# APPENDIX A

# CURRICULUM IN MECHANICAL ENGINEERING
## (Catalog #133, 2010-2011)

Name:_____ Date:_____ UIN:_____

| Course | Credit | | Prerequisite |
|---|---|---|---|
| __ENGR 111[1] | (1-3) | 2 | Admission to COE; Co-requisite MATH 151 |
| __ENGL 104[1] | (3-0) | 3 | |
| __MATH 151[1] | (3-2) | 4 | High School Algebra I&II, Trigonometry & Geometry MATH 150 or satisfactory performance on a qualifying exam. |
| __PHYS 218[1] | (3-3) | 4 | MATH 151 or reg. therein |
| __ Univ. Core Curriculum Elect.[2] | | 3 | |
| __KINE 198 | (0-2) | 1 | |
| | | **(17)** | |
| __MATH 251[1] | (3-0) | 3 | MATH 152 or equivalent |
| __MEEN 221[1] | (2-2) | 3 | Admission to upper division (MEEN); MATH 251 or 253 or reg. therein; PHYS 218 |
| __MEEN 222[1] | (3-0) | 3 | CHEM 107 & PHYS 218 |
| __ Univ. Core Curriculum elect[2] | | 3 | |
| __ Univ. Core Curriculum elect.[2] | | 3 | |
| | | **(15)** | |
| __ENGL 301[4] | (3-0) | 3 | ENGL 104 |
| __MEEN 357[1] | (3-0) | 3 | ENGR 112, MATH 308 |
| __MEEN 363[1] | (2-2) | 3 | MEEN 221; MATH 308; MEEN 357 or CVEN 302, registration therein; CVEN 305 or registration therein. |
| __MEEN 360[1] | (3-3) | 4 | MEEN 222 & 260; CVEN 305 |
| __MEEN 344[1] | (3-0) | 3 | MEEN 221 and 315 |
| __MEEN 345 | (0-3) | 1 | MEEN 260; MEEN 344 or reg. therein |
| | | **(17)** | |
| __MEEN 401[1] | (2-3) | 3 | MEEN 360, 364, 368, 461 |
| __MEEN 404 | (2-3) | 3 | MEEN 260, 360, 364, 461; MEEN 401 or reg. therein; jr. or sr. classification |
| __Stem Course[3] | (3-0) | 3 | |
| __Stem Course[3] | (3-0) | 3 | |
| __ENGR 482 | (2-2) | 3 | Junior classification |
| | | **(15)** | |

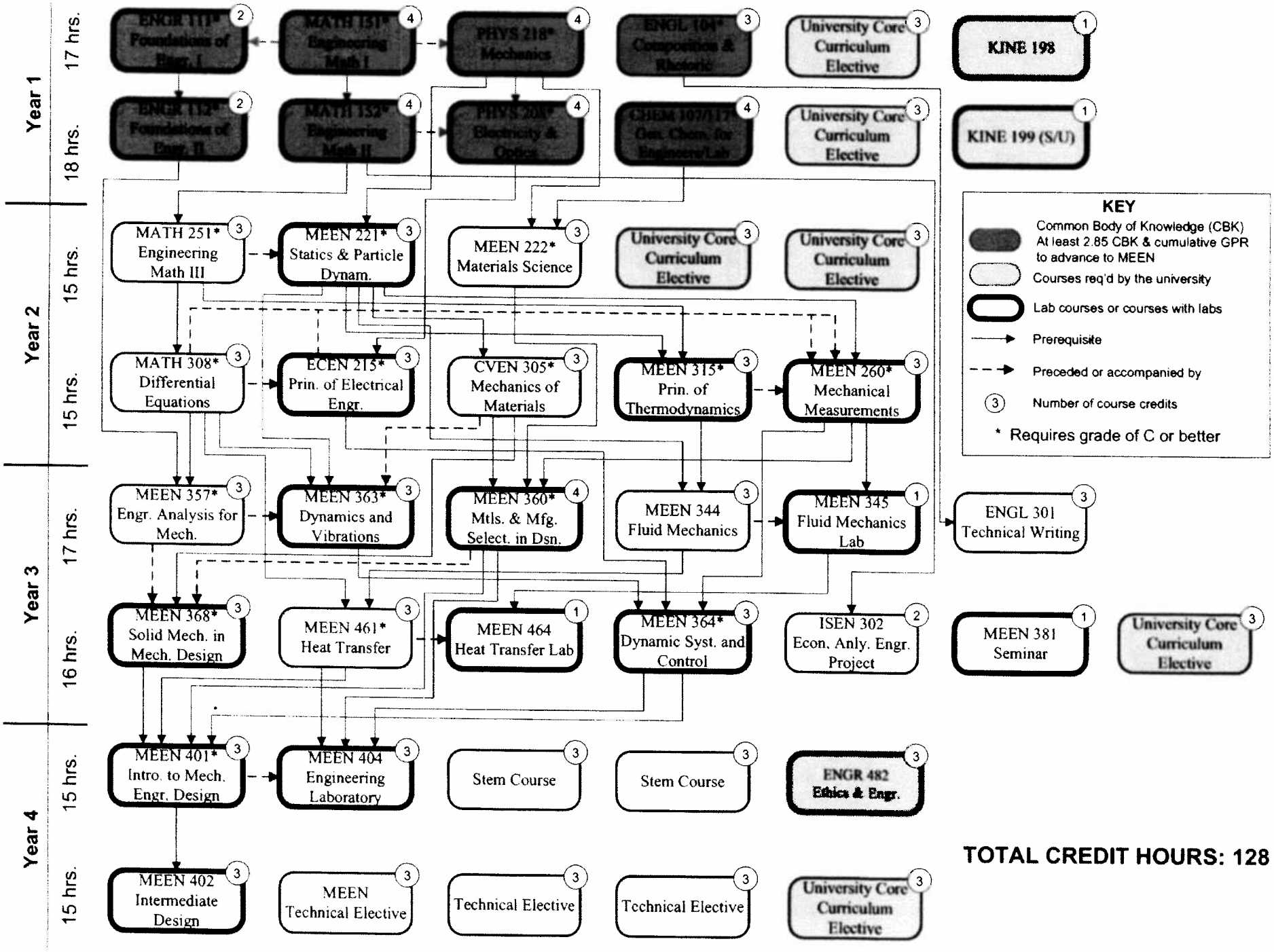
| Course | Credit | | Prerequisite |
|---|---|---|---|
| __ENGR 112[1] | (1-3) | 2 | ENGR 111; MATH 151 |
| __MATH 152[1] | (3-2) | 4 | MATH 151 or equivalent |
| __PHYS 208[1] | (3-3) | 4 | PHYS 218; MATH 152 or reg. therein |
| __ Univ. Core Curriculum Elect.[2] | | 3 | |
| __CHEM 107/117[1] | (3-3) | 4 | |
| __KINE 199 (S/U) | (0-2) | 1 | |
| | | **(18)** | |
| __MATH 308[1] | (3-0) | 3 | MATH 251; Knowledge of computer algebra system (Maple) |
| __MEEN 315[1] | (2-2) | 3 | MEEN 221; MATH 251 or 253 |
| __CVEN 305[1] | (3-0) | 3 | MEEN 221 |
| __ECEN 215[1] | (2-2) | 3 | PHYS 208; MATH 308 or registration therein |
| __MEEN 260[1] | (2-3) | 3 | MEEN 221; MEEN 315, ECEN 215 & MATH 308 or reg. therein |
| | | **(15)** | |
| __MEEN 368[1] | (2-2) | 3 | CVEN 305; MEEN 357, 360 or reg. therein |
| __MEEN 461[1] | (3-0) | 3 | MATH 308; MEEN 344 |
| __MEEN 464 | (0-3) | 1 | MEEN 345; MEEN 461 or reg. therein |
| __MEEN 364[1] | (2-3) | 3 | ECEN 215; MEEN 260, 363 |
| __MEEN 381 | (0-2) | 1 | Upper –level classification in Mechanical Engineering |
| __ISEN 302 | (2-0) | 2 | MATH 152 |
| __ Univ. Core Curriculum Elect.[2] | | 3 | |
| | | **(16)** | |
| __ MEEN 402 | (2-3) | 3 | MEEN 401; jr. or sr. classification |
| __ Univ. Core Curriculum Elect.[2] | | 3 | |
| __Tech. Elective[3] | | 3 | |
| __Tech. Elective[3] | | 3 | |
| __Tech. Elective[3] | | 3 | |
| | | **(15)** | |

**Total Hours 128**

1. Requires a grade of "C" or better.
2. To be selected from the University Core Curriculum. Of the 18 hours shown as University Core Curriculum electives, 3 must be from visual and performing arts, 3 from social and behavioral sciences, 6 from U.S. history, and 6 from POLS 206 and POLS 207, and 6 from international and cultural diversity. The international and cultural diversity requirement may be met by courses satisfying the visual and performing arts, social and behavioral sciences, and the political science and history requirements if they are also on the approved list of international and cultural diversity courses.
3. Stem courses & Technical Electives: See the MEEN Academic Advising Office for list of approved course.
4. Students may take ENGL 301 or choose from the following list: COMM 205; ENGL 203, 235, 241.

*Updated 05/27/10*

# TEXAS A&M UNIVERSITY MECHANICAL ENGINEERING 2010-2011 – Cat. #133




**TOTAL CREDIT HOURS: 128**

# CURRICULUM IN AEROSPACE ENGINEERING

TEXAS A&M

(Fall 2010)

## FRESHMAN

| Course | CR | Prerequisite |
|---|---|---|
| __ MATH 151 (3-2)[CBK, 1] | 4 | MATH 150 |
| __ ENGR 111 (1-3)[CBK, 1] | 2 | MATH 151[R] |
| __ PHYS 218 (3-3)[CBK, 1] | 4 | MATH 151[R] |
| __ ENGL 104 (3-0)[CBK, 1] | 3 | |
| __ UCC Elective[2] | 3 | see University catalog |
| __ KINE 198 (0-2) | 1 | |
| | (17) | |

| Course | CR | Prerequisite |
|---|---|---|
| __ MATH 152 (3-2)[CBK, 1] | 4 | MATH 151 |
| __ ENGR 112 (1-3)[CBK, 1] | 2 | ENGR 111, MATH 151 |
| __ PHYS 208 (3-3)[CBK, 1] | 4 | PHYS 218, MATH 152[R] |
| __ CHEM 107 (3-0)[CBK, 1] | 3 | |
| __ CHEM 117(0-3)[CBK, 1] | 1 | |
| __ UCC Elective[2] | 3 | see University catalog |
| __ KINE 199 (0-2) | 1 | S/U only |
| | (18) | |

## SOPHOMORE

| Course | CR | Prerequisite |
|---|---|---|
| __ MATH 251 (3-0)[1] | 3 | MATH 152 |
| __ AERO 201 (3-0)[1] | 3 | Promotion to AERO, MATH 251[R], AERO 209[R] |
| __ AERO 209 (2-1)[1] | 2 | Promotion to AERO, MATH 251[R] |
| __ AERO 213 (2-2)[1] | 3 | Promotion to AERO, MATH 251[R], AERO 209[R] |
| __ AERO 220 (2-1)[1] | 2 | Promotion to AERO, AERO 209[R] |
| __ UCC Electives[2] | 3 | see University catalog |
| | (16) | |

| Course | CR | Prerequisite |
|---|---|---|
| __ MATH 308 (3-0)[1] | 3 | MATH 251 |
| __ AERO 320 (2-3)[1] | 3 | AERO 220, MATH 308[R] |
| __ AERO 212 (2-2)[1] | 3 | Promotion to AERO, MATH 308[R] |
| __ AERO 214 (2-2)[1] | 3 | AERO 209, 213[R];MATH 308[R] |
| __ AERO 210 (2-1)[1] | 2 | AERO 209,MATH 308[R] |
| __ UCC Elective[2] | 3 | see University catalog |
| | (17) | |

## JUNIOR

| Course | CR | Prerequisite |
|---|---|---|
| __ AERO 301 (3-0)[1] | 3 | AERO 201, AERO 320[R], MATH 308 |
| __ AERO 302 (1-3)[1, W] | 2 | AERO 301[R] |
| __ AERO 304 (3-0)[1] | 3 | AERO 320[R], MATH 308, AERO 213, 214 |
| __ AERO 310 (3-0)[1] | 3 | AERO 320[R], MATH 308, AERO 210, 214 |
| __ ECEN 215 (2-2)[1] | 3 | Promotion to AERO, PHYS 208, MATH 308[R] |
| __ Communications (3-0)[3] | 3 | ENGL 104 |
| | (17) | |

| Course | CR | Prerequisite |
|---|---|---|
| __ AERO 303 (3-0)[1] | 3 | AERO 301, AERO 212 |
| __ AERO 305 (1-3)[1] | 2 | AERO 304, 310, ECEN 215 |
| __ AERO 306 (3-0)[1] | 3 | AERO 304 |
| __ AERO 351 (3-0)[1] | 3 | AERO 303[R] |
| __ AERO 421(3-0)[1] | 3 | AERO 301, 310 |
| __ UCC Elective[2] | 3 | see University catalog |
| | (17) | |

## SENIOR

| Course | CR | Prerequisite |
|---|---|---|
| __ AERO 401 (2-3)[1] | 3 | AERO 302/303/306/351/421 |
| __ AERO 423 (3-0) | 3 | AERO 421 |
| __ Computational Methods/Mathematics[5] | 3 | see course descriptions |
| __ Design Elective[6] | 3 | see course descriptions |
| __ Technical Elective[7] | 3 | see course descriptions |
| | (15) | |

| Course | CR | Prerequisite |
|---|---|---|
| __ AERO 402 (0-6) | 2 | AERO 305, 401 |
| __ AERO 452 (3-0) | 3 | AERO 351, MATH 308 |
| __ ENGR/PHIL 482(2-2)[W] | 3 | U3 classification |
| __ Technical Elective[7] | 3 | see course descriptions |
| __ Sci or Tech Elec (3-0)[4] | 3 | see course descriptions |
| __ UCC Elective[2] | 3 | see University catalog |
| | (17) | |

## TOTAL CREDIT HOURS 134

Notes:

CBK To be admitted to upper division, a 2.85 GPR is required in both the common body of knowledge (CBK) courses and all TAMU courses.

R Or registration therein (co-requisite).

W Designated as TAMU Writing Intensive Course required by UCC committee.

1 Requires a grade of "C" or better (includes all courses that are used as prerequisites for the AERO degree plan courses).

2 To be selected from the University Core Curriculum (UCC). Of the 18 hours shown as UCC electives, 3 must be from visual and performing arts (VPA), 3 from social and behavioral sciences (SBS), 6 from U.S. history, 6 from POLS 206 and 207, and 6 from international and cultural diversity (ICD). The ICD requirement may be met by courses satisfying the VPA, SBS, and history requirements if they are also on the list of ICD courses.

3 To be selected from ENGL 210, ENGL 301, or COMM 205.

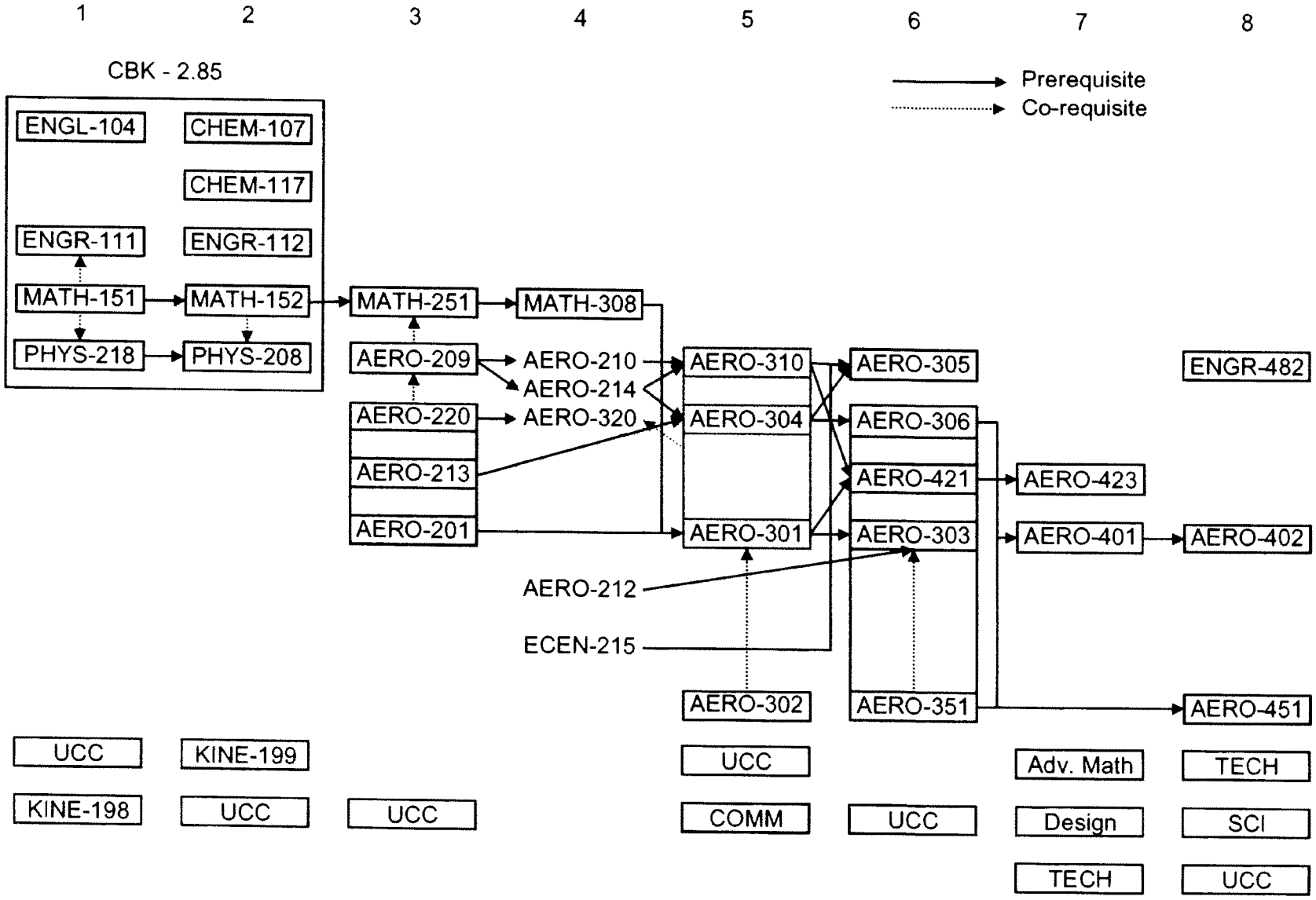
4 To be selected from PHYS 222, PHYS 309, ASTR 314 , or Approved AERO Technical Elective.

5 To be selected from AERO 430 or MATH 401.

6 AERO 405, 417, 426, 428, 472, or 489 if designated as an AERO design elective.

7 Approved technical electives include: AERO 404, 405, 406, 417, 419, 420, 422, 424, 425, 426, 428, 430, 435, 440, 445, 472, 485H, 491H (maximum of 3 hours, senior classification), 489; MEMA 467, ECEN 421; ENGR 385 (3 hours). Courses cannot double count for Design Elective, Technical Elective, or Computational Methods/Mathematics.

# Aerospace Engineering Course Flowchart - 2010-2011 - Catalog 133



**Civil Engineering Degree Plan**
Catalog 133, Academic Year 2010-2011

Name: _____ UIN: _____ Option: _____ Date: _____

**Freshman Year**

| | | | | | |
|---|---|---|---|---|---|
| ENGL 104 | Composition & Rhetoric | 3 ___ | CHEM 107 | Chemistry for Engineers | 3 ___ |
| ENGR 111 | Foundations in Engineering I | 2 ___ | CHEM 117 | Chimstry for Engineers Lab | 1 ___ |
| MATH 151 | Calculus I | 4 ___ | ENGR 112 | Foundations in Engineering II | 2 ___ |
| PHYS 218 | Mechanics and Heat | 4 ___ | MATH 152 | Calculus II | 4 ___ |
| _____ | Directed Elective | 3 ___ | PHYS 208 | Electricity & Optics | 4 ___ |
| KINE 198 | Health & Fitness | 1 ___ | _____ | Directed Elective | 3 ___ |
| | | | KINE 199 | Physical Activity | 1 ___ |
| | | 17 | | | 18 |

**Sophomore Year**

| | | | | | |
|---|---|---|---|---|---|
| CVEN 207 | Introduction to Civil Engineering | 1 ___ | CVEN 302 | Computer Applications in CE | 3 ___ |
| CVEN 221 | Engineering Mechanics: Statics | 3 ___ | CVEN 305 | Mechanics of Materials | 3 ___ |
| MATH 251 | Calculus III | 3 ___ | CVEN 306 | Materials for Civil Engineers | 3 ___ |
| STAT 211 | Principles of Statistics | 3 ___ | MATH 308 | Differential Equations | 3 ___ |
| _____ | Directed Elective | 3 ___ | _____ | Directed Elective | 3 ___ |
| _____ | Writing Skills Elective | 3 ___ | | | |
| | | 16 | | | 15 |

**Junior Year**

| | | | | | |
|---|---|---|---|---|---|
| CVEN 311 | Fluid Mechanics | 3 ___ | MEEN 315 (Thermo) or BAEN 320 (Thermo) | | |
| CVEN 322 | System Design & Optimization | 3 ___ | | or ECEN 215 (Elec Circ) | 3 ___ |
| CVEN 345 | Theory of Structures | 3 ___ | CVEN 303 | Civil Engineering Measurements | 3 ___ |
| CVEN 363 | Engineering Mechanics: Dynamics | 3 ___ | Technical Elective | | 3 ___ |
| _____ | Science Elective | 3 ___ | Technical Elective | | 3 ___ |
| | | | _____ | Directed Elective | 3 ___ |
| | | 15 | | | 15 |

**Senior Year**

| | | | | | |
|---|---|---|---|---|---|
| CVEN 424 | CVEN Professional Practice | 2 ___ | ENGR 482 | Engineering Ethics | 3 ___ |
| _____ | Technical Elective | 3 ___ | _____ | Technical Elective | 3 ___ |
| _____ | Technical Elective | 3 ___ | _____ | Technical Elective | 3 ___ |
| _____ | Technical Elective | 3 ___ | _____ | Technical Elective | 3 ___ |
| _____ | Technical Elective | 3 ___ | _____ | Technical Elective | 3 ___ |
| _____ | Directed Elective | 3 ___ | | | |
| | | 17 | | | 15 |

**Directed Electives:**

| | |
|---|---|
| American History | 6 |
| Political Science 206 (Federal Government) | 3 |
| Political Science 207 (State & Local Government) | 3 |
| Social & Behavioral Science | 3 |
| Visual & Performing Arts | 3 |

**International & Cultural Diversity (ICD), 6 credit hours required**. Like the Foreign Language requirement, this is a graduation requirement, NOT a degree requirement. Some American History, Social & Behavioral Science and Visual & Performing Arts courses are designated as ICD courses and will fulfill both the degree requirement and the graduation requirement concurrently. See an advisor for details.

# COMMON DEGREE PLAN

Name _____

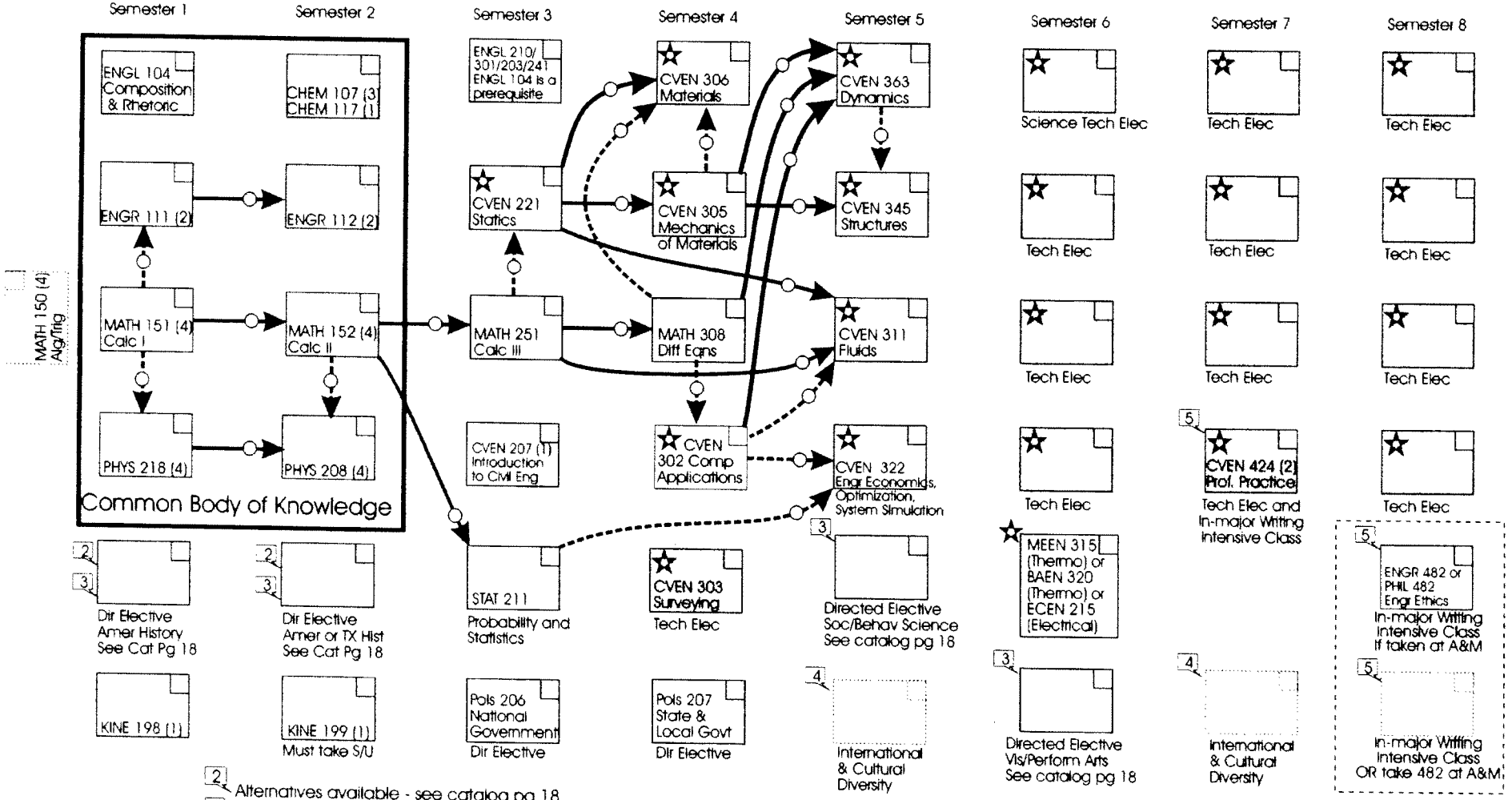
UIN _____

By: _____ Date: _____

# CIVIL ENGINEERING

Catalog 133 - 2010/2011

NOTE: This is NOT an official document. FOR ADVISING ONLY.
All classes listed are 3 hours credit unless otherwise noted by ( )
Shaded boxes are specified by your Technical Elective Plan




2 Alternatives available - see catalog pg 18

3 Careful selection of this course will simultaneously satisfy one of your required International and Cultural Diversity courses listed on pg. 19 of Catalog. Also see 4 http://lowery.tamu.edu/icd for HIST, SBS, and VPA courses which will simultaneously satisfy ICD requirements.

5 Writing intensive courses (2 required). One is satisfied if you take ENGR/PHIL 482 at A&M, one is satisfied by your required CVEN 424.

☆ - Cannot be taken until CBK is complete.
Check ALL course prerequisites CAREFULLY!
—○— ● Fill bubbles if prerequisite is satisfied.
Solid arrows indicate prerequisites, dashed arrows indicate a prerequisite or concurrent registration therein.

Revised 06-10-10

# APPENDIX B

Name: E-mail:
UIN: (if want personalized results)

**Math Instrument – No calculators**

1) Two forces are applied to the bracket shown below. What is the $\vec{j}$ component of $\vec{F_1}$ where $\vec{j}$ is in the positive *y* direction?

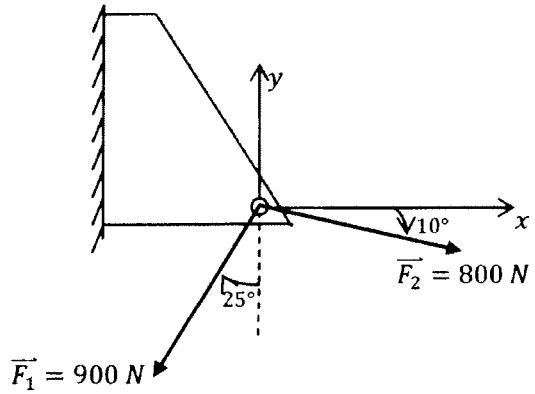
a) $+\,900 \sin 25\,\vec{j}$ N

b) $-\,900 \sin 25\,\vec{j}$ N

c) $+\,900 \cos 25\,\vec{j}$ N

d) $-\,900 \cos 25\,\vec{j}$ N

e) none of the above




2) Find the derivative of the following function with respect to *x*: $\cos(x\,t^2 + 6)$

a) $-t^2 \sin(x\,t^2 + 6)$
b) $t^2 \sin(x\,t^2 + 6)$
c) $\sin(t^2)$
d) $2\,t \sin(x\,t^2 + 6)$
e) $t^2 \sin(x\,t^2 + 6)$

3) A point *P* travels on a path given by $x(t) = -\frac{1}{6}t^3$. The term *x* is in meters, and *t* is in seconds. Find the acceleration.

a) $-\frac{t^5}{120}$ m/s²

b) $-\frac{t^5}{30}$ m/s²

c) $-\frac{t^4}{24}$ m/s²

d) $-\frac{t^2}{2}$ m/s²

e) $-\,t$ m/s²

4) A heavy sign (not to drawn to scale) is supported by the following configuration. What is the $\vec{i}$ component of the force in cable BC where $\vec{i}$ is in the positive *x* direction? Assume the $F_{BC}$ is a known force equal to 500 N, and the force acts along its axis.

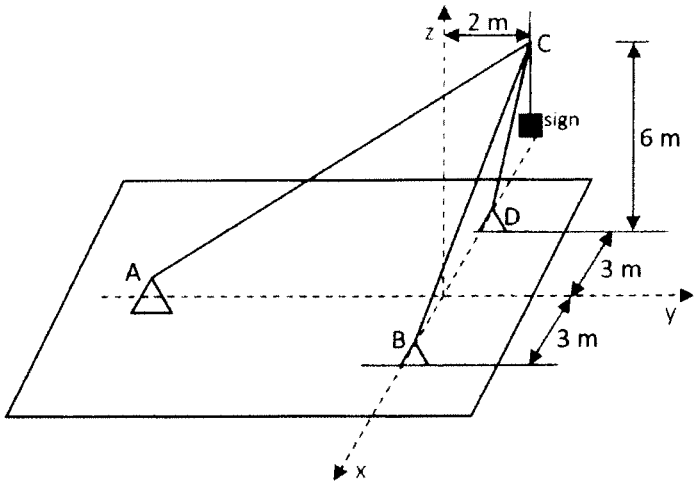
a) $\frac{3}{7}(500)\,\text{N}\,\vec{i}$

b) $-\frac{3}{7}(500)\,\text{N}\,\vec{i}$

c) $\frac{6}{11}(500)\,\text{N}\,\vec{i}$

d) $\frac{3}{11}(500)\,\text{N}\,\vec{i}$

e) $-\frac{3}{11}(500)\,\text{N}\,\vec{i}$




5) An equation is given: $y = ar^3$. At $r = 3, \frac{dr}{dt} = 7$. What is the value of $\frac{dy}{dt}$ at $r = 3$?

a) 343 a
b) 189 a
c) 27 a
d) $\frac{27}{7}$ a
e) not enough information provided to obtain an answer

6) Evaluate the following integral. $\int_0^1 (2t+1)^4\,dt$

a) $\frac{80}{10}$

b) $\frac{121}{5}$

c) $\frac{242}{5}$

d) $\frac{243}{5}$

e) $\frac{243}{10}$

7) Find the area of the following shaded region formed by the two equations given in the figure.

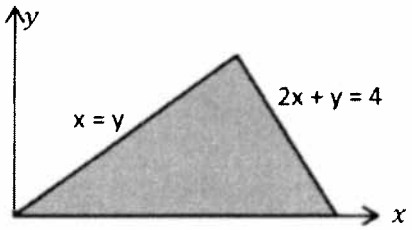
a) $\frac{4}{3}$

b) $\frac{4}{9}$

c) 8

d) 12

e) 20




8) Two equations are given: $-\frac{3}{2}x - 2y = -3$ and $-3x + ay = 5$

Solve for *x* and *y* in terms of *a*. Select the best answer from the options below.

a) $x = 2 - \frac{4}{3}y,\ a = \frac{11}{y} - 4$

b) $x = -\frac{3}{4},\ a = \frac{11}{4y}$

c) $x = 2 - \frac{44}{12a},\ y = \frac{11}{4a}$

d) $x = \frac{6a - 20}{3a + 12},\ y = \frac{11}{4 + a}$

e) problem cannot be solved because there are three unknowns and only two equations

9) Two equations are given: $3x + 5y = 11$ and $-x + \frac{1}{2}y = 5 + 4x$

Solve for the numerical value of *y* that satisfies both equations.

a) $\frac{76}{13}$

b) $\frac{140}{53}$

c) $\frac{80}{47}$

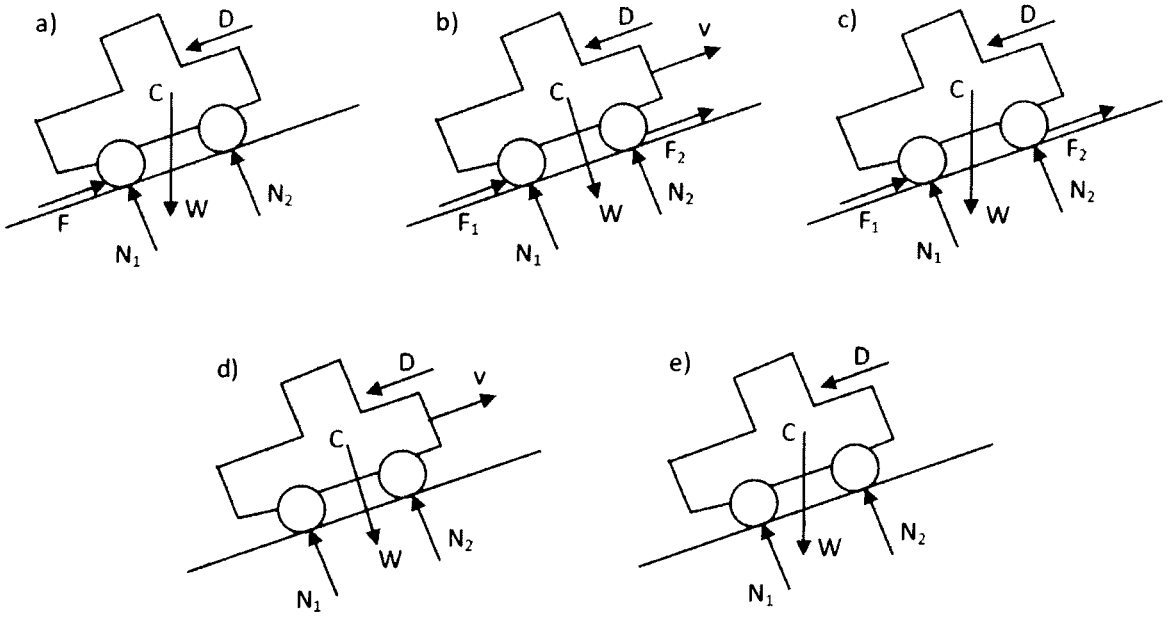
d) $\frac{4}{3}$

e) $\frac{39}{53}$

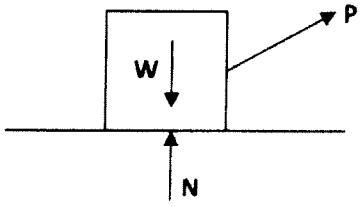
Name: E-mail:
UIN: (if want personalized results)

**Physics Instrument – No calculators**

1) A rear-wheel drive pickup truck drives up an incline with constant speed. The truck weighs 15 kN with center of gravity at point C, and it is subject to drag. Which one of the following correctly depicts the free body diagram for the truck?



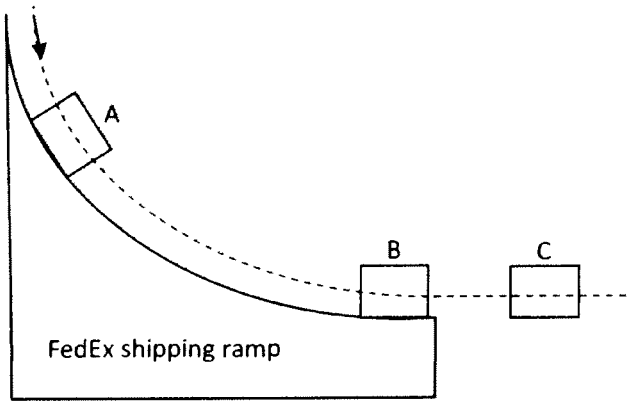

2) A person pulls a block across a rough horizontal surface at a constant speed by applying a force P. The arrows in the diagram correctly indicate the directions, but not necessarily the magnitudes of the various forces on the block. Select the most nearly correct answer from the options below to describe the friction force on the block.



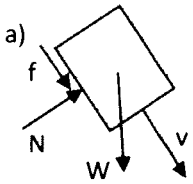

a) The friction force has the same line of action as the applied force P but in the opposite direction (↙) because the direction of force P indicates it will pull the block up an incline.
b) The friction force has the same line of action as the applied force P but in the opposite direction (↙) because every force on a free body diagram should have an equal and opposite force shown.
c) The friction force acts to the left (←) because friction acts in the opposite direction to the externally applied force.
d) The friction force acts to the left (←) because it opposes the direction of motion.
e) There is not a friction force because the block is moving at a constant speed.

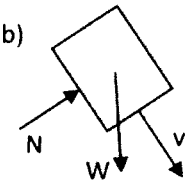
Refer to the diagram on the below when answering the next three questions (#3-#5).

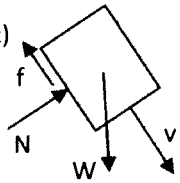
At the FedEx shipping terminal, a box slides down a smooth ramp into a waiting truck.

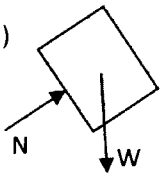


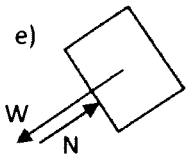

3) The free body diagram of the block, when in position A, is best represented by which of the following?

a) 

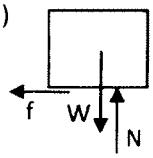

b) 

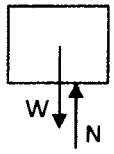

c) 

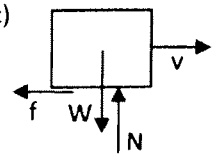

d) 

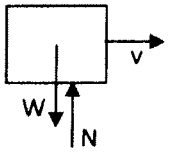

e) 

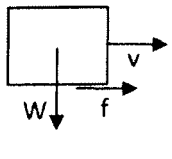

4) The free body diagram of the block, when in position B, is best represented by which of the following?

a) 

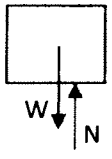

b) 

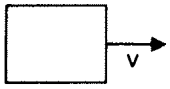

c) 

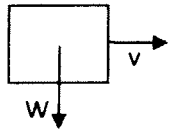

d) 

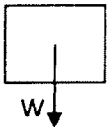

e) 

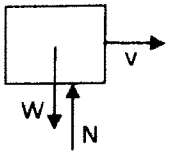

5) The free body diagram of the block, when in position C, is best represented by which of the following?

a) 

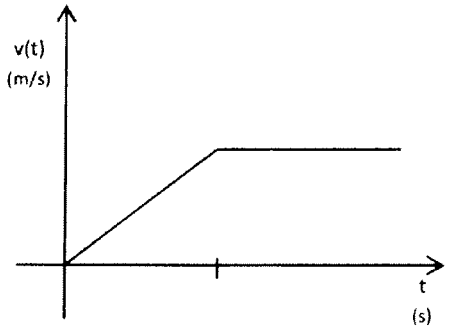

b) 


c) 

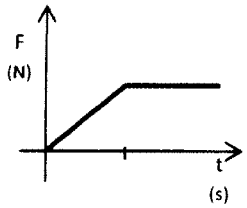

d) 


e) 

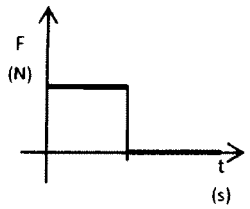
6) A tennis ball moves such that its velocity as a function of time is described by the graph below. Which of the following graphs most accurately represents the ball's net force versus time association?



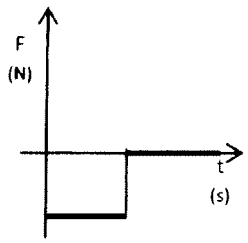

a)



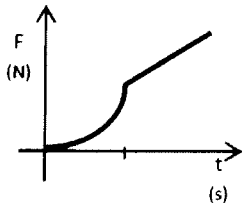

b)



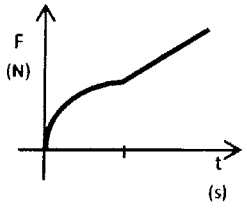

c)




d)

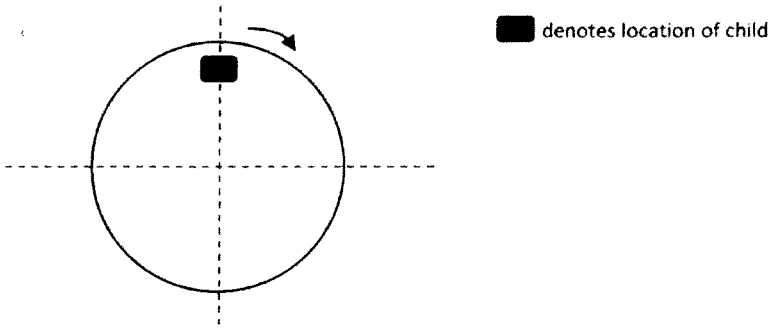



e)



Refer to the diagram on the below when answering the next two questions (#7-#8).

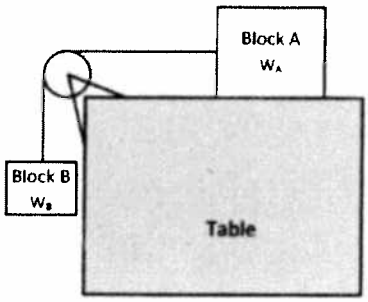
Shown below is a representation of a child viewed from above sitting on a circular merry-go-round turning clockwise at a constant speed.

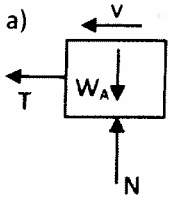


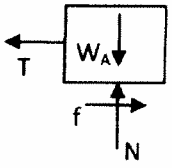

7) Select the most nearly correct answer from the options below.
   a) The direction of the net force acting on the child is to the right (→) because it is in the same direction as the velocity vector.
   b) The direction of the net force acting on the child is upwards (↑) because it is the centrifugal force pointing away from the center of the merry-go-round.
   c) The direction of the net force acting on the child is upwards (↑) because the motion of the merry-go-round is clockwise.
   d) The direction of the net force acting on the child is down (↓) because the motion of the merry-go-round is clock-wise.
   e) The direction of the net force acting on the child is down (↓) because it is pointing to the center of the merry-go-round.

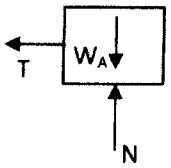
8) Select the most nearly correct answer from the options below.
   a) The direction of the acceleration of the child is to the right (→) because it is in the same direction as the velocity vector.
   b) The direction of the acceleration of the child is to the right (→) because child is accelerating away from the center of the merry-go-round.
   c) The acceleration is zero because the merry-go-round is turning at a constant speed.
   d) The direction of the acceleration of the child is down (↓) because the motion of the merry-go-round is clockwise.
   e) The direction of the acceleration of the child is down (↓) because it is pointing to the center of the merry-go-round.

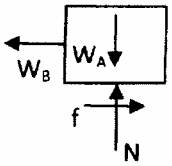
9) A massless, frictionless pulley is attached to a stationary table as shown below. Block A and Block B are connected by an inextensible cable that passes over the pulley. Which one of the following is the most correct free-body diagram for Block A?

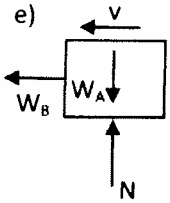



a) 

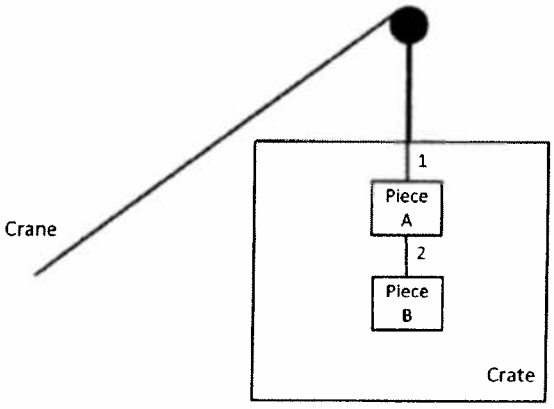

b) 


c) 


d) 


e) 


Refer to the diagram below when answering the next two questions (#10-#11).
A crate containing two ornamental pieces, piece A and piece B, is picked up by an overhead crane. The cables holding the pieces are denoted by numbers **1** and 2. Each ornamental piece weighs 10 kg.



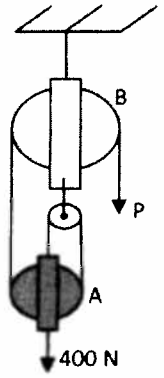

10) When the pieces in the crate are not moving, what is the magnitude of the force exerted on piece A by rope 2?

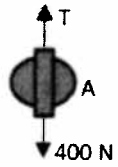
a) 10 N b) 20 N c) 98 N d) 196 N e) 0 N because it is not moving

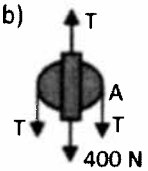
11) If the pieces in the crate are moving upward at a constant speed of 3.0 m/s, how (if any) would the answer above in question #10 differ?

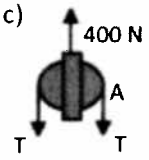
a) The answer would be equal to 3 N.
b) The answer would be multiplied by 3 and then given in N.
c) The answer would be multiplied by $3^2$ and then given in N.
d) The answer would be divided by 3 and then given in N.
e) The answer would not differ.

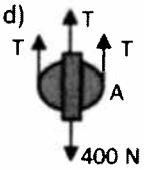
12) A frictionless, massless pulley system is connected to the ceiling with a single, heavy-duty cable. All of the ropes and cables in the system are inextensible. Which one of the following is the most correct free-body diagram for the pulley system A, which is shaded below?

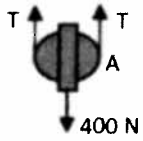



a) 

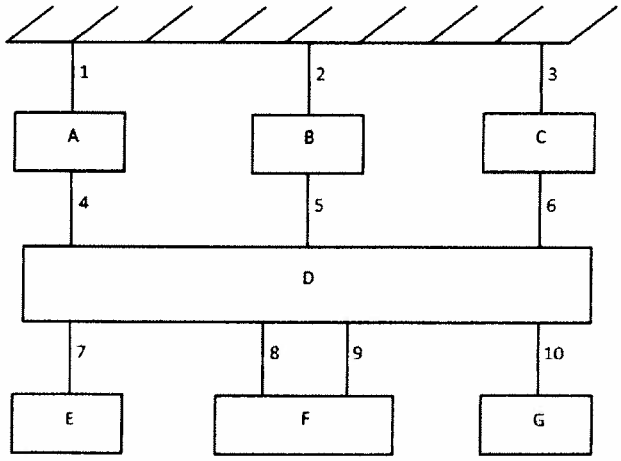

b) 


c) 

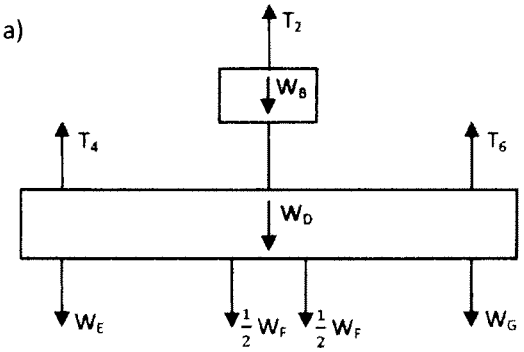

d) 


e) 

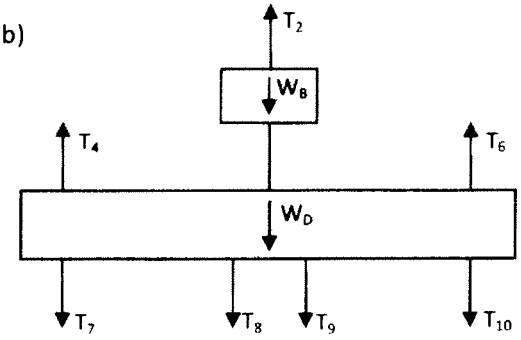

13) Different signs hang together outside a doctor's office. Each sign is denoted by a different letter. Each cable is labeled with a different number. Which is the most correct free-body diagram for the system containing signs B and D and the cable connecting them?



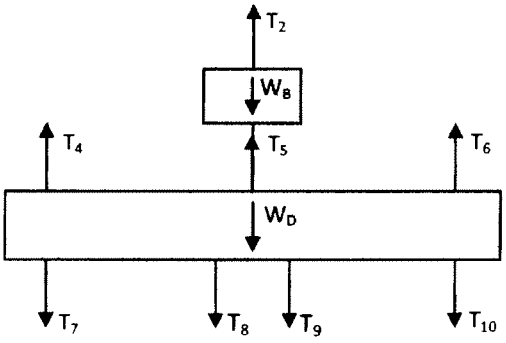
a)


T2
WB
T4
T6
WD
WE
½ WF
½ WF
WG

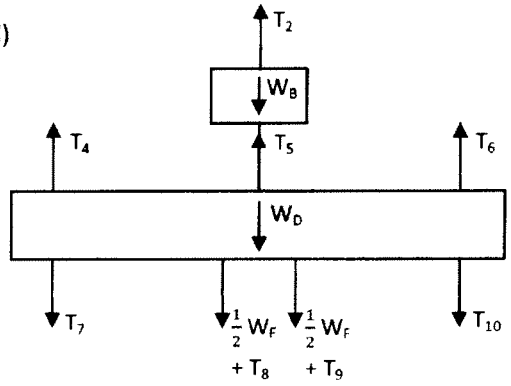
b)


T2
WB
T4
T6
WD
T7
T8
T9
T10

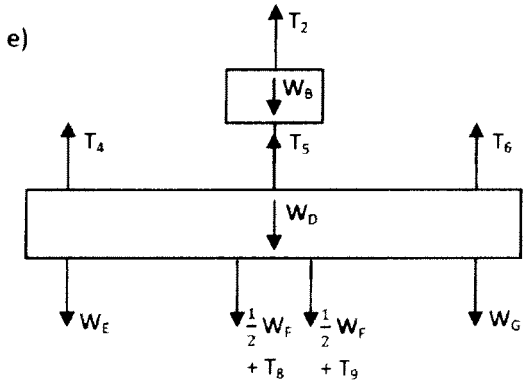
c)


T2
WB
T4
T5
T6
WD
T7
T8
T9
T10

d)


T2
WB
T4
T5
T6
WD
T7
½ WF
+ T8
½ WF
+ T9
T10

e)


T2
WB
T4
T5
T6
WD
WE
½ WF
+ T8
½ WF
+ T9
WG

14) A car with a mass of 2,500 kg is moving at a speed of 72 km/hr. Calculate the braking force necessary to bring the car to a stop in 10 seconds.
   a) 347 N
   b) 1,000 N
   c) 1,250 N
   d) 5,000 N
   e) 18,000 N

The following information refers to the next three questions (#15-#17).

A train of mass $1.0 \times 10^7$ kg is moving at a speed of 72 km/hr. The brakes, which produce a net backward constant force of $2.0 \times 10^6$ N, are applied for 20 seconds. Assume forward motion is in the positive direction.

15) What is the acceleration of the train after the brakes are applied?
   a) $-0.2\ m/s^2$
   b) $-0.25\ m/s^2$
   c) $-4.0\ m/s^2$
   d) $-5.0\ m/s^2$
   e) $-20.0\ m/s^2$

16) What is the new speed of the train after the brakes are applied for 20 seconds?
   a) 15 m/s
   b) 16 m/s
   c) 24 m/s
   d) 25 m/s
   e) 68 m/s

17) How far has the train traveled in this time after the brakes are applied for 20 seconds?
   a) 360 m
   b) 398 m
   c) 440 m
   d) 1,400 m
   e) 1,480 m

## Assessment of the Mathematics Instrument

The intent of this questionnaire is to evaluate how well items in the Mathematics Instrument (attached to this questionnaire) assess each topic below. You are not being asked to actually take the Mathematics Instrument. You are being asked to evaluate the validity of each question.

Directions: Please place a 1, 0, or -1 in each of the blank boxes to the right of each question number. There are # topic areas. Please evaluate each question to see if it measures the given topic area.
1 = the item measures the topic area; 0 = the item is an unclear measure of the topic area; -1 = the item does not measure the topic area.

**Topic Area**

| | Vectors | | Derivatives | | | Integration | | Simultaneous Equations | |
|---|---|---|---|---|---|---|---|---|---|
| # | Geometrical (2-D) | Geometrical (3-D) | Chain Rule (1 var) | Chain Rule (2 var) | 2nd Derivatives | Substitution | Graphical Equations | Two Equations | Two Equation (parameter) |
| Q1 | | | | | | | | | |
| Q2 | | | | | | | | | |
| Q3 | | | | | | | | | |
| Q4 | | | | | | | | | |
| Q5 | | | | | | | | | |
| Q6 | | | | | | | | | |
| Q7 | | | | | | | | | |
| Q8 | | | | | | | | | |
| Q9 | | | | | | | | | |

## Assessment of the Physics Instrument

The intent of this questionnaire is to evaluate how well items in the Physics Instrument (attached to this questionnaire) assess each topic below. You are not being asked to actually take the Physics Instrument. You are being asked to evaluate the validity of each question.

Directions: Please place a 1, 0, or -1 in each of the blank boxes to the right of each question number. There are # topic areas. Please evaluate each question to see if it measures the given topic area.
1 = the item measures the topic area; 0 = the item is an unclear measure of the topic area; -1 = the item does not measure the topic area.

**Topic Area**

| # | Free Body Diagram | | | | Friction | Newton's 2nd Law | | Newton's 3rd Law |
|---|---|---|---|---|---|---|---|---|
| | Forward Motion | Free-fall | Pulley | Stationary | | General | Circular Motion | |
| Q1 | | | | | | | | |
| Q2 | | | | | | | | |
| Q3 | | | | | | | | |
| Q4 | | | | | | | | |
| Q5 | | | | | | | | |
| Q6 | | | | | | | | |
| Q7 | | | | | | | | |
| Q8 | | | | | | | | |
| Q9 | | | | | | | | |
| Q10 | | | | | | | | |
| Q11 | | | | | | | | |
| Q12 | | | | | | | | |
| Q13 | | | | | | | | |
| Q14 | | | | | | | | |
| Q15 | | | | | | | | |
| Q16 | | | | | | | | |
| Q17 | | | | | | | | |

# APPENDIX C

## Q-matrix Used for Alignment of Skills to Homework, Exam, and Quiz Problems

| | Homework, Exam, and Quiz Problems | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Skills | 1-1 | 1-7 | 1-8 | 1-9 | 1-16 | 1-17 | 2-1 | 2-3 | 2-4 | 2-10 | 2-18 | 2-29 | 2-34 | 2-60 | 2-63 | 2-90 | 3-1 | 3-5 |
| **MATH** | | | | | | | | | | | | | | | | | | |
| resolve vectors into components (2-D geometrical) | | | | | | | | | | | | | | | | | | |
| resolve vectors into components (3-D geometrical) | | | | | | | | | | | | | | | | | | |
| magnitude of vector | | | | | | | | | | | | | | | | | | |
| simultaneous equations | | | | | | | | | | | | | | | | | | |
| trig (find angle) | | | | | | | | | | | | | | | | | | |
| cross product | | | | | | | | | | | | | | | | | | |
| projection | | | | | | | | | | | | | | | | | | |
| integration | | | | | | | | | | | | | | | | | | |
| integration (substitution) | | | | | | | | | | | | | | | | | | |
| area of shape (rectangles) | | | | | | | | | | | | | | | | | | |
| area under curve | | | | | | | | | | | | | | | | | | |
| derivative | | | | | | | | | | | | | | | | | | |
| derivative - 2nd deriv w/ one variable | | | | | | | | | | | | | | | | | | |
| derivative - 2nd deriv w/ chain rule (trig) | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| **PHYS** | | | | | | | | | | | | | | | | | | |
| SI units | | | | | | | | | | | | | | | | | | |
| given accel, find weight and mass | | | | | | | | | | | | | | | | | | |
| sum of forces | | | | | | | | | | | | | | | | | | |
| force=ma | | | | | | | | | | | | | | | | | | |
| find moment | | | | | | | | | | | | | | | | | | |
| find area and centroid | | | | | | | | | | | | | | | | | | |
| fbd | | | | | | | | | | | | | | | | | | |
| method of joints / sections | | | | | | | | | | | | | | | | | | |
| pulleys | | | | | | | | | | | | | | | | | | |
| friction | | | | | | | | | | | | | | | | | | |
| given velocity, find accel | | | | | | | | | | | | | | | | | | |
| given velocity, find position | | | | | | | | | | | | | | | | | | |
| given accel and velocity, find position | | | | | | | | | | | | | | | | | | |
| given graph of accel, find graph of velocity and position | | | | | | | | | | | | | | | | | | |
| circular motion | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |

# MATH 151 - Suggested Weekly Schedule

**Note:** This is a fall or spring schedule. In summer, this schedule is accelerated by 50% in order to accommodate a 10-week session.

**Suggested Schedule**

**Week 1**
Appendix D, Section 1.1
Introduction, trigonometry review, two-dimensional vectors

**Week 2**
Sections 1.2–1.3, 2.2
Dot product, parameterized curves, (qualitative) definition of limit
Examples from Section 2.1 on tangent and velocity can be incorporated into Section 2.2 to motivate limits. T concepts of tangents and velocity will be revisited in later sections.

**Week 3**
Sections 2.3, 2.5–2.6
Calculation of limits, limits at infinity, continuity. Note that the epsilon-delta definition (Section 2.4) is skippec

**Week 4**
Sections 2.7, 3.1–3.2
Velocity, differentiation
**Note:** Physics has requested that we cover antidifferentiation formulas along with differentiation formulas

**Week 5**
Sections 3.3–3.4
Rates of Change. Derivatives of the trigonometric functions, and **Exam I** (Thursday, covering thru Section 3

**Week 6**
Sections 3.5–3.7
Chain rule, implicit differentiation, derivatives of vector-valued functions

**Week 7**
Sections 3.8–3.10
Higher derivatives, tangents of parameterized curves. Related rates

**Week 8**
Sections 3.11, 4.1–4.2
Differentials and approximation, exponential and inverse functions. Pay particular attention in Section 3.11 t approximations, such as sin(x) ~ x and sqrt(1+x) ~ 1+x/2 (Section 3.12 on Newton's Method will be done in

**Week 9**
Sections 4.3–4.4
Logarithmic functions, derivatives of logarithms, and **Exam II** (Thursday, covering Sections 3.3–4.2)

**Week 10**
Sections 4.5–4.6, 4.8
Exponential growth and decay, inverse trigonometric functions, L'Hospital's Rule

**Week 11**
Sections 5.1–5.3
Graphical interpretation of the derivative, first and second derivative tests (Section 5.4 on curve sketching w technology will be done in lab)

**Week 12**
Sections 5.5, 5.7, 6.1
Applied max/min, antiderivatives, Riemann sums

**Week 13**
Sections 6.2–6.3
Area and the definite integral. Thanksgiving falls this week.

**Week 14**
Section 6.4
The Fundamental Theorem of Calculus and **Exam III** (Tuesday, covering Sections 4.3–6.3)

**Week 15**
Review for FINAL. Last day of class is Tuesday. Note that the last week of class has redefined day(s). See Dates for details.

# MATH 152 Course Schedule

**Note:** This is a fall or spring schedule. In summer, this schedule is accelerated by 50% in order to accommodate a 10-week session.

**Suggested Schedule**

Week 1
Sections 6.4–6.5, 7.1
Review of the Fundamental Theorem of Calculus, integration by substitution, area
Week 2
Sections 7.1–7.2
Area ctd, volumes by slicing, disks, washers
Week 3
Sections 7.3–7.4
Volume by cylindrical shells, work
Week 4
Sections 7.5, 8.1–8.2
Average value, integration by parts, trigonometric integrals
Week 5
Sections 8.3–8.4
Trigonometric substitution, partial fractions. **Exam 1** (Covers through Section 8.2).
Week 6
Sections 8.9, 9.3–9.4
Improper integrals, arc length, surface area of revolution. (Section 8.8 on Numerical integration will be do
Week 7
Sections 10.1–10.2
Sequences, Series
Week 8
Sections 10.2–10.3
Series, convergence tests
Week 9
Section 10.4
Absolute convergence, convergence tests. **Exam 2** (Covers through Section 10.3).
Week 10
Sections 10.5–10.6
Power series, representing functions as power series
Week 11
Sections 10.7, 10.9
Taylor and Maclaurin series, applications of Taylor series
Week 12
Section 11.1–11.2
3D coordinates, vectors, dot product
Week 13
Section 11.3
Cross product. *Thanksgiving falls on this week in the fall.*
Week 14
Section 13.4
Polar coordinates. **Exam 3** (Covers through Section 11.3).
**Note:** Instructors should be wary of redefined days in week 15 and adjust their coverage of topics accord
Week 15
Review for **Final**. Last week of class has redefined days. See Important Dates for more details.

*Last modified by Manuel on Thu Aug 12, 2010.*

**Class Schedule Fall 2010 Physics 218 Youngblood**

| Week of | Chapters | Topics/Suggested Book Homework |
|---|---|---|
| Aug 30 | 1 (1-10) | Introduction; vectors<br>**1:** 9,10,16,17,18,32,35,40,41,47,50,52,56,72,74,89 |
| Sep 6 | 2 (1-6) | Motion along a straight line<br>**2:** 4,9,11,18,21,36,40,49,50,61,76,80,83,92 |
| Sep 14 | 3 (1-5) | Motion in two or three dimensions<br>**3:** 9,10,18,32,33,38,40,47,52,54,64,81 |
| Sep 20 | 4 (1-6) | Newton's laws of motion<br>**4:** 12,14,22,24,31,35,37,44 |
| **Sep 23** | **Exam 1 (Chap. 1-3)** | **Lecture Room** |
| Sep 27 | 5 (1-4) | Further application of Newton's laws<br>**5:** 3,8,13,15,30,31,44,49,56,62,84,89,90,111,113,114,115 |
| Oct 4 | 6 (1-4), 7 (1,2) | Work, kinetic energy, and potential energy<br>**6:** 3,18,24,27,34,39,40,48,61,62,69,70,76,81,82<br>**7:** 9,14,16,18 |
| Oct 11 | 7 (3-5), 8 (1,2) | Force and energy; Momentum<br>**7:** 29,38,42,46,54,56,62,66,67,69,74<br>**8:** 4,8,16,27 |
| Oct 18 | 8 (3-5) | Momentum and collisions<br>**8:** 34,36,40,43,46,47,61,70,94 |
| **Oct 21** | **Exam 2 (Chap. 4-7)** | **Lecture Room** |
| Oct 25 | 9 (1-5), 10 (1,2) | Rotation of rigid bodies; Torque<br>**9:** 1,6,10,19,25,30,36,37,47,53,85,86<br>**10:** 1,2,5,8,13 |
| Nov 1 | 10 (3-7) | Dynamics of rotational motion<br>**10:** 19,22,27,29,34,35,39,41,63,70,91 |
| Nov 8 | 11 (1-3), 12 (1-5) | Static equilibrium; Gravitation<br>**11:** 7,10,11,13,14,18,41,42,52,66,73<br>**12:** 3,5,16,24,29,53,73,75 |
| Nov 15 | 13 (1-5) | Periodic motion<br>**13:** 1,2,7,8,12,13,19,27,32,36,41,43,48 |
| **Nov 18** | **Exam 3 (Chap. 8-11)** | **Lecture Room** |
| Nov 22 | 13 (6-8) | Periodic motion<br>**13:** 49,51,54,63,66,69,88,90 |
| ** Nov. 25-26 (Thu-Fri): | | Thanksgiving holidays |
| Nov 29 | 15 (1-8) | Mechanical waves<br>**15:** 1,4,6,7,10,15,20,26,28,31,37,39,43,47,48,49 |
| Dec 6 | Review | |
| **Dec 15 1-3PM** | **Final Exam (Chap.1-13, 15)** | **Lecture Room** |

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August 2001 – present

Most Recent Related Publications:

- Shryock, K.J., A.R. Srinivasa, and J.E. Froyd. 2011. Alignment of preparation via first-year physics mechanics and calculus courses with expectations for a sophomore statics and dynamics course. In *Proceedings of American Society for Engineering Education.* Vancouver, CA.

- Shryock, K.J., A.R. Srinivasa, and J.E. Froyd. 2011. Assessing first-year calculus knowledge and skills needed for a sophomore statics and dynamics course. In *Proceedings of American Society for Engineering Education.* Vancouver, CA.

- Shryock, K.J., A.R. Srinivasa, and J.E. Froyd. 2011. Assessing first-year physics mechanics knowledge and skills needed for a sophomore statics and dynamics course. In *Proceedings of American Society for Engineering Education.* Vancouver, CA.