311, TIL 3340. Systems Engineering Track: SENG 3370, SENG 4330, SENG 4340, SENG 4350, SENG 4360, ~~SENG 4390~~ SENG 4315.
5. **MATH: 12** SCH including 1 SCH surplus from core and MATH 2414, MATH 2415, and MATH 3310.
6. **Business/Systems Engineering Electives:** ~~6~~ 3 SCH selected from BA 3320, BA 4199-4399, MKT 4310, MKT 4390, SENG 4370, SENG 4380, SENG 4385, SENG 4195-4395, SENG 4199-4399, SENG 4152-4352.

Systems Engineering -- Tracks

Prefix and Number	Prescribed Elective Courses (Engineering Track)	SCH
SENG 3370	Computer Integrated Manufacturing	3
SENG 4330	Operations Research II	3
SENG 4340	Intelligent Systems	3
SENG 4350	Facilities Design and Logistics	3
SENG 4360	Systems Simulation	3
~~SENG 4390~~	~~Systems Engineering Senior Project~~	~~3~~
SENG 4315	Embedded Systems	3

Prefix and Number	Prescribed Elective Courses (Business Track)	SCH
MKT 3310	Principles of Marketing	3
MIS 3310	Management Information Systems	3
TIL 3310	Principles of Transportation	3
TIL 3311	Export/Import Operations and Practice	3
TIL 3340	Business Logistics Management	3
BA 4390	Business Strategy	

Electives

Prefix and Number	Business and Engineering Electives	SCH
BA 3320	International Business	3
BA 4199-4399	Issues in Business Administration	1-3
MKT 4310	International Marketing	3
MKT 4390	Marketing Problems and Policies	3
SENG 4370	Introduction to Virtual Manufacturing	3
SENG 4380	~~Total~~ Quality Control and Reliability ~~Engineering~~	3
SENG 4385	Special Topics in Systems Engineering	3
SENG 4195-4395	Undergraduate Research	1-3
SENG 4199-4399	Independent Study	1-3
SENG 4152-4352	Internship in Systems Engineering	1-3

ENGR 1201

Foundations of Engineering I

Two semester hours. (FL/SS)

Previous Description:

~~Introduction to the engineering profession, ethics and disciplines, development of skills in teamwork, problem solving, logic processing, design and drawing; emphasis on computing applications and CAD tools.~~ Corequisite: MATH 2413. ~~(Formerly ENGR 1211)~~

Revised Description:

Introduction to the engineering profession and disciplines; development of skills in problem solving including numbers, units, graphs and error calculation; drawing and design using CAD tools; students work in teams on an engineering design project, including construction, testing and reporting. Co- requisite: MATH 2413. Course fee: $35.00

ENGR 1202

Foundations of Engineering II

Two semester hours. (SP/SS)

Previous Description:

~~Development of skills in problem solving, design, analysis, estimation and teamwork; utilization of computer tools for documentation and presentation; introduction to logic processing and computer programming; introduction to systems and industrial engineering; introduction to conservation principles in engineering sciences.~~ Prerequisite: ENGR 1201 and MATH 2413. ~~(Formerly ENGR 1212)~~

Revised Description:

Introduction to engineering ethics and professional responsibilities; development of skills in problem solving, analysis, estimation, design, and teamwork; introduction to systems engineering; computational analysis, computer programming applications. Students work in teams on an engineering design project, including construction, testing, and reporting. Prerequisite: ENGR 1201 and MATH 2413. Course fee: $35.00

ENGR 1204

Engineering Graphics

Two semester hours.

Orthographical and isometric drawings. ~~auxiliary view and sections views~~ ~~and dimensioning are introduced.~~ Tolerance, working drawings, three dimensional pictorials, primary and successive auxiliary view and vector graphics ~~are presented~~. Computer aided design software ~~such as Auto CAD~~ is used for drawing and development of systems in mechanical, electrical and welding applications. Prerequisite: ENGR 1201. Course fee: $35.00

ENGR 2303

Engineering Mechanics-Statics and Dynamics.

Three semester hours.

Application of the fundamental principles of Newtonian mechanics to the statics and dynamics of particles and the equilibrium of trusses, frames, beams and other rigid bodies. Dynamics of moving particles, including friction, torque, impulse, and momentum. Prerequisites: PHYS 2325/2125 and MATH 2414. Corequisite: ENGR 2103. ~~(Formerly ENGR 2321)~~

ENGR 2103

Engineering Mechanics-Statics & Dynamics Laboratory

One semester hours.

Laboratory course to accompany ENGR 2303. Laboratory exercises reinforce ENGR 2303 lecture material and place importance on scientific communication and collaboration. Corequisite: ENGR 2303. Course fee: $35.00

ENGR 2305

Principles of Electrical Engineering

Three semester hours.

Fundamentals of electrical circuit analysis, AC power and electronics, intended as a terminal course in these areas for most engineering disciplines. Prerequisites: ~~ENGR 1202 and MATH 2414~~ PHYS 2326. Corequisite: ENGR 2105. ~~(Formerly ENGR 2315)~~

ENGR 2105

Principles of Electrical Engineering Laboratory

One semester hours.

Laboratory course to accompany ENGR 2305. Laboratory exercises reinforce ENGR

2305 lecture material and place importance on scientific collaboration. Corequisite: ENGR 2305. Course fee: $35.00

ENGR 2372

Introduction to Design of Experiments

Three semester hours.

Introduction to basic probability theories and hypothesis testing will be introduced. Single factor

ANOVA. Randomized blocks and Latin squares, two-factorials and 2k factorial designs, robust

parameter design and uncertainty analysis. Software packages are used for data mining and

interpretation, with application to engineering and/or other systems. Prerequisite: MATH 2414

ENGR 1202. Course fee: $35.00

ENGR 2376

Conservation Principles of Thermal Engineering

Three semester hours.

Theory and applications of energy methods in engineering; conservation principles to investigate

"traditional" thermodynamics and internal flow fluids; material properties. Prerequisites: ENGR

2303, MATH 2415 or registration therein. (Formerly ENGR 2312).

SENG 3300

Engineering Economics

Three semester hours.

Principles of engineering economics including economic equivalence, time value of money,

analysis of single and multiple investments, comparison of alternatives; capital recovery and tax

implications; certainty; uncertainty; risk analysis; public sector analysis and break-even

concepts. Prerequisites: MATH 2414, ENGR 2372.

SENG 3301

Engineering Project Management and Proposals ~~Technical Reports and Project Management~~

Three semester hours.

Previous Description:

~~Process of developing and presenting field-specific technical information related to engineering, including researching, drafting, editing, revising, and designing technical reports, proposals, manuals; principles of project management~~. Prerequisite: ENGL 2311.

Revised Description:

Principles of project management; planning, scheduling, and control. Engineering proposals; technical reports. Students prepare proposals, including specifications, timelines, schedule, and budget, for projects to be implemented in SENG 4390. This course should be taken the semester preceding SENG 4390. Prerequisite: ENGL 2311 and senior standing.

SENG 3310

Introduction to Control Systems

Three semester hours.

Analysis and synthesis of controlled, dynamic, linear mechanical, electrical, fluid and/or thermal systems; introduction to concepts of stability, controllability, and observability. ~~, and to discrete time, sampled data control systems,~~ Optimal control systems and nonlinear control theory. Prerequisites: ENGR 2305, MATH 3310, COSC 1336.

SENG 3320

Engineering Modeling and Design

Three semester hours.

Fundamentals of modeling and specifications engineering design, reverse engineering, ~~computer-aided design,~~ rapid prototyping, and manufacturing. Application of the design process and problem solving through individual and/or team projects. Prerequisites: ENGR 1204, ENGR 2305~~, ENGR 2372~~, COSC 1336.

SENG 3330

Operations Research I

Three semester hours.

Introduction to the fundamental deterministic analytical methods and their applications to industrial and systems engineering. Modeling and decision making. Methods include linear programming, integer programming, dynamic programming, and nonlinear programming. Prerequisite: MATH 3310, SENG 3320.

SENG 3340

Robotics and Automation

Three semester hours.

Study of the use, design, and deployment of industrial automation and robotics technologies in high-precision, multi-product manufacturing environments. Robot manipulators, kinematics and dynamics, robot automation and control, integrated robotic systems for manufacturing, automation in manufacturing, programmable logic controllers, ~~automation in service industry~~, applications to industrial systems. Prerequisite: SENG 3310. Course fee: $35.00

SENG 3350

Production Planning and Control

Three semester hours.

Coordination of activities of manufacturing and services systems. System design, inputs and outputs, planning and scheduling. Inventory controls and supply chains management with the employment of linear programming. Job scheduling on flexible manufacturing lines. Prerequisite: MATH 3310, SENG 3300, ~~SENG 3330~~.

SENG 3370

Computer Integrated Manufacturing

Three semester hours.

Programmable automation applied to manufacturing systems. ~~Programmable logic controllers,~~ sensors, and data acquisition. Continuous and discrete control system design and analysis. Computer control of manufacturing processes and integration. Communications through local areas networks. Prerequisite: SENG 3310. Course fee: $35.00

SENG 3380

Engineering Statistics~~, Quality Control, and Forecasting~~

Three semester hours.

<mark>Probability and distribution;</mark> statistical methods to monitor and improve product quality and reduce the manufacturing variations. Variable and attribute control charts or statistical process charts. Acceptance sample methods. Process capability indexes. Forecasts based on moving average, exponential smoothing, and regression analysis will be studied. Prerequisite: ENGR 2372.

SENG 4195-4395

Undergraduate Research

One to three semester hours.

Permits work <mark>on a research engineering project</mark> ~~special project in systems engineering~~. <mark>May be repeated.</mark> Prerequisite: Permission of instructor ~~and Senior classification in systems engineering~~.

SENG 4199-4399

~~Special Topics in Systems Engineering~~

<mark>Independent Study in Systems Engineering</mark>

One to three semester hours.

A directed study course. Topics selected from contemporary developments in the field of systems engineering. Prerequisite: Permission of instructor.

<mark>**SENG 4315**</mark>

<mark>Embedded Systems</mark>

<mark>Three semester hours.</mark>

<mark>Characteristics of embedded systems, microprocessors and microcontrollers, system design, modular programming, interface devices, memory management, interrupts, input/output applications, multitasking, and simulation. Prerequisites: ENGR 2305 and COSC 1336. Course fee: $35.00</mark>

SENG 4330

Operations Research II

Three semester hours.

Introduction to the fundamental probabilistic analytical methods and their applications to industrial and systems engineering. Modeling and decision making with uncertainties. Methods include Markov chains, Poisson processes, renewal theories and queuing systems with application to production systems and inventory controls. Prerequisites: SENG 3330, SENG 3380.

SENG 4340

Intelligent Systems

Three semester hours.

Introduction to methods for the analysis and design of intelligent engineering systems. Topics include reinforcement learning, optimal estimation, Bayesian networks, expert systems, neural networks, and genetic algorithms. Applications emphasize control and decision making in engineering, finance, and computer science. Prerequisites: SENG 3340, ~~SENG 3370.~~

SENG 4350

Facilities Design and Logistics

Three semester hours.

Design and analysis of models and algorithms for facility location, vehicle routing, and facility layout problems. Emphasis will be placed on both the use of computers and the theoretical analysis of models and algorithms in the design of production/service facilities, sequencing, and scheduling. Fundamental concepts applied through a sequence of design projects. Prerequisite: ~~ENGR 2372,~~ SENG 3330, SENG 3350.

SENG 4360

Systems Simulation

Three semester hours.

Study the structure, logic, methodologies, and computer techniques for simulating systems. Topics include fundamentals of discrete simulation, design-modeling and subsequent analysis,

model verification and validation, and understanding and predicting the behavior of systems. Prerequisites: ~~COSC 1336, COSC 1136,~~ SENG 3320, SENG 3380. Course fee: $35.00

SENG 4370

Introduction to Virtual Manufacturing

Three semester hours.

Introduction to virtual manufacturing, ~~its applications, and key research issues in this contemporary field of systems engineering~~ virtual reality applications in manufacturing systems design, networked manufacturing applications, and modeling of occupational safety engineering. Prerequisites: SENG 3370.

SENG 4380

~~Total~~ Quality Control and Reliability ~~Engineering~~

Three semester hours.

~~Principles and practices of total quality management (TQM). Basic TQM concepts of leadership, customer satisfaction, employee involvement, continuous improvement and performance measures. Tools and techniques of TQM including statistical process controls, quality function deployment, failure mode and effect analysis, and total productive maintenance. Prerequisites: SENG 3380.~~

Principle and practice of statistical quality control including control by variable and by attribute; construction and use of control charts for variables; fraction defectives, number of defects and use of standard plans; reliability and life cycle testing; failure mode and effect analysis; basic concepts of total quality management.   Prerequisites: SENG 3380.

SENG 4385

Special Topics in Systems Engineering

Three semester hours.

Topics may be from an area of systems engineering. May be repeated when topic changes.

Prerequisite: Senior standing or permission of instructor.

SENG 4390

Systems Engineering Senior Project

Three semester hours.

This capstone course provides students the experience of implementing (including building, testing, and documenting) the approved project in SENG 3301, within budget and on schedule. ~~and designing an integrated enterprise project that incorporates operational cost analysis in the choice of product and selection of manufacturing process.~~ Requires integration of knowledge from ~~all~~ required systems engineering courses. Course requirements include a written report and oral presentation. Prerequisites: To be taken during the semester of graduation. ~~Senior standing and 12 SCH Engineering Track courses or concurrent enrollment.~~ and SENG 3301. Course fee: $35.00

SENG 4152-4352

Internship in Systems Engineering

One to three semester hours.

A directed internship in an organization appropriate to the student's career objectives. May be repeated. Prerequisite: Permission of instructor. Evaluation of performance is on CR/NC basis.

SLOs:1. Demonstrate a sound understanding of the legal, professional and ethical framework for an engineering system; 2. demonstrate strong problem solving skills and apply professional judgment in engineering systems; 3. Identify, analyze and solve technical problems; 4. Apply project management techniques to engineering systems; and 5. communicate and function effectively with team members.