FORM A
College of Technology

Revised 7/23/07

PROPOSAL SUMMARY AND ROUTING FORM

Proposal Title: Create a new calculus based Engineering Statics course

Initiating Unit or Individual: Surveying Engineering Department
Contact Person's Name: Sayed R. Hashimi **e-mail:** hashimis@ferris.edu **phone:** 2632
Date or Term of Proposal Implementation: FALL 2009

- ☐ Group I - A – New degree/major or major, redirection of a current offering, or elimination of a degree, major or minor
- ☐ Group I - B – New minors or concentrations
- ☐ Group II - A – Minor curriculum clean-up and course changes
- ☒ Group II - B – New Course
- ☐ Group III - Certificates
- ☐ Group IV – Off-Campus Programs

Group/Individual	Signature	Date	Vote/Action *
Program Faculty	S. Hashimi	2/26/09	5 Support 0 Support with Concerns 0 Not Support
Department Faculty	S. Hashimi	2/26/09	5 Support 0 Support with Concerns 0 Not Support
Department Head / Chair	S. Hashimi	2/26/09	✓ Support Support with Concerns Not Support
College Curriculum Committee	Lon McKean	3/17/09	9 Support Support with Concerns Not Support
Dean	[signature]	3/17/09	✓ Support Support with Concerns Not Support
University Curriculum Committee	[signature]	3/31/09	✓ Support 7-0. Support with Concerns Not Support
Senate	Richard Griffin/jpn	4/2/09	✓ Support Support with Concerns Not Support
Academic Affairs	David Anderson	4/2/09	✓ Support Support with Concerns Not Support

* Support with Concerns or Not Support must include a list of specific concerns. Votes must be shown for faculty groups. Administrators check appropriate action taken.

To be completed by Academic Affairs

President (Date Approved)	Board of Trustees (Date Approved)	President's Council (Date Approved)

REC'D APR - 2 2009

1. Proposal Summary

(Summary is generally less than one page. Briefly: state what is proposed with a summary of rationale and highlights. Additional rationale may be attached.)

To create a calculus based statics course for the Surveying Engineering program students replacing the Statics and Structures – CONM 221 course. See attached for further rationale.

2. Summary of All Course Action Required*

a. **Newly Created Courses to FSU:**

Prefix	Number	Title
CENG	240	Engineering Statics

b. **Courses to be Deleted From FSU Catalog:**

Prefix	Number	Title

c. **Existing Course(s) to be Modified:**

Prefix	Number	Title

d. **Addition of existing FSU courses to program**

Prefix	Number	Title

e. **Removal of existing FSU courses from program**

Prefix	Number	Title
CONM	221	Statics and Structures

*Contact Senate Secretary or UCC Chair if spaces for additional courses are needed.

Revised 2/27/09

Rational for Creating a New Calculus Based Statics Course

Currently, the Surveying Engineering program courses include a course in Statics and Structures – CONM 221 for three credits with 2 + 2 configuration. This course's main audiences are students majoring in Construction Management and Civil Engineering Technology. As a result, the content of the course is designed as algebra based unlike engineering statics courses in engineering programs which are calculus based. The Surveying Engineering program is accredited by the Accreditation Board for Engineering and Technology (ABET) as an Engineering Program and thus its courses must be engineering based.

The new course will be taught by the Construction Management faculty as was the CONM 221. Another major difference between the two courses besides the course contents is the course configuration. The new course is three credits with 3 + 0 configuration as opposed to CONM 221 which is also three credits but with 2 + 2 configuration.

The new course requires no significant additional resources in terms of faculty loads or additional equipment and facility.

FORM B
Rev.7/23/07

CURRICULUM CONSULTATION FORM

To be completed by each department affected by the proposed change, new degree, new program, new minor, or new course. Potential duplication of coursework is reason for consultation.

1. This completed form must be forwarded with the proposal to the chair/head of the department to be consulted.
2. The department must respond within 20 calendar days of receipt of this form to insure inclusion in the final proposal. The completed form is returned to the initiator and inserted into the proposal.

   Failure to respond is interpreted as support for the proposal.
3. The Proposing Department must address any concerns raised by the department. This response will be in writing and be included in the proposal following the consultation form.

RE: Proposal Title Add New Course

Initiator(s): Sayed R. Hashimi

Proposal Contact: Sayed R. Hashimi **Date Sent**: December 12, 2008

Department: Surveying Engineering Campus Address: Swan 314
(Please print)

Responding Department: Construction Management

Chair/Head/Coordinator: Edward Brayton Date Returned: 12/16/08

Based upon department faculty review on 12/16/08 (date), we

- [x] Support the above proposal.
- [ ] Support the above proposal with the modifications and concerns listed below.
- [ ] Do not support the proposal for the reasons listed below.

Comment regarding the impact this proposal has on scheduling, room assignments, faculty load, and prerequisites for your department. Use additional pages, if necessary.

FORM C
Rev. 07/27/07

FLITE SERVICES CONSULTATION FORM

To be completed by the liaison librarian and approved by the Dean of FLITE. All returned forms should be included in the proposal. **FLITE must respond within 20 calendar days of receipt of this form to insure that the form is included in the final proposal.**

FAILURE TO RESPOND IS CONSIDERED AS SUPPORT OF THE CHANGE.

RE: Proposal Title: Add New Course

Projected number of students per year affected by proposed change: 25-30

Initiator(s): Sayed R. Hashimi

Proposal Contact: Sayed R. Hashimi Date Sent: December 12, 2008

Department: Surveying Engineering Campus Address: Swan 314
(Please print)

Liaison Librarian Signature: Frances Rosen **Date:** 12/17/08

Dean of FLITE Signature: Leah M. Monger **Date Returned:** 12-17-08

Based upon our review on 12/17/08 (date), FLITE concludes that:

☑ Library resources to support the proposed curriculum change are currently available.

☐ Additional Library resources are needed but can be obtained from current funds.

☐ Support, but significant additional Library funds/resources are required in the amount of $_____.

☐ Does not support the proposal for reasons listed below.

Comment regarding the impact this proposal will have on library resources, collection development, programs, etc. Use additional pages if necessary.

JAN 5 2009

Department of Construction Technology & Management
Ferris State University
College of Engineering Technology

Course Outline

Last Revision Date:	02 Mar 2009
Prepared By:	J.R. Schmidt
Department Curriculum Committee Chair:	S. Hashimi/ E. Brayton

Course: CENG 240 Engineering Statics

Credits:	3
Contacts:	3
Course Description:	This first course in mechanics for engineers focuses on rigid bodies and, more specifically, statics. Statics is the study of rigid bodies at rest. Using vector mechanics as appropriate, the principles of mechanics and their application to the solution of engineering problems are explored.
Course Prerequisites:	MATH 230
Course Corequisites:	PHYS 241
Required Textbooks:	Beer, Johnston, and Eisenberg, *Vector Mechanics for Engineers: Statics*, Eighth Edition, McGraw-Hill, NY, 2007. ISBN-13: 978-0-07-297687-8 ISBN-10: 0-07-297687-X

Student Learning Outcomes

1. Demonstrate equilibrium as it relates to rigid body statics.
2. Correctly draw Free-Body Diagrams to express the equivalence of force systems and for the analysis of static equilibrium.
3. Demonstrate an expanded knowledge and use of basic units of measure in U.S. Customary and the international system (S.I.).
4. Determine the values of section profile properties.
5. Calculate the value of a variety of forces within structural members.
6. Calculate forces of friction.
7. Demonstrate knowledge for Fundamentals of Engineering Licensing Exam.

Proposed

Rev. 3/04/09

Ferris State University
College of Technology

SURVEYING ENGINEERING
BACHELOR OF SCIENCE DEGREE
Curriculum Guide Sheet

THIRD YEAR-FALL SEMESTER		**CREDIT/GRADE**
SURE 365	Legal Aspects of Surveying 1* **(Co-Req. SURE 215, ENGL 250)**	3 _____
SURE 372	Adjustment Computations 1 **(SURE 230, MATH 230, SURE 272, MATH 322)**	3 _____
GISC 239	Remote Sensing **(Co-Req.MATH 120)**	3 _____
GEOL 131	Geology and Land-Use Management	3 _____
COMM 121	Fundamentals of Public Speaking	3 _____
ELECTIVE	Social Awareness Elective	3 _____
		(18)
THIRD YEAR- SPRING SEMESTER		
GISC 225	Principles of GIS	3 _____
SURE 340	Photogrammetry **(SURE 110)**	3 _____
SURE 373	Adjustment Computations 2 **(SURE 372)**	3 _____
SURE 420	Prof. Practice of Surveying* **(SURE 365, ENGL 250)**	3 _____
SURE 452	Geodesy 1 **(SURE 230, SURE 372)**	4 _____
		(16)
FOURTH YEAR-FALL SEMESTER		
SURE 366	Evid. & Proce. for Boundary Location **(SURE 365)**	3 _____
GISC 425	Technical Issues in GIS & Cartography **(SURE 272, GISC 225)**	3 _____
SURE 440	Advanced Photogrammetry **(SURE 340, SURE 373)**	3 _____
SURE 453	Geodesy 2 **(SURE 373, SURE 452)**	4 _____
ELECTIVE	Cultural Enrichment Elective	3 _____
		(16)
FOURTH YEAR- SPRING SEMESTER		
CENG 321	Hydraulics Engineering **(PHYS 242, MATH 230)**	4 _____
CENG 421	Soils Engineering **(CONM 121, MATH 220)**	4 _____
SURE 465	Legal Aspects of Surveying 2* **(SURE 365, ENGL 250, Senior Status)**	3 _____
CENG 485	Sustainable Land Use **(Senior Status)**	4 _____
ELECTIVE	Social Awareness Elective	3 _____
		(18)

***Writing Intensive Courses**

Proposed

Rev. 3/04/09

SURVEYING ENGINEERING
BACHELOR OF SCIENCE DEGREE
Curriculum Guide Sheet

Total semester hours required for graduation: 133

FIRST YEAR-FALL SEMESTER		**CREDITS/GRADE**
SURE 110	Fundamentals of Surveying (**Co-Req. MATH 120**)	4 _____
SURE 115	Introduction to Computer Mapping	1 _____
MATH 220	Analytical Geometry & Calculus 1 (**MATH 130 or 126**)	5 _____
ENGL 150	English 1	3 _____
FSUS 100		1 _____
ELECTIVE	Cultural Enrichment Elective	3 _____
		(17)

FIRST YEAR-SPRING SEMESTER		
CENG 220	Engineering Surveying (**SURE 110**) OR SURE 230 Advanced Surveying (**SURE 110**)	4 _____
MATH 230	Analytical Geometry & Calculus 11 (**MATH 220**)	5 _____
CONM 121	Materials Properties & Testing (**MATH 116**) OR SURE 215 Surveying Computations (**SURE 110**)	3 _____
ENGL 250	English 2 (**ENGL 150**)	3 _____
		(15)

SECOND YEAR-FALL SEMESTER		
SURE 215	Surveying Computations (**SURE 110**) CONM 121 Mat'ls Properties & Testing (**MATH 116 or 120**)	3 _____
CENG 240	Engineering Statics (**MATH 230, Co- Req PHYS 241**)	**3** _____
PHYS 241	General Physics 1 (**MATH 220 C- or better**)	5 _____
CHEM 121	General Chemistry (**CHEM 103, MATH 115**)	5 _____
		(16)

SECOND YEAR- SPRING SEMESTER)		
SURE 230	Advanced Surveying (**SURE 110, SURE 115**) OR CENG 220 Engineering Surveying (**SURE 110**)	4 _____
SURE 272	Programming Applications in Geomatics (**SURE 215, MATH 130**)	2 _____
MATH 322	Linear Algebra (MATH 220)	3 _____
PHYS 242	General Physics 2 (**PHYS 241, MATH 230 C- or better**)	5 _____
SURE 331/HUMN 331	Ethics & Professionalism in Engineering & Tech. (**ENGL 150**)	3 _____
		(17)

** Or Co-requisite PHYS 241

Existing check sheet

FERRIS STATE UNIVERSITY
Imagine More

Bachelor of Science Degree

Surveying Engineering

Course Sequence Guide

Student:			
Email:		ID:	
Advisor:		Ph:	

YEAR 1 - FALL SEMESTER			Crs	Gr
SURE	110	Fundamentals of Surveying (MATH 120 co-req.)	4	
SURE	115	Intro to Computer Mapping	1	
ENGL	150	English 1	3	
MATH	220	Analytical Geometry & Calculus 1 (MATH 130 or 126)	5	
		Cultural Enrichment Elective	3	
FSUS	100	FSU Seminar	1	
		Total	17	

YEAR 1 - SPRING SEMESTER			Crs	Gr
CENG	220	Engineering Surveying * (SURE 110)	4	
CONM	121	Materials Properties & Testing ** (MATH 116)	3	
ENGL	250	English 2 (ENGL150)	3	
MATH	230	Analytical Geometry & Calculus 2 (MATH 220)	5	
		Total	15	

YEAR 2 - FALL SEMESTER			Crs	Gr
CONM	221	Statics and Structures (C- in MATH 116, PHYS 241)	3	
SURE	215	Surveying Computations ** (SURE 110)	3	
CHEM	121	General Chemistry 1 (CHEM 103, MATH 115)	5	
PHYS	241	General Physics 1 (C- in MATH 220)	5	
		Total	16	

YEAR 2 - SPRING SEMESTER			Crs	Gr
SURE	230	Advanced Surveying * (SURE 110, 115)	4	
SURE	272	Programming Appl. In Geomatics (SURE 215, MATH 130)	2	
MATH	322	Linear Algebra (MATH 220)	3	
PHYS	242	General Physics 2 (C- in MATH 230, PHYS 241)	5	
SURE	331	Ethics/Profess. In Engineering & Technology	3	
		Total	17	

YEAR 3 - FALL SEMESTER			Crs	Gr
GISC	239	Remote Sensing (MATH 120 co-req.)	3	
SURE	365	Legal Aspects of Surveying 1 *** (SURE 215, ENGL 250)	3	
SURE	372	Adjustment Computations 1 (SURE 230,272; MATH 230,322)	3	
COMM	121	Fundamentals of Public Speaking	3	
GEOL	131	Geology and Land-Use Mgmt. (CHEM 103, MATH 115)	3	
		Social Awareness Elective	3	
		Total	18	

YEAR 3 - SPRING SEMESTER			Crs	Gr
GISC	225	Principles of GIS	3	
SURE	340	Photogrammetry (SURE 110)	3	
SURE	373	Adjustment Computations 2 (SURE 372)	3	
SURE	420	Prof. Practice of Surveying *** (SURE 365, ENGL 250)	3	
SURE	452	Geodesy 1 (SURE 230, 272)	4	
		Total	16	

Submit Application for Graduation.

YEAR 4 - FALL SEMESTER			Crs	Gr
GISC	425	Tech. Issues in GIS & Cartography (SURE 272, GISC 225)	3	
SURE	366	Evid. & Procedure for Boundary Locations (SURE 365)	3	
SURE	440	Advanced Photogrammetry (SURE 340, 373)	3	
SURE	453	Geodesy 2 (SURE 373, 452)	4	
		Cultural Enrichment Elective	3	
		Total	16	

YEAR 4 - SPRING SEMESTER			Crs	Gr
CENG	321	Hydraulics Engineering (PHYS 242, MATH 230)	4	
CENG	421	Soils Engineering (CONM 121, MATH 230)	4	
CENG	485	Sustainable Land Use (Senior Status)	4	
SURE	465	Lgl. Aspts. of Survey. 2 *** (SURE 365, ENGL 250, Sr. Status)	3	
		Social Awareness Elective (200 level or above)	3	
		Total	18	

* CENG 220- Engineering Surveying and SURE 230 - Advanced Surveying may be taken in either semester.
** CONM 121 - Materials Properties and Testing and SURE 215 Surveying Computations may be taken in either semester.
*** Writing Intensive Courses.

Course Prefixes: SURE: Surveying Engineering GISC: Geographic Information Sciences CENG: Civil Engineering

Contact the Surveying Department for more information!
Phone: 231-591-2633
Email:surveying@ferris.edu
www.ferris.edu/surveying

8/17/2008

FERRIS STATE UNIVERSITY

Imagine More

Bachelor of Science Degree

Surveying Engineering

Program Academic Requirements

Student:				Transfer Credits:	
Email:		ID:		GPA Major:	
Advisor:		Ph		GPA Degree:	

MAJOR			Cr	Gr	TR
CENG	220	Engineering Surveying * (SURE 110)	4		
CENG	321	Hydraulics Engineering (PHYS 242, MATH 230)	4		
CENG	421	Soils Engineering (CONM 121, MATH 230)	4		
CENG	485	Sustainable Land Use (Senior Status)	4		
CONM	121	Materials Properties & Testing ** (MATH 116)	3		
CONM	221	Statics and Structures (C- in MATH 116, PHYS 241)	3		
GISC	225	Principles of GIS	3		
GISC	239	Remote Sensing (MATH 120 co-req.)	3		
GISC	425	Tech. Issues in GIS & Cartography (SURE 272, GISC 225)	3		
SURE	110	Fundamentals of Surveying (MATH 120 co-req.)	4		
SURE	115	Intro. to Computer Mapping	1		
SURE	215	Surveying Computations ** (SURE 110)	3		
SURE	230	Advanced Surveying * (SURE 110, 115)	4		
SURE	272	Programming Appl. In Geomatics (SURE 215, MATH 130)	2		
SURE	340	Photogrammetry (SURE 110)	3		
SURE	365	Legal Aspects of Surveying 1 *** (SURE 215, ENGL 250)	3		
SURE	366	Evid. & Procedure for Boundary Locations (SURE 365)	3		
SURE	372	Adjustment Computations 1 (SURE 230,272; MATH 230,322)	3		
SURE	373	Adjustment Computations 2 (SURE 372)	3		
SURE	420	Prof. Practice of Surveying *** (SURE 365, ENGL 250)	3		
SURE	440	Advanced Photogrammetry (SURE 340, 373)	3		
SURE	452	Geodesy 1 (SURE 230, 272)	4		
SURE	453	Geodesy 2 (SURE 373, 452)	4		
SURE	465	Lgl. Aspts. of Survey. 2 *** (SURE 365, ENGL 250, Sr. Status)	3		

COMMUNICATIONS COMPETENCE			Cr	Gr	TR
ENGL	150	English 1	3		
ENGL	250	English 2 (ENGL150)	3		
COMM	121	Fundamentals of Public Speaking	3		
QUANTITATIVE SKILLS					
MATH	220	Analytical Geometry & Calculus 1 (MATH 130 or 126)	5		
MATH	230	Analytical Geometry & Calculus 2 (MATH 220)	5		
MATH	322	Linear Algebra (MATH 220)	3		
SCIENTIFIC UNDERSTANDING					
CHEM	121	General Chemistry 1 (CHEM 103, MATH 115)	5		
GEOL	131	Geology and Land-Use Mgmt. (CHEM 103, MATH 115)	3		
PHYS	241	General Physics 1 (C- in MATH 220)	5		
PHYS	242	General Physics 2 (C- in MATH 230, PHYS 241)	5		
CULTURAL ENRICHMENT					
		Cultural Enrichment Elective	3		
		Cultural Enrichment Elective	3		
SURE	331	Ethics/Profess. In Engineering & Technology	3		
SOCIAL AWARENESS			Cr		
		Social Awareness Elective	3		
		Social Awareness Elective (200 level or above)	3		
FRESHMEN SEMINAR			Cr		
FSUS	100	FSU Seminar	1		

General Education Requirements: One course (3cr): Global Consciousness, One Course (3cr): Race - Ethnicity - Gender(REG), One Course(3cr): Foundation. Multiple Requirements may be satisfied by a single course. Cultural Enrichment – 9 credits (3 credits in course > 200 level); Social Awareness - 6 credits (3 credits in course > 200 level) Reference: http://www.ferris.edu/htmls/academics/gened/gen_edspecific.html

40 credits at or above the 300 level are required in the BS program.

Contact the Surveying Department for more information!
Phone: 231-591-2633
Email:surveying@ferris.edu
www.ferris.edu/surveying

8/17/2008

CREATE NEW COURSE
Course Data Entry Form

FORM F

Create New Course
Rev. 07/23/07

I. ACTION TO BE TAKEN: CREATE A NEW COURSE

Notes
1. Complete each item in Section I and Section II.
2. If this course is to be used as a prerequisite for other university courses, Form Fs that reflect the prerequisite change must be submitted for those courses as well.

Term Effective (6 digit code only): 200908 **Examples: 200801(Spring), 200805(Summer), 200808(Fall)**
Note: The first four digits indicate year, the next two digits indicate month in which term begins.

II. PROPOSED FOR NEW COURSE: Complete all sections a through r, See manual for clarification.

a. Course Prefix: CENG
b. Number: 240
c. Enter Contact Hours per week in boxes.
LECture 3 LAB 0 INDependent Study – Check (x) ☐
Practicum: ____ Seminar: ____

d. Course Title: **Engineering Statics** (Limit to 30 characters/spaces.)
e. College Code: TE **f.** Department Code: SURE
Credit Hours: Check (x) type and enter maximum and minimum hours in boxes.

g. Type: ☐ Variable ☒ Fixed **h.** Minimum Credit Hours 3 **i.** Maximum Credit Hours 3

j. May Be Repeated for Added Credit: Check (x) ☐ Yes ☒ No

k. Levels: Check (x) ☒ Undergraduate ☐ Graduate ☐ Professional

l. Grade Method: Check (x) ☒ Normal Grading ☐ Credit/No Credit only (Pass/Fail)

m. Does proposed new course replace an equivalent course? Check (x) ☒ Yes ☐ No

n. Equivalent course: Prefix CONM Number 221 See instructions on Replacement courses.

o. CATALOG DESCRIPTION – Limit to 75 words – PLEASE BE CONCISE.

> This first course in mechanics for engineers focuses on rigid bodies and, more specifically, statics. Statics is the study of rigid bodies at rest. Using vector mechanics as appropriate, the principles of mechanics and their application to the solution of engineering problems are explored.

p. Term(s) Offered: F (See instructions for listing.) **q.** Max. Section Enrollment: 30

r. Prerequisites/Co-requisites/Restrictions: (If none, leave blank.) Limited to 100 spaces. MATH 230, Co-Req. PHYS 241.

UCC Chair Signature/Date: 3/31/09

Academic Affairs Approval Signature/Date: 4/2/09

To be completed by Academic Affairs Office: - Standard & Measures Coding and General Education Code
☐ Basic Skill (BS) ☐ General Education (GE) ☐ Occupational Education (OC) ____ G.E. Codes

Office of the Registrar use ONLY

Date Rec'd: ____ **Date Completed:** ____ **Entered: SCACRSE** __ **SCADETL** __**SCARRES** __ **SCAPREQ** __

FORM E
Rev. 4/02/09

NEW COURSE INFORMATION FORM

See Sample – Limit to Two Pages Please

Course Identification:

Prefix:	Number	Title
CENG	240	Engineering Statics

Course Description:

This first course in mechanics for engineers focuses on rigid bodies and, more specifically, statics. Statics is the study of rigid bodies at rest. Using vector mechanics as appropriate, the principles of mechanics and their application to the solution of engineering problems are explored.

Course Outcomes and Assessment Plan:

1.	Demonstrate equilibrium as it relates to rigid body statics.
2.	Correctly draw Free-Body Diagrams to express the equivalence of force systems and for the analysis of static equilibrium.
3.	Demonstrate an expanded knowledge and use of basic units of measure in U.S. Customary and the international system (S.I.).
4.	Determine the values of section profile properties.
5.	Calculate the value of a variety of forces within structural members.
6.	Calculate forces of friction.
7.	Demonstrate knowledge for Fundamentals of Engineering Licensing Exam.

Course Outline including Time Allocation:

Instructional Unit Topic Descriptions and Approximate Time Allocations

No.	Unit Topic Description Summary	Approximate Lecture Hours
I.	Introduction to and Preparation for Mechanics	2
II.	Statics of Particles	4
III.	Rigid Bodies: Equivalent System of Forces	4
IV.	Equilibrium of Rigid Bodies	4
V.	Centroids and Centers of Gravity	4
VI.	Analysis of Structures	6
VII.	Forces in Beams and Cables	5
VIII.	Friction	4
IX.	Moments of Inertia	6
X.	Fundamentals of Engineering Review	3
XI.	Assessments (Three In-Class Exams)	3
	Approximate Total Hours:	45

Department of Construction Technology & Management
Ferris State University
College of Engineering Technology

Course Outline

Instructional Unit Topic Descriptions and Approximate Time Allocations

No.	Unit Topic Description Summary	Approximate Lecture Hours
I.	Introduction to and Preparation for Mechanics	2
II.	Statics of Particles	4
III.	Rigid Bodies: Equivalent System of Forces	4
IV.	Equilibrium of Rigid Bodies 4	4
V.	Centroids and Centers of Gravity	4
VI.	Analysis of Structures 8	6
VII.	Forces in Beams and Cables 8	5
VIII.	Friction 4	4
IX.	Moments of Inertia	6
X.	Fundamental of Engineering Review	3
XI.	Assessments (Three In-Class Exams)	3
	Approximate Total Hours:	45

Learning Outcomes for Each Instructional Unit

Upon completion of each instructional unit, the leaner will be able to satisfactorily complete the following:

I. Introduction to and Preparation for Mechanics
   - A. Identify the six fundamental principles of elementary mechanics.
   - B. Demonstrate the proper use of units and convert units between U.S. Customary and S.I. systems using dimensional analysis.
   - C. Set up then solve problems using a formal engineering approach.

II. Statics of Particles
   - A. Perform addition and resolution of forces using tip-to-tail construction and rectangular components.
   - B. Demonstrate an understanding of equilibrium of a particle by correctly drawing or identifying the appropriate Free Body Diagram.
   - C. Define forces in space using unit vectors.
   - D. Establish equilibrium of a particle in space by using vector addition.

III. Rigid Bodies: Equivalent System of Forces
   - A. Identify or state the principle of transmissibility.
   - B. Calculate the vector product of two vectors.
   - C. Calculate the moment of a force about a point by using vector products.
   - D. Calculate the moment of a force using Varignon's Theorem.

Course Outline

E. Calculate the moment of a force about a point by using rectangular components.
F. Calculate the scalar product of two vectors, mixed triple product of three vectors, and use these concepts to calculate the moment of a force about an axis.
G. Manipulate couples through calculation or identification of equivalent systems.
H. Perform addition of couples and resolution of a force into an equivalent force and a couple.
I. Calculate an equivalent system of forces to reduce the system to one force and one couple.

IV. Equilibrium of Rigid Bodies
A. Identify the appropriate equations of equilibrium.
B. Identify the reaction forces represented by their symbols used in a free-body diagram..
C. Demonstrate equilibrium of a rigid body by correctly drawing or identifying the appropriate Free Body Diagram.
D. Solve for the unknown forces acting on a statically determinate two-dimensional rigid body using the appropriate equations of equilibrium.
E. Recognize configurations containing indeterminate reactions and partial constraint (instability of supports).
D. Calculate unknown forces acting upon a two-force body using an appropriate free-body diagram.
F. Calculate unknown forces acting upon a three-force body using an appropriate free-body diagram.
G. Calculate unknown forces acting upon a three-dimensional body using an appropriate free-body diagram.

V. Centroids and Centers of Gravity
A. Calculate the center of gravity by integration.
B. Calculate the centroid by integration.
C. Calculate the centroid of composite shapes by integration.
D. Calculate the magnitude and location of an equivalent concentrated load acting on a beam by integration.
E. Calculate the magnitude and location of an equivalent concentrated load acting on a submerged surface.
F. Calculate the centroid and center of gravity of a three-dimensional body by integration.

VI. Analysis of Structures
A. Distinguish statically determinate trusses from statically indeterminate trusses.
B. Calculate the internal forces in a loaded truss by method of joints.
C. Recognize special loading conditions of truss joints that lead to zero force members.
D. Calculate the internal forces in a loaded truss by method of sections.
E. Calculate reaction and joint forces in multi-force members such as frames and simple machines.

VII. Forces in Beams and Cables
A. Recognize the internal forces in two- and three-force members.

Course Outline

B. Identify internal forces in two- and three-force members by correctly drawing or selecting the appropriate free-body diagram.
C. Calculate the necessary values then draw the shear and moment diagrams by using successive free-body diagrams.
D. Demonstrate relationships among load, shear, and moment using integration to calculate the values for and draw the shear and moment diagrams.
E. Analyze flexible cables determining internal forces, position, and angles of those having concentrated loads and uniform loads; and parabolic or catenary shapes.

VIII. Friction
A. Solve problems of dry friction.
B. Solve problems of wedges and screws.
C. Solve problems of belt friction.

IX. Moments of Inertia
A. Calculate the second moment of area (Moment of Inertia) of any shape about a centroidal axis by integration.
B. Calculate the second moment of area (Moment of Inertia) of any shape about a parallel axis by integration (i.e., Parallel-Axis Theorem).
C. Calculate the Polar Moment of Inertia of any shape by integration.
Calculate the Radius of Gyration.
D. Calculate the second moment of area (Moment of Inertia) of composite areas.
E. Calculate the Product of Inertia by integration.
F. Calculate the location and angle of the Principal Axes and the values of the Principal Moments of Inertia.
G. Construct Mohr's Circle and demonstrate its use.

X. Fundamental of Engineering Review
A. Demonstrate readiness for the Statics portion of the Fundamentals of Engineering Licensing Exam by solving several representative problems.

XI. Assessments

XII. Holidays (per University schedule)

XII. Final Exam (during scheduled University exam week)