College of Integrative Sciences and Arts
Science and Mathematics Faculty
Tenure-Track Faculty Annual Report Form

Tenured and Tenure Track Faculty Annual Report Form for January 1, 2020 – December 31, 2020. Reference: CISA bylaws/Appendix A

Please use this Annual Report Form to report your accomplishments in research/creative activity, teaching, and service. Use the category and subcategory headings. On those lines of the form where there is no activity to report, leave the line blank. Provide an explanation or clarification wherever you think it may be useful, including contributions to diversity and inclusion.

For the evaluation of faculty performance in 2019, please submit your report as a single pdf file by **January 15, 2021**. Name the report using the format LastName_annual_report_2020.pdf. Please add syllabi, representative assignments, CV and any other materials, **in that order**, as appendices at the end of the document. Information on where to send your file will be sent out in a separate message.

Name: Michael Dugger

Rank: Associate Professor

Faculty Head to complete this section.
Evaluation Summary for 2020 based on evidence in categories 1, 2, and 3 below:
Numerical ranking [unsatisfactory (1), satisfactory (2), merit (3), high merit (4)]:

Research	_____	X Research Weight	_____	= _____
Instruction	_____	X Instruction Weight	_____	= _____
Service	_____	X Service Weight	_____	= _____

Overall numerical ranking = _____

Faculty Head signature _____ Date _____

I have read this review and it has been discussed with me. I understand my signature does not necessarily indicate agreement.
Faculty signature _____ Date _____

Category 1: Research (provide information in the following categories as applicable)
ABOR mandates that research be evaluated in three-calendar-year increments.

1. Books (including monographs, edited volumes, and textbooks)

2. Articles, chapters, essays, poems, and short stories in refereed venues
I was a coauthor on three papers [1-3]. Two papers were experimental measurements of meson photoproduction off the proton [1-2], with the remaining paper [3] regarding the interaction of nucleon pairs within nuclei. Of those papers, one was with the GlueX Collaboration [2], while the other two [1,3] was with the CEBAF Large Acceptance Spectrometer (CLAS) Collaboration.

[1] A. Celentano *et al*., for the CLAS Collaboration, *First measurement of direct photoproduction* of the $a_2(1320)^0$ meson on the proton, Phys. Rev. C **102** (2020) 3, 032201
[2] S. Adhikari *et al*., for the GlueX collaboration, *Measurement of the photon beam asymmetry in* $\gamma\, p \rightarrow K^+ \Sigma^0$ *at* $E_\gamma = 8.5$ *GeV*, Phys. Rev. C 101 (2020) 6, 065206
[3] A. Schmidt *et al*., for the CLAS Collaboration, *Probing the core of the strong nuclear interaction*, Nature **578** (2020) 7796, 540-544

3. Invited publications

4. Grants (both internal and external; specify amount and role)
Proposals funded. Include funding agency, amount funded, degree of involvement (%, PI, Co-PI, etc.), and dates.
Response:
2019-2022: Department of Energy grant "Experimental Medium Energy Physics at Arizona State University" (PI: M. Dugger, 100%, award number DE-SC0020404, total award amount: $450,000, award amount received thus far: $295,000).

5. Proposals submitted. Include funding agency, amount requested, degree of involvement (%, PI, Co-PI, etc.), and dates.
Response:
I submitted a proposal for a Design Aspirations Grant from CISA for undergraduates in my research group to present posters at the American Physics Society Four Corners Meeting (PI: M. Dugger, 100%). The amount requested was $1000.

6. Invited addresses, such as keynotes

7. Conference presentations and papers

8. Professional-development workshops attended

9. Travel to collections for research purposes

10. Book reviews, review essays, and research notes

11. Honors and awards for scholarship

12. Sabbatical report

13. Shows, performances and exhibits

14. Other contributions

I have given presentations at various meetings over the past year [4-17]. A bulleted list of my presentations is given below.

- Presentations related to the ASU designed and constructed photon polarimeter (TPOL)[4-7]
- Presentations related to hyperon (Λ, Σ, Ξ) production [8,9]

[4] https://userweb.jlab.org/~dugger/triPol/makePolValsV7.pdf Polarization study with additional study of possible systematics in convertor thickness, GlueX meeting 7-7-2020
[5] https://userweb.jlab.org/~dugger/triPol/makePolValsV7B.pdf Polarization study related to list of included runs, GlueX meeting 7-21-2020
[6] https://userweb.jlab.org/~dugger/triPol/makePolValsV8.pdf Polarization study including release of spring 2018 data, GlueX meeting 8-4-2020
[7] https://userweb.jlab.org/~dugger/triPol/makePolValsV9Test.pdf Polarization study of fall 2018 data using recooked data, GlueX meeting 12-22-2020
[8] https://userweb.jlab.org/~dugger/veryStrange/moCorrV1Gardner.pdf Use of Alan Gardner's (ASU graduate student) correction factors and search for cascade baryon, Very Strange meeting 2-3-2020
[9] https://userweb.jlab.org/~dugger/veryStrange/vs2020-4-14-Pass1FirstLook.pdf My first look at pass 1 data, Very Strange meeting 2-14-2020

Category 2: Instructional Contributions (provide information in the following categories as applicable)

ABOR mandates that teaching be evaluated in one-calendar-year increments.

Evaluation of teaching will include attention to SYLLABI AND OTHER COURSE MATERIALS, student evaluations, the number of students enrolled in a class, and the demonstrated relation between the classes offered and departmental needs.

1. List the courses you taught each semester. Explain any special circumstances that apply to these courses (e.g., a first-time prep; team-teaching; teaching early in the morning, at night, or on Saturday; teaching high-enrollment/multicultural content classes; or teaching online or web-enhanced courses).

List course, enrollment numbers, credits, and SCH (enrollment number x credit hours) in the order of S20, Su20, and F20 (add more lines as needed).

Semester/ Year	Prefix/ Number	Course Title	Enrollment number	Credit hours	SCH
S20	PHY321	Vector Mechanics and Vibration	37	3	111
S20	PHY394	Basics of Medical Physics	7	3	21
S20	PHY499	Individualized Instruction	3	3,3,1	7
S20	PHY792	Research	2	3	6
F20	PHY121	University Physics I: Mechanics	43	3	129
F20	PHY321	Vector Mechanics and Vibrations	39	3	117
F20	PHY495	Project Research	1	1	1
F20	PHY493	Honors Thesis	1	3	3
F20	PHY792	Research	3	3	9
				Total SCH =	404

Special circumstances: PHY121 and PHY394 were first-time prep, with PHY394 (Basics of Medical Physics) being the first time offered at ASU.

2. At the **end of the report** attach syllabi and other course documents. Please submit one syllabus for each unique course you taught (i.e., if you taught the same course two semesters in a row, only submit one syllabus for this course). Please also submit one representative assignment for each unique course taught.

3. For online and web-enhanced courses, faculty using My ASU are encouraged to enroll their head as an instructor so that the head can view password-protected materials; faculty using their homepages or other web pages should provide their head with URLs and access.

1. Course evaluations Please provide a **table** (see example below) that gives the evaluation score for Question 17 (All things considered, this instructor was a very effective university teacher) for **each course** taught.

Semester	Course number; SLN	Type of class	Score
Spring 20	PHY321; 22714	lecture	1.40
Spring 20	PHY394; 32778	Lecture	1.00

Fall 20	**PHY121; 89095**	**Lecture**	**1.76**
Fall 20	**PHY321; 84261**	**Lecture**	**1.92**

Produce a double-spaced narrative (at most 1 to 2 pages) that contextualizes your evaluation scores. Discuss areas in which you excel (such as your level of experience, effective teaching strategies, accessibility to students, your ability to produce an effective learning environment for your students), as well as any pedagogical changes you would like to implement in becoming a more effective teacher. Please include your contributions to diversity and inclusion in your teaching in this section.

Response:

As can be seen in the above table, the response from my students for Question 17 were close to the optimal value for the spring semester. The resulting scores from the fall semester were further than optimal than I like (1.76 and 1.92). After the spring break I created videos of my lectures and posted those on the web. I feel that the students responded well to that format. For fall semester I taught in Sync mode and I am still trying to adapt my style of teaching to the Sync format.

5. Names of students supervised in independent study courses and names of students you are mentoring at the graduate level, indicating whether you are serving as chair or member of their committees.

Response:

- Sebastian Cole (graduate student): I am the chair of his Ph.D. committee and supervised him for PHY 792. Sebastian made several presentations over the year [10-13]. One of the presentations [10] discusses the creation of monitoring histograms that are used by shift takers during data acquisition at Jefferson Lab in Newport News VA. Another presentation [11] discusses a simulation study for the $K^+ K^- \pi^0$ photoproduced from the proton. The cross sections were shown in May [13]. Sebastian also presented results [12] at the fall 2020 CISA research symposium. He won the CISA outstanding graduate student award in December of 2020.
- Brandon Sumner (graduate student): I am the chair of his Ph.D. committee and supervised him for PHY 792. Brandon made several presentations during the year [14-16]. He presented plans for an upgrade to the ASU built triplet polarimeter [14] (project put on hold due to pandemic). Brandon showed his results for the cascade baryon (Ξ) normalized yields [15] and study of confidence level cuts [16].
- Alan Gardner (graduate student): I am Alan's advisor, supervised Alan for his research rotation (PHY 500) and will be the chair of his committee when it has been formed. Alan created a few presentations during the year [17-19] and provided me with correction factors for a presentation I gave [8] to the Very Strange gorup. Alan presented a preliminary search for the Ξ^- baryon [17], showed a scheme for kinematic binning of Λ(1520) states [18] and implementation of energy corrections with event topology study [19].
- Glenn Randall (graduate student): I am on Glenn's Ph.D. committee.
- Jesse Giron (graduate student): I am on Jesse's Ph.D. committee.
- Mohamed Mohamed (undergraduate student): Mohamed took PHY499 during the spring 2020 semester. He gave a presentation of his work on using decision trees to assist in particle identification during the spring 2020 CISA research symposium [20]. Mohamed won the CISA undergraduate research award in May of 2020.
- Rebecca Osar (undergraduate student): Rebecca took PHY499 (spring 2020) and PHY495 (fall 2020) with me. She presented her work on the creation of an event generator for the reaction $\gamma p \rightarrow p K^+ K^-$ during the fall 2020 CISA research symposium [21].
- Patrick Walker (undergraduate student): I am Patrick's advisor for his Honors Thesis. Patrick took Honors Directed study (PHY492) with me. Patrick presented his work on the isolation of the ϕ meson at the fall 2020 CISA research symposium [22] and at a Very Strange meeting [23].
- Kevin Scheuer (undergraduate student): Kevin took PHY499 with me during the spring 2020 semester. He presented his study of machine learning methods for $K\pi$ identification at the spring 2020 CISA research symposium [24].

[10] https://halldweb.jlab.org/wiki/images/a/a7/TPOL_2019_11_running.pdf TPOL results, GlueX meeting 2-4-2020

[11] http://meson.hldsite.com/presentations/others/SEB-1-23-2020-BGGEN_Study_new.pdf Simulation study, GlueX meeting 1-23-2020
[12] http://meson.hldsite.com/presentations/CISAFall20/SebastianCole_CISA_Fall_2020.pdf K* K in GlueX, CISA poster session for fall 2020
[13] https://halldweb.jlab.org/wiki-private/images/b/b5/KStarK_CrossSection.pdf K* K production cross sections, GlueX meeting 5-29-2020
[14] https://userweb.jlab.org/~dugger/triPol/TPOLUpdate1-21-20.pdf TPOL update, GlueX meeting 1-21-2020
[15] http://lc.asu.edu/~testUser/Hyperon5120.pdf Cascade production, GlueX meeting 5-1-2020
[16] http://lc.asu.edu/~testUser/HyperonNew52920.pdf Cascade production, GlueX meeting 5-29-2020
[17] http://meson.hldsite.com/presentations/others/May19_2020-Alan-Gardner.pdf Lambda and cascade searches, Very Strange meeting 5-19-2020
[18] http://meson.hldsite.com/presentations/others/May26_2020-1-Alan-Gardner.pdf Excited lambda progress, Very Strange meeting 5-26-2020
[19] http://meson.hldsite.com/presentations/others/AlanGardnerVS-6-9-20.pdf Energy correction, detector topology study and Lambda fitting, Very Strange meeting 6-19-2020
[20] http://meson.hldsite.com/presentations/Poster2020/PosterMoMoSp20Final.pdf Particle ID study, CISA poster session for spring 2020
[21] http://meson.hldsite.com/presentations/CISAFall20/RebeccaOsar_CISA_Fall_2020.pdf Event generator for the p K^+ K^- events, CISA poster session for fall 2020.
[22] http://meson.hldsite.com/presentations/CISAFall20/PatrickWalker_CISA_Fall_2020.pdf Isolation of phi-meson states, CISA poster session fall 2020
[23] http://meson.hldsite.com/presentations/others/veryStrange12-15-2021Walker.pdfIsolation of phi-meson states, Very Strange meeting 12-15-2021
[24] http://meson.hldsite.com/presentations/Poster2020/PresentationKevin2020.pdf Machine learning methods, CISA poster session for spring 2020

6. Any additional mentoring of undergraduate and/or graduate students (e.g., co-authoring with students or assisting them to make conference presentations; participating in professional-development workshops).

7. Names of undergraduate Barrett honors students you have mentored, 1) class honors contracts or 2) either as chair or member of their thesis committees.

Response:

- Bridget Koehl (undergraduate student): I had an Honors Contract with Bridget. She met with me once a week to discuss the theory of Special Relativity.
- Patrick Walker (undergraduate student): I am Patrick's advisor for his honors thesis.
- Rebecca Osar (undergraduate student): I am mentoring Rebecca and expect to be the advisor for her honors thesis.

8. Teaching awards you have received.

9. Materials that provide evidence of curriculum development and/or significant course revision.

Response:
I put together a medical physics course at ASU (PHY 394) and instructed that course during the spring 2020 semester. This is the first time that a medical physics course has been taught at any ASU campus.

10. Evidence of course supervision, mentoring of teachers.

11. Other instructional contributions not listed above.

Response:

- I have started training ASU undergraduate students Taryn Brown and Anna Costelle in the use of the Linux operating system and software libraries used in analysis of particle/nuclear physics data. I anticipate that both will become members of my research group in 2021.

Category 3: Service (provide information in the following categories as applicable)

ABOR mandates that service be evaluated in three-calendar-year increments. For each of the four service categories please indicate the year 2018, 2019, 2020.

Service to the Profession:
1. Academic activities (e.g., editorships; boards of directors; consulting editor; occasional reviewer of proposals, manuscripts; conference sessions organized and/or chaired). Specify journal or agency, role, and time period.

Response:
I have performed journal reviews of two articles and two proceedings:

- Article review for Physical Review Letters (1-24-2018 to 4-2-2018).
- Article review for Physical Review C (8-12-2019 to 10-11-2019).
- Proceedings reviews (two) for the MENU (Meson Nucleon) conference (10-22-2019 to 11-22-2019).

2. Service (e.g., committee work for professional organizations). Specify organization, role and time period.

Response:
I was a chair for the nuclear physics session of the American Physical Society Four Corners Meeting held on October 24, 2020.

Service to the University:
1. Membership on university-level committees. Indicate with an asterisk those committees you chair(ed).

Response:

Member of the Graduate College review committee for the ARCS (Achievement Rewards for College Scientists) Fellowship, 2018, 2019 and 2020.

2. Work with other departments (e.g., serving on search committees, coordinating joint programs).

3. Lectures, seminars given specifically to other departments.

4. Other service to the university (e.g., faculty senator).

Service to the College of Integrative Sciences and Arts:
1. School committees on which you have served and/or are serving. Indicate with an asterisk those committees you chair(ed).

2. School activities you organize(d), beyond assigned committee work.

3. School administrative position(s) you have held/currently hold.

Service to the Community:
1. Consultation and membership on community committees and boards. List the agency, duties and time period that you served.

2. Lectures, talks, workshops, and other public relations.

Other Professional Activities:
Please provide information not covered in previous headings, such as being the subject of interviews.

To faculty with course releases: If you have non-research-related course releases, please specify what you are doing for that course release.

Category 4: Professional Goals for 2021 Calendar Year

Please list goals for each of the three evaluative categories (research, teaching and service) for the next year.

Response:
Research goals: During the 2021 year, my goal is to assist my graduate students in discovering new baryonic Ξ states and hybrid mesons. I also plan to submit a continuing grant proposal to the DOE.

Teaching goals: During the 2021 year my goal is to become more comfortable with the Sync mode of teaching and to have my course evaluations near the optimal values.

Service activity goals: My goal for service work is to maintain good standing with the collaborations I participate in. I also plan to provide service work to the academic and general physics communities by agreeing to any reasonable requests of my time made by those entities.

Tenured/Tenure-track faculty member to complete this section.

Three Year Workload Distribution (%)

Area	**2018**	**2019**	**2020**	**2021 (projected)**
Teaching	20%	30%	40%	40%
Research/Creative Activity	20%	30%	40%	40%
Service	10%	15%	20%	20%

PHY-321

Vector Mechanics and Vibration

Polytechnic campus | TTh | 3:00-4:15am | Peralta 145

Instructor information

Name: Dr. Michael Dugger
Office Location: Wanner Hall 340B (Poly)
Office Hours: My office hours will be on Tuesday and Thursday from 4:30 pm to 5:30 pm.
Email: dugger@asu.edu or dugger@jlab.org
Phone Number: 480-727-1109 (Office)
College Contact: **CISA@asu.edu**

This course is offered by the College of Integrative Sciences and Arts. For more information about the college, visit our website: cisa.asu.edu/ . If you have questions or concerns about this course please speak with your instructor. If your instructor is unable to address your concerns, please send your inquiry to cisa@asu.edu.

Course information

Course Format: Lecture T,Th from 3:00 pm to 4:15 pm.

Course Description: Vector based formulation of Newtonian mechanics of particles and rigid bodies, including oscillatory systems.

Required Textbook:

1. ***Vector Mechanics for Engineers, Dynamics*** (11th edition) by Ferdinand Beer, E. Russell Johnston Jr., Philip J. Cornwell and Brian Self.

Assignments, Exams and Grading

Tentative schedule: The exact schedule for lectures, quizzes and examinations will depend on how long it takes to cover the material. The following is a tentative schedule:

Chapter 11:	Starts January 14
Chapter 12:	Starts January 28
Chapter 13:	Starts February 11
Chapter 14:	Starts February 20
Chapter 15:	Starts March 3

Chapter 16:	Starts March 19
Chapter 17:	Starts March 26
Chapter 19:	Starts April 9

Tentative exam dates:

February 6:	Chapter 11 and 12
February 27:	Chapter 13 and 14
April 7:	Chapter 15, 16, 17
April 28:	Chapter 19
May 5:	Comprehensive final

Assignments and Exams:

Percentage Distribution:	
Homework assignments	20%
Exams (4 out of 5)	80%
Total	**100%**

The lowest score from the five examination scores will be dropped in computing the semester average.

Course Grading System:
Grades will be determined by the percentage you accumulate:

A	90-100	Excellent
B	80-89.9	Good
C	70-79.9	Average
D	60-69.9	Passing
E	<60	Failure
XE		Failure due to Academic Dishonesty

For your own protection, you should keep a copy of everything you hand in, and you should keep your graded assignments at least until grades are finalized at the end of the semester, and in the event you wish to contest any grades.

Grade Appeals
Students must first speak with the instructor of the class to discuss any disputed grades. If, after review, a resolution is not achieved students may proceed with the appeal process. Student grade appeals must be processed in the regular semester immediately following the issuance of the grade in dispute (by commencement for fall or spring), regardless whether the student is enrolled at the university. Complete details are available in the ASU Grade Appeals policy.

Course Policies

Attendance is expected. Students are responsible for all material presented in class, all homework, and for all changes to the schedule or plans announced in class.

Homework: Late homework will **not** be accepted.

Extra Credit: There will be no extra credit opportunities assigned for this course.

Trigger Warning: I do not expect that there will be any material presented in the course that can be interpreted as offensive.

Classroom Behavior

We want to build a classroom climate that is comfortable for all. It is important that we (1) display respect for all members of the classroom – including the instructor and students; (2) pay attention to and participate in all class sessions and activities; (3) avoid unnecessary disruption during class time (e.g. having private conversations, reading the newspaper, surfing the Internet, doing work for other classes, making/receiving phone calls, text messaging, etc.); and (4) avoid racist, sexist, homophobic, or other negative language that may unnecessarily exclude members of our campus and classroom. This is not an exhaustive list of behaviors; rather, it represents examples of the types of things that can have a dramatic impact on the class environment. Your final grade may be reduced by 5% each time you engage in these sorts of behaviors.

Establishing a Safe Environment

Learning takes place best when a safe environment is established in the classroom. In accordance with SSM 104-02 of the Student Services Manual, students enrolled in this course have a responsibility to support an environment that nurtures individual and group differences and encourages engaged, honest discussions. The success of the course rests on your ability to create a safe environment where everyone feels comfortable to share and explore ideas. We must also be willing to take risks and ask critical questions. Doing so will effectively contribute to our own and others intellectual and personal growth and development. We welcome disagreements in the spirit of critical academic exchange, but please remember to be respectful of others' viewpoints, whether you agree with them or not.

All incidents and allegations of violent or threatening conduct by an ASU student (whether on- or off-campus) must be reported to the ASU Police Department (ASU PD) and the Office of the Dean of Students. If either office determines that the behavior poses or has posed a serious threat to personal safety or to the welfare of the campus, the student will not be permitted to return to campus or reside in any ASU residence hall until an appropriate threat assessment has been completed and, if necessary, conditions for return are imposed. ASU PD, the Office of the Dean of Students, and other appropriate offices will coordinate the assessment in light of the relevant circumstances.

Email Communication

ASU email is an official means of communication among students, faculty, and staff. Students are expected to read and act upon email in a timely fashion. Students bear the responsibility of missed messages and should check their ASU-assigned email regularly. *All instructor correspondence will be sent to your ASU email account.* For help with your email go to: MyASU > Service > Live Chat OR New Ticket.

Prohibition of Commercial Notetaking Services
In accordance with ACD 304-06 Commercial Note Taking Services, written permission must be secured from the official instructor of the class in order to sell the instructor's oral communication in the form of notes. Notes must have the note taker's name as well as the instructor's name, the course number, and the date.

University Policies

Academic Integrity
Arizona State University and the College of Integrative Sciences and Arts strongly believe in academic integrity; thus cheating and plagiarism is not tolerated. Students must refrain from uploading to any course shell, discussion board, or website used by the course instructor or other course forum, material that is not the student's original work, unless the students first comply with all applicable copyright laws; faculty members reserve the right to delete materials on the grounds of suspected copyright infringement. If a student is charged with academic dishonesty and found to be in violation, disciplinary action will be taken and a student's name will be kept on file. Academic dishonesty includes borrowing ideas without proper citation, copying others' work (including information posted on the internet), failing to turn in your own work for group projects, as well as providing materials of any type to a homework help site or a study resource site. Disciplinary action may result in a reduced grade for the assignment or class, suspension or expulsion from the university, and/or an XE on his or her transcript. For further information, please read the Student Academic Integrity policy at provost.asu.edu/academic-integrity.

Students with Disabilities
If you need academic accommodations or special consideration of any kind to get the most out of this class, please let me know at the beginning of the course. If you have a disability and need a reasonable accommodation for equal access to education at ASU, please call Disability Resources for Students (DRC). The site can be found at eoss.asu.edu/drc. Instructors cannot provide accommodations without authorization from the DRC.

Downtown Phoenix Campus
University Center building, Suite 160
Phone: 602.496.4321
E-mail: DRCDowntown@asu.edu

Polytechnic Campus
Sutton Hall - Suite 240
Phone: 480.727.1039
E-mail: DRCPoly@asu.edu

Tempe Campus
Matthews Center building, 1st floor
Phone: 480.965.1234
E-mail: DRCTempe@asu.edu

West Campus
University Center Building, Room 130
Phone:602.543.8145
E-mail: DRCWest@asu.edu

Mental Health

As a student, like anyone else, you may experience a range of challenges that can interfere with learning, such as strained relationships, increased anxiety, substance use, feeling down, difficulty concentrating and/or lack of motivation. These emotional health concerns or stressful events may diminish your academic performance and/or reduce your ability to participate in daily activities. ASU Counseling Services provides counseling and crisis services for students who are experiencing a mental health concern. Any student may call or walk-in to any ASU counseling center for a same day or future appointment to discuss any personal concern. Here is the Web site: eoss.asu.edu/counseling. After office hours and 24/7 ASU's dedicated crisis line is available for crisis consultation by calling 480-921-1006.

Student Code of Conduct

Students are required to adhere to the behavior standards listed in the Arizona Board of Regents Policy Manual Chapter V –Campus and Student Affairs: Code of Conduct located online at students.asu.edu/srr/code and the ACD 125: Computer, Internet, and Electronic Communications available at asu.edu/aad/manuals/acd/acd125.html.

Students are entitled to receive instruction free from interference by other members of the class. An instructor may withdraw a student from a course when the student's behavior disrupts the educational process under USI 201-10 asu.edu/aad/manuals/ssm/ssm201-10.html. An instructor may withdraw a student from a course with a mark of "W" or "E" when the student's behavior disrupts the educational process. Disruptive classroom behavior for this purpose is defined by the instructor.

Harassment Prohibited

ASU policy prohibits harassment on the basis of race, sex, gender identity, age, religion, national origin, disability, sexual orientation, Vietnam era veteran status, and other protected veteran status. Violations of this policy may result in disciplinary action, including termination of employees or expulsion of students. Contact the professor if you are concerned about online harassment of any kind, and he/she will put you in contact with the Dean of Students office.

Title IX

Title IX is a federal law that provides that no person be excluded on the basis of sex from participation in, be denied benefits of, or be subjected to discrimination under any education program or activity. Both Title IX and university policy make clear that sexual violence and harassment based on sex is prohibited. An individual who believes they have been subjected to sexual violence or harassed on the basis of sex can seek support, including counseling and academic support, from the university. If you or someone you know has been harassed on the basis of sex or sexually assaulted, you can find information and resources at sexualviolenceprevention.asu.edu/faqs.

"As a mandated reporter, I am obligated to report any information I become aware of regarding alleged acts of sexual discrimination, including sexual violence and dating violence. ASU Counseling Services, eoss.asu.edu/counseling, is available if you to wish discuss any concerns confidentially and privately."

Statement on Inclusion

Arizona State University is deeply committed to positioning itself as one of the great new universities by seeking to build excellence, enhance access and have an impact on our community, state, nation and the

world. To do that requires our faculty and staff to reflect the intellectual, ethnic and cultural diversity of our nation and world so that our students learn from the broadest perspectives, and we engage in the advancement of knowledge with the most inclusive understanding possible of the issues we are addressing through our scholarly activities. We recognize that race and gender historically have been markers of diversity in institutions of higher education. However, at ASU, we believe that diversity includes additional categories such as socioeconomic background, religion, sexual orientation, gender identity, age, disability, veteran status, nationality and intellectual perspective.

Syllabus Disclaimer

The course syllabus is an educational contract between the instructor and students. Every effort will be made to avoid changing the course schedule but the possibility exists that unforeseen events will make syllabus changes necessary. The instructor reserves the right to make changes to the syllabus as deemed necessary. Students will be notified in a timely manner of any syllabus changes via email, or in the Announcements section on Blackboard.

Campus Resources

There is clear evidence that students who take advantage of academic support services perform better academically. As an ASU student you have access to many resources on campus. This includes tutoring, academic success coaching, counseling services, financial aid, disability resources, career and internship help and many opportunities to get involved in student clubs and organizations.

- Tutoring: students.asu.edu/academic-success
- Counseling Services: students.asu.edu/counseling
- Financial Aid: students.asu.edu/financialaid
- Disability Resource Center: asu.edu/studentaffairs/ed/drc/
- Major/Career Exploration: uc.asu.edu/majorexploration/assessment
- Career Services: students.asu.edu/career
- Student Organizations: asu.edu/studentaffairs/mu/clubs/
- ASU Writing Centers: tutoring.asu.edu/writing-centers
- ASU Police Department: cfo.asu.edu/police
- International Student Resources: students.asu.edu/international/support/academic

Representative homework assignment (taken from textbook used in course):

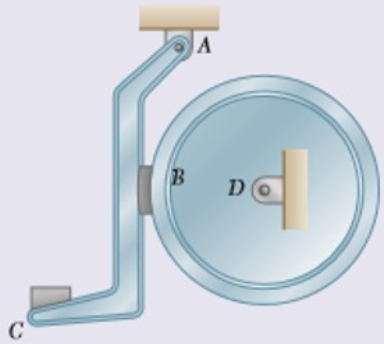

Fig. P15.1

15.1 The brake drum is attached to a larger flywheel that is not shown. The motion of the brake drum is defined by the relation $\theta = 36t - 1.6t^2$, where θ is expressed in radians and t in seconds. Determine (*a*) the angular velocity at $t = 2$ s, (*b*) the number of revolutions executed by the brake drum before coming to rest.

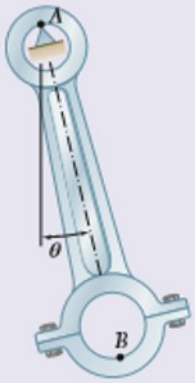

Fig. P15.6

15.6 A connecting rod is supported by a knife-edge at point *A*. For small oscillations the angular acceleration of the connecting rod is governed by the relation $\alpha = -6\theta$ where α is expressed in rad/s^2 and θ in radians. Knowing that the connecting rod is released from rest when $\theta = 20°$, determine (*a*) the maximum angular velocity, (*b*) the angular position when $t = 2$ s.

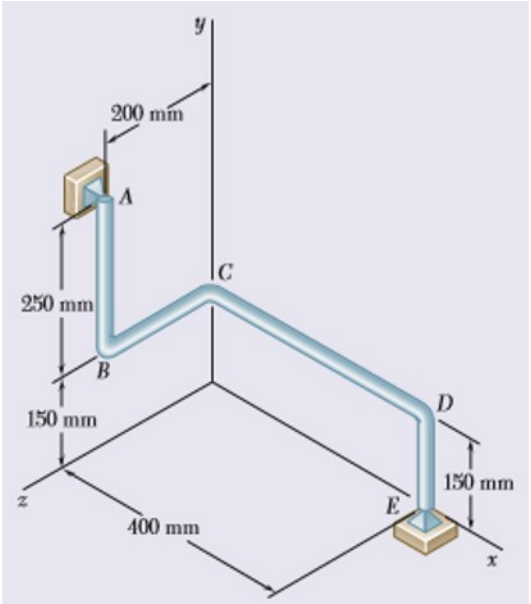

Fig. P15.10

15.10 The bent rod *ABCDE* rotates about a line joining points *A* and *E* with a constant angular velocity of 9 rad/s. Knowing that the rotation is clockwise as viewed from *E*, determine the velocity and acceleration of corner *C*.

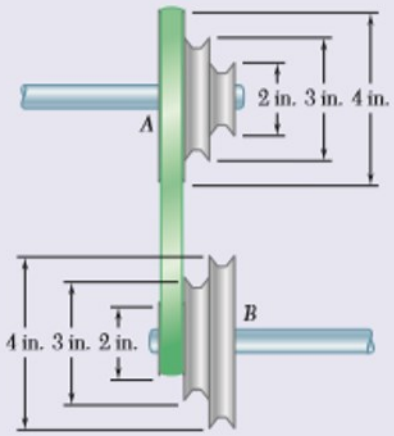

Fig. P15.22

15.22 The two pulleys shown may be operated with the V belt in any of three positions. If the angular acceleration of shaft *A* is 6 rad/s^2 and if the system is initially at rest, determine the time required for shaft *B* to reach a speed of 400 rpm with the belt in each of the three positions.

15.38 An automobile travels to the right at a constant speed of 48 mi/h. If the diameter of a wheel is 22 in., determine the velocities of points *B*, *C*, *D*, and *E* on the rim of the wheel.

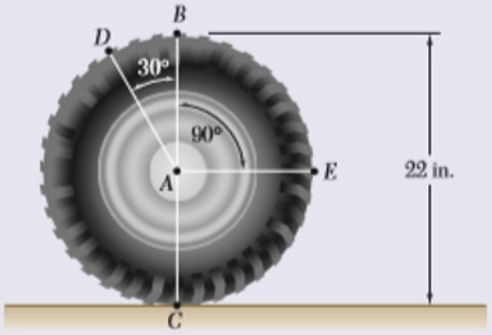

Fig. P15.38

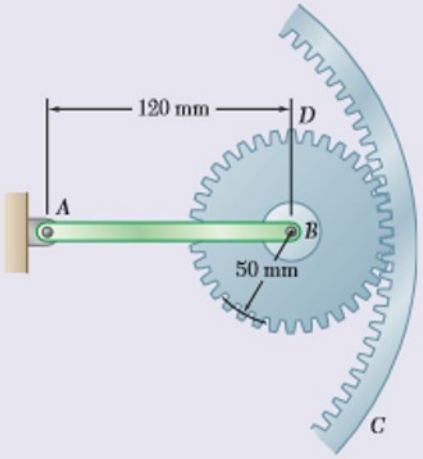

Fig. P15.50

15.50 Arm *AB* rotates with an angular velocity of 20 rad/s counterclockwise. Knowing that the outer gear *C* is stationary, determine (*a*) the angular velocity of gear *B*, (*b*) the velocity of the gear tooth located at point *D*.

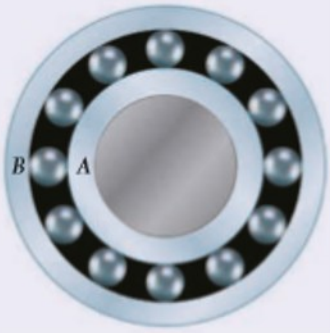

Fig. P15.51

15.51 In the simplified sketch of a ball bearing shown, the diameter of the inner race *A* is 60 mm and the diameter of each ball is 12 mm. The outer race *B* is stationary while the inner race has an angular velocity of 3600 rpm. Determine (*a*) the speed of the center of each ball, (*b*) the angular velocity of each ball, (*c*) the number of times per minute each ball describes a complete circle.

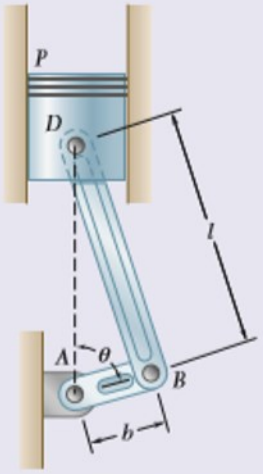

Fig. P15.61 and P15.62

15.62 In the engine system shown, $l = 160$ mm and $b = 60$ mm. Knowing that crank AB rotates with a constant angular velocity of 1000 rpm clockwise, determine the velocity of the piston P and the angular velocity of the connecting rod when $\theta = 60°$.

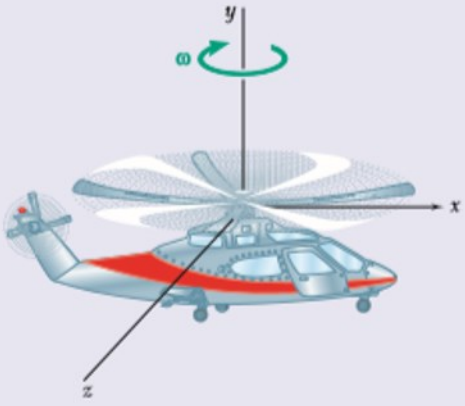

Fig. P15.75

15.75 A helicopter moves horizontally in the x direction at a speed of 120 mi/h. Knowing that the main blades rotate clockwise when viewed from above with an angular velocity of 180 rpm, determine the instantaneous axis of rotation of the main blades.

15.76 and ~~15.77~~ A 60-mm-radius drum is rigidly attached to a 100-mm-radius drum as shown. One of the drums rolls without sliding on the surface shown, and a cord is wound around the other drum. Knowing that end E of the cord is pulled to the left with a velocity of 120 mm/s, determine (*a*) the angular velocity of the drums, (*b*) the velocity of the center of the drums, (*c*) the length of cord wound or unwound per second.

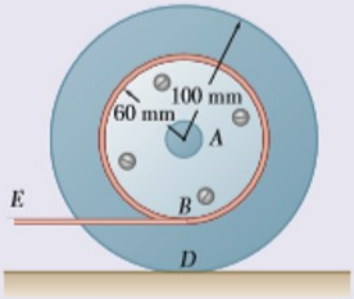

Fig. P15.76

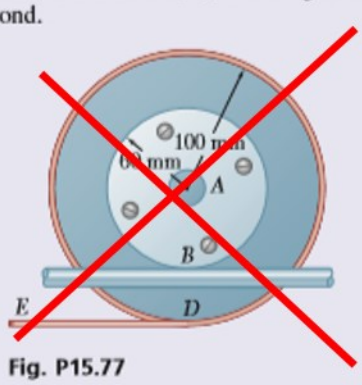

Fig. P15.77

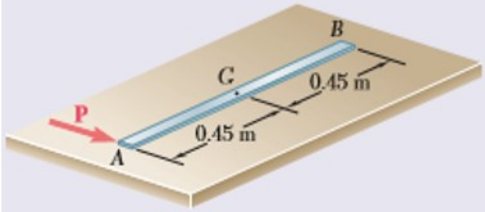

Fig. P15.107 and P15.108

15.107 A 900-mm rod rests on a horizontal table. A force **P** applied as shown produces the following accelerations: $\mathbf{a}_A = 3.6$ m/s^2 to the right, $\alpha = 6$ rad/s^2 counterclockwise as viewed from above. Determine the acceleration (*a*) of point G, (*b*) of point B.

15.111 An automobile travels to the left at a constant speed of 72 km/h. Knowing that the diameter of the wheel is 560 mm, determine the acceleration (*a*) of point B, (*b*) of point C, (*c*) of point D.

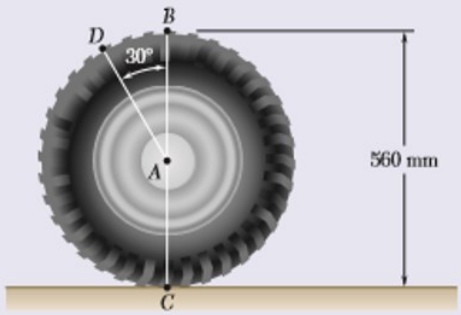

Fig. P15.111

15.112 The 18-in.-radius flywheel is rigidly attached to a 1.5-in.-radius shaft that can roll along parallel rails. Knowing that at the instant shown the center of the shaft has a velocity of 1.2 in./s and an acceleration of 0.5 in./s^2, both directed down to the left, determine the acceleration (*a*) of point A, (*b*) of point B.

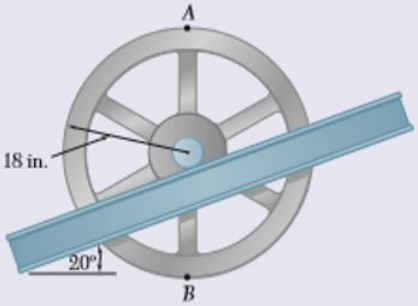

Fig. P15.112

PHY-394

Basics of Medical Physics

Polytechnic campus | T,Th | 12:00-1:15 | Santan Hall 130

Instructor information

Name: Dr. Michael Dugger

Office Location: Wanner Hall 340B

Office Hours: My office hours will be on Tuesdays and Thursdays from 10 am to 11 am at my office. You can also make an appointment by contacting me via email.

Email: dugger@asu.edu or dugger@jlab.org

Phone Number: 480-727-1109 (Office), 480-727-0024 (Lab)

College Contact: CISA@asu.edu

This course is offered by the College of Integrative Sciences and Arts. For more information about the college, visit our website: cisa.asu.edu/ . If you have questions or concerns about this course please speak with your instructor. If your instructor is unable to address your concerns, please send your inquiry to cisa@asu.edu.

Course information

Course Format: Lecture from noon to 1:15 pm on T,Th.

Course Description: A non-calculus treatment of the physics related to medical applications primarily intended for premed and other non-physics majors, but all majors are welcome.

Required Textbook:

1. ***Introduction to Physics in Modern Medicine*** (2^{nd} edition) by Suzanne Amador Kane (ISBN 9781584889434 : Paperback, ISBN 9781138445703 : Hardback, ISBN 9781584889441 : ebook).

Assignments, Exams and Grading

Tentative schedule: The exact schedule for lectures, quizzes and examinations will depend on how long it takes to cover the material. The following is a tentative schedule:

Chapter 1 (Introduction and overview):	Starts 1-14-2020
Chapter 2 (Fiber optics and endoscopes):	Starts 1-14-2020
Chapter 3 (Lasers in medicine):	Starts 1-21-2020

Chapter 4 (Ultrasound imaging):	Starts 2-11-2020
Chapter 5 (X-rays and CT scans):	Starts 3-3-2020
Chapter 6 (Radionuclide scans):	Starts 3-19-2020
Chapter 7 (Radiation therapy and safety):	Starts 3-26-2020
Chapter 8 (Magnetic resonance imaging):	Starts 4-9-2020

Tentative exam dates:

Feb. 6:	Chapter 2 and 3
Feb. 27:	Chapter 4
Apr. 7:	Chapter 5, 6 and 7
Apr. 28:	Chapter 8
May 5:	Comprehensive final

Assignments and Exams:

Percentage Distribution:	
Homework assignments	20%
Exams (4 out of 5)	80%
Total	**100%**

The lowest score from the five examination scores will be dropped in computing the semester average.

Course Grading System:
Grades will be determined by the percentage you accumulate:

A	90-100	Excellent
B	80-89.9	Good
C	70-79.9	Average
D	60-69.9	Passing
E	<60	Failure
XE		Failure due to Academic Dishonesty

For your own protection, you should keep a copy of everything you hand in, and you should keep your graded assignments at least until grades are finalized at the end of the semester, and in the event you wish to contest any grades.

Grade Appeals
Students must first speak with the instructor of the class to discuss any disputed grades. If, after review, a resolution is not achieved students may proceed with the appeal process. Student grade appeals must be processed in the regular semester immediately following the issuance of the grade in dispute (by commencement for fall or spring), regardless whether the student is enrolled at the university. Complete details are available in the ASU Grade Appeals policy.

Course Policies

Attendance is expected. Students are responsible for all material presented in class, all homework, and for all changes to the schedule or plans announced in class.

Homework: Late homework will **not** be accepted.

Extra Credit: There will be no extra credit opportunities assigned for this course.

Trigger Warning: I do not expect that there will be any material presented in the course that can be interpreted as offensive.

Classroom Behavior

We want to build a classroom climate that is comfortable for all. It is important that we (1) display respect for all members of the classroom – including the instructor and students; (2) pay attention to and participate in all class sessions and activities; (3) avoid unnecessary disruption during class time (e.g. having private conversations, reading the newspaper, surfing the Internet, doing work for other classes, making/receiving phone calls, text messaging, etc.); and (4) avoid racist, sexist, homophobic, or other negative language that may unnecessarily exclude members of our campus and classroom. This is not an exhaustive list of behaviors; rather, it represents examples of the types of things that can have a dramatic impact on the class environment. Your final grade may be reduced by 5% each time you engage in these sorts of behaviors.

Establishing a Safe Environment

Learning takes place best when a safe environment is established in the classroom. In accordance with SSM 104-02 of the Student Services Manual, students enrolled in this course have a responsibility to support an environment that nurtures individual and group differences and encourages engaged, honest discussions. The success of the course rests on your ability to create a safe environment where everyone feels comfortable to share and explore ideas. We must also be willing to take risks and ask critical questions. Doing so will effectively contribute to our own and others intellectual and personal growth and development. We welcome disagreements in the spirit of critical academic exchange, but please remember to be respectful of others' viewpoints, whether you agree with them or not.

All incidents and allegations of violent or threatening conduct by an ASU student (whether on- or off-campus) must be reported to the ASU Police Department (ASU PD) and the Office of the Dean of Students. If either office determines that the behavior poses or has posed a serious threat to personal safety or to the welfare of the campus, the student will not be permitted to return to campus or reside in any ASU residence hall until an appropriate threat assessment has been completed and, if necessary, conditions for return are imposed. ASU PD, the Office of the Dean of Students, and other appropriate offices will coordinate the assessment in light of the relevant circumstances.

Email Communication

ASU email is an official means of communication among students, faculty, and staff. Students are expected to read and act upon email in a timely fashion. Students bear the responsibility of missed messages and should check their ASU-assigned email regularly. *All instructor correspondence will be sent to your ASU email account.* For help with your email go to: MyASU > Service > Live Chat OR New Ticket.

Prohibition of Commercial Notetaking Services
In accordance with ACD 304-06 Commercial Note Taking Services, written permission must be secured from the official instructor of the class in order to sell the instructor's oral communication in the form of notes. Notes must have the note taker's name as well as the instructor's name, the course number, and the date.

University Policies

Academic Integrity

Arizona State University and the College of Integrative Sciences and Arts strongly believe in academic integrity; thus cheating and plagiarism is not tolerated. Students must refrain from uploading to any course shell, discussion board, or website used by the course instructor or other course forum, material that is not the student's original work, unless the students first comply with all applicable copyright laws; faculty members reserve the right to delete materials on the grounds of suspected copyright infringement. If a student is charged with academic dishonesty and found to be in violation, disciplinary action will be taken and a student's name will be kept on file. Academic dishonesty includes borrowing ideas without proper citation, copying others' work (including information posted on the internet), failing to turn in your own work for group projects, as well as providing materials of any type to a homework help site or a study resource site. Disciplinary action may result in a reduced grade for the assignment or class, suspension or expulsion from the university, and/or an XE on his or her transcript. For further information, please read the Student Academic Integrity policy at provost.asu.edu/academic-integrity.

Students with Disabilities

If you need academic accommodations or special consideration of any kind to get the most out of this class, please let me know at the beginning of the course. If you have a disability and need a reasonable accommodation for equal access to education at ASU, please call Disability Resources for Students (DRC). The site can be found at eoss.asu.edu/drc. Instructors cannot provide accommodations without authorization from the DRC.

Downtown Phoenix Campus
University Center building, Suite 160
Phone: 602.496.4321
E-mail: DRCDowntown@asu.edu

Polytechnic Campus
Sutton Hall - Suite 240
Phone: 480.727.1039
E-mail: DRCPoly@asu.edu

Tempe Campus
Matthews Center building, 1st floor
Phone: 480.965.1234
E-mail: DRCTempe@asu.edu

West Campus
University Center Building, Room 130
Phone:602.543.8145
E-mail: DRCWest@asu.edu

Mental Health

As a student, like anyone else, you may experience a range of challenges that can interfere with learning, such as strained relationships, increased anxiety, substance use, feeling down, difficulty concentrating and/or lack of motivation. These emotional health concerns or stressful events may diminish your academic performance and/or reduce your ability to participate in daily activities. ASU Counseling Services provides counseling and crisis services for students who are experiencing a mental health concern. Any student may call or walk-in to any ASU counseling center for a same day or future appointment to discuss any personal concern. Here is the Web site: eoss.asu.edu/counseling. After office hours and 24/7 ASU's dedicated crisis line is available for crisis consultation by calling 480-921-1006.

Student Code of Conduct

Students are required to adhere to the behavior standards listed in the Arizona Board of Regents Policy Manual Chapter V –Campus and Student Affairs: Code of Conduct located online at students.asu.edu/srr/code and the ACD 125: Computer, Internet, and Electronic Communications available at asu.edu/aad/manuals/acd/acd125.html.

Students are entitled to receive instruction free from interference by other members of the class. An instructor may withdraw a student from a course when the student's behavior disrupts the educational process under USI 201-10 asu.edu/aad/manuals/ssm/ssm201-10.html. An instructor may withdraw a student from a course with a mark of "W" or "E" when the student's behavior disrupts the educational process. Disruptive classroom behavior for this purpose is defined by the instructor.

Harassment Prohibited

ASU policy prohibits harassment on the basis of race, sex, gender identity, age, religion, national origin, disability, sexual orientation, Vietnam era veteran status, and other protected veteran status. Violations of this policy may result in disciplinary action, including termination of employees or expulsion of students. Contact the professor if you are concerned about online harassment of any kind, and he/she will put you in contact with the Dean of Students office.

Title IX

Title IX is a federal law that provides that no person be excluded on the basis of sex from participation in, be denied benefits of, or be subjected to discrimination under any education program or activity. Both Title IX and university policy make clear that sexual violence and harassment based on sex is prohibited. An individual who believes they have been subjected to sexual violence or harassed on the basis of sex can seek support, including counseling and academic support, from the university. If you or someone you know has been harassed on the basis of sex or sexually assaulted, you can find information and resources at sexualviolenceprevention.asu.edu/faqs.

"As a mandated reporter, I am obligated to report any information I become aware of regarding alleged acts of sexual discrimination, including sexual violence and dating violence. ASU Counseling Services, eoss.asu.edu/counseling, is available if you to wish discuss any concerns confidentially and privately."

Statement on Inclusion

Arizona State University is deeply committed to positioning itself as one of the great new universities by seeking to build excellence, enhance access and have an impact on our community, state, nation and the

world. To do that requires our faculty and staff to reflect the intellectual, ethnic and cultural diversity of our nation and world so that our students learn from the broadest perspectives, and we engage in the advancement of knowledge with the most inclusive understanding possible of the issues we are addressing through our scholarly activities. We recognize that race and gender historically have been markers of diversity in institutions of higher education. However, at ASU, we believe that diversity includes additional categories such as socioeconomic background, religion, sexual orientation, gender identity, age, disability, veteran status, nationality and intellectual perspective.

Syllabus Disclaimer

The course syllabus is an educational contract between the instructor and students. Every effort will be made to avoid changing the course schedule but the possibility exists that unforeseen events will make syllabus changes necessary. The instructor reserves the right to make changes to the syllabus as deemed necessary. Students will be notified in a timely manner of any syllabus changes via email, or in the Announcements section on Blackboard.

Campus Resources

There is clear evidence that students who take advantage of academic support services perform better academically. As an ASU student you have access to many resources on campus. This includes tutoring, academic success coaching, counseling services, financial aid, disability resources, career and internship help and many opportunities to get involved in student clubs and organizations.

- Tutoring: students.asu.edu/academic-success
- Counseling Services: students.asu.edu/counseling
- Financial Aid: students.asu.edu/financialaid
- Disability Resource Center: asu.edu/studentaffairs/ed/drc/
- Major/Career Exploration: uc.asu.edu/majorexploration/assessment
- Career Services: students.asu.edu/career
- Student Organizations: asu.edu/studentaffairs/mu/clubs/
- ASU Writing Centers: tutoring.asu.edu/writing-centers
- ASU Police Department: cfo.asu.edu/police
- International Student Resources: students.asu.edu/international/support/academic

Q6.1. Explain why radioisotopes that produce gamma rays are used for imaging applications, and why those that produce beta or alpha particles would be poor choices.

P6.1. A worker is preparing a radiopharmaceutical containing a radioactive isotope of iodine to be used in a procedure requiring a source activity of 2.0 MBq. If the procedure will be performed approximately 2 days in the future, what source activity should initially be prepared if the isotope is: (a) iodine-123, with a half-life of 13 hours? (b) iodine-131, with a half-life of 8.05 days?

P6.2. Cobalt-60 has been used as a gamma ray source in radiation therapy procedures. Its half-life is 5.3 years. (a) Roughly, what fraction of the original source activity is left after 11 years? (b) Would you need to correct for radioactive decay over the course of a treatment lasting days or a few weeks? (Assume you wish to know the source activity to within a few percent.)

P6.3. You have been administered 100 MBq of technetium-99m for a radioisotope scan. About how long must you wait until your source activity falls to 25 MBq?

P6.4. If the physical half-life of sulfur-35 is 87.1 days, and the biologic half-life in the testicle is 632 days, what is its effective half-life in this organ?

P6.8. To understand the effect of attenuation on the measured gamma camera signal for 140 keV photons, compute the amount by which the actual count rate is attenuated for gamma photons that must travel through: (a) 1 cm and (b) 10 cm of soft tissue. (Use information from Chapter 5 regarding the attenuation of x-ray photons in water.)

P6.9. Time-of-flight PET scanners work by detecting the difference in times required for two coincidentally detected gamma rays to

P6.9. Time-of-flight PET scanners work by detecting the difference in times required for two coincidentally detected gamma rays to
travel to two detectors. The location of the positron that generated these gamma rays is then reconstructed using a calculation similar to that used in echo ranging in ultrasound imaging. (a) Explain how this information is used to compute distances. (Recall that gamma rays travel at the speed of light.) (b) The spatial resolution of such a device is limited by the smallest difference in time its detector electronics can distinguish. If such an instrument has a resolution of 3 cm, how well can it distinguish coincident times? If a PET scanner can distinguish times as small as 300 picoseconds (10^{-12} s), how well can it detect position?

Q7.2. If an individual received a dose of 1 Gy of radiation, what other information would you need to know about the circumstances of the exposure in order to judge the severity of the biological effects?

Q7.6. Why are multiple beams now used in radiation therapy? What are the advantages of employing such a geometry?

P7.1. The typical dose to the whole body from a conventional thallium-201 study is estimated to be 0.65 mGy per 1 MBq dose. Perform a crude worst-case estimate of this quantity, using the following numbers: $T_{1/2}$ = 72 hours; Φ = 0.8 (for a simple model assuming a sphere with the same mass as a typical person [60 kg] with a point radioactive source located at its center);* E = 68 to 80.3 keV gamma rays. (Assume 100% uptake and retention.)

P7.3. Would you expect to be able to detect the increase in cancer deaths due to the extra radiation dose received due to cosmic rays due to living at high altitudes? Assume the annual radiation doses due to cosmic rays are as follows:

Sea level: 41 millirem
Denver, Colorado (5000 ft.): 70 millirem
Leadville, Colorado (10,500 ft.): 160 millirem

Assume for this problem that the population of Denver, Colorado, is 1,600,000 and that of Leadville, 3900. (These are historical numbers, for reasons that will become apparent.) Assume for this problem that the BEIR risk estimates are valid. How many total excess cancer deaths would you expect due to the additional radiation exposure at high altitudes? Should this difference be detectable statistically in a study where you could somehow determine the cause of death of each one of the present residents over a long period of time? (Hint: Use the background cancer rates given in Chapter 7 to estimate the expected cancer deaths for exposures at sea level, and use the definition of statistical significance described in Chapter 7. Assume that you could control for all other possible influences on the cancer rate—an unlikely assumption at best.)

PHY 121

Polytechnic campus | MWF | 12:55-1:45pm | PICHO bldg., room 150
ASU Sync

Course and Faculty Information

Course Description: Kinematics; Newton's laws; work, energy, momentum, conservation laws; dynamics of particles, solids, and fluids.

Credits: 3

Prerequisites: MAT 265 or 270 with C or better; corequisite(s): MAT 266 or 271 with C or better if completed OR Visiting University Student.

Instructor: Dr. Michael Dugger

Contact Info: Office: Wanner Hall 340B. Email: dugger@asu.edu

Office Hours: Zoom session by appointment only

College Contact: This course is offered by the College of Integrative Sciences and Arts (CISA). For more information about the college, visit our website: https://cisa.asu.edu. If you have questions about this course, please speak with your instructor. If your instructor is unable to address your questions, please send your inquiry to cisa@asu.edu.

Course Format: Lecture MWF from 12:55 am to 1:45 am.

Required Textbook:

1. ***University Physics with Modern Physics*** (15th edition) by Hugh D. Young and Roger A. Freedman.

Assignments, Exams and Grading

Tentative schedule: The exact schedule for lectures, quizzes and examinations will depend on how long it takes to cover the material. The following is a tentative schedule:

Chapter 1:	Starts August 21
Chapter 2:	Starts August 28
Chapter 3:	Starts September 4
Chapter 4:	Starts September 18
Chapter 5:	Starts September 25
Chapter 6:	Starts October 5

Chapter 7:	Starts October 14
Chapter 8:	Starts October 21
Chapter 9:	Starts October 28
Chapter 10:	Starts November 6
Chapter 11:	Starts November 16
Chapter 13:	Starts November 23

Tentative exam dates:

September 16:	Chapter 1, 2, 3
October 12:	Chapter 4, 5, 6
November 4:	Chapter 7, 8, 9
November 30:	Chapter 10, 11, 13
December 4:	Comprehensive final

ASU Sync

This course is scheduled as an in-person (face-to-face) course. You will attend some class sessions in-person and be remote for other sessions to ensure we keep the room occupancy below 50%.

For the remote option, this course uses Sync. ASU Sync is a technology-enhanced approach designed to meet the dynamic needs of the class. During Sync classes, students learn remotely through live class lectures, discussions, study groups, and/or tutoring. You can find out more information about ASU Sync for students here: https://provost.asu.edu/sync/students.

To access live sessions of this class, go to MyASU and click the Attend via Sync button next to this class on your schedule.

Face Coverings

Everyone is required to wear a face cover while in ASU buildings and community spaces, regardless of distance. Face covers help prevent pre-symptomatic and asymptomatic individuals from inadvertently spreading COVID-19 to others. They are meant to protect others in case you are sick. Students will be required to wear a face cover in the classroom. For more information about face coverings, please visit the FAQ page.

Course Access

Your ASU courses can be accessed by both my.asu.edu and asu.instructure.com; bookmark both in the event that one site is down.

Computer Access Requirements

ASU Sync classes can be live streamed anywhere with the proper technology. We encourage you to use a PC or Apple laptop or desktop equipped with a built-in or standalone webcam. You will need an internet connection that can effectively stream live broadcasts. It is recommended that your internet download speed is at least 5.0 mbps. You can use this tool to test your current connection.

We do not recommend the use of iPads or Chromebooks for ASU Sync because these devices do not work for class exams that may be proctored remotely.

If you are not able to personally finance the equipment that you need to attend class via ASU Sync, ASU has a laptop and WiFi hotspot checkout program available through ASU Library.

Who is eligible?

- Any currently enrolled ASU student is eligible to checkout a laptop or WiFi hotspot. The current availability of laptops can be found here.

Borrowing and returning laptop rules

- Laptops are lent on a first-come, first-serve basis, and cannot be reserved in advance. They can be returned at any time, but will be due at the conclusion of the fall 2020 semester.
- Rentals are limited to one laptop per student.
- Laptops are available for checkout at the following libraries on all four campuses: (Please check online for current library hours)
    - Downtown Phoenix campus Library
    - Polytechnic campus Library
    - Tempe: Hayden and Noble Libraries
    - West campus: Fletcher Library
- Return laptops to any ASU Library Information Desk (not at the drop box or other location)
- Refer to ASU Library Computer Use Policy and ASU Computer, Internet, and Electronic Communications Policy.
- Borrowers are responsible for loss, damage, and theft of the laptop while in their possession. Borrowers should verify the condition of the laptop at the time of check-out and upon check-in.

Student Success

To be successful:

- check the course daily
- read announcements
- read and respond to course email messages as needed
- complete assignments by the due dates specified
- communicate regularly with your instructor and peers
- create a study and/or assignment schedule to stay on track
- access ASU Online Student Resources or CISA Academic Resources

Assignments and Exams:

Percentage Distribution:

Homework assignments	20%
Recitation	20%
Exams (4 out of 5)	60%
Total	**100%**

The lowest score from the five examination scores will be dropped in computing the semester average.

Course Grading System:
Grades will be determined by the percentage you accumulate:

A	90-100	Excellent
B	80-89.9	Good
C	70-79.9	Average
D	60-69.9	Passing
E	<60	Failure
XE		Failure due to Academic Dishonesty

For your own protection, you should keep a copy of everything you hand in, and you should keep your graded assignments at least until grades are finalized at the end of the semester, and in the event you wish to contest any grades.

Course Policies

Attendance is expected. Students are responsible for all material presented in class, all homework, and for all changes to the schedule or plans announced in class.

Homework: Late homework will **not** be accepted.

Extra Credit: There will be no extra credit opportunities assigned for this course.

Communicating with your Instructor and Classmates

Classroom Community

To build a course climate that is comfortable for all, it is important that students (1) display respect for all members of the class – including the instructor and students; (2) pay attention to and participate in all interactive student partner/instructor sessions and activities; and (3) observe the rules of appropriate online behavior (also known as *netiquette*). This term is defined by the instructor and includes keeping course discussion posts and oral communication with other students (or the instructor) focused on the assigned topics. Students must maintain a cordial atmosphere and use tact in expressing differences of opinion. In addition, they must avoid racist, sexist, homophobic, or other negative language that may

unnecessarily exclude course members. This is not an exhaustive list of behaviors; rather, it represents examples of the types of things that can have a dramatic impact on the course environment. Your final grade may be reduced each time you engage in the types of negative behaviors indicated above.

Email

ASU email is an official means of communication among students, faculty, and staff. Students are expected to read and act upon email in a timely fashion. Students bear the responsibility of missed messages and should check their ASU-assigned email regularly.

All instructor correspondence will be sent to your ASU email account.

Submitting Assignments

For your own protection, you should keep a copy of everything you hand in, and you should keep your graded assignments at least until grades are finalized at the end of the semester in the event you wish to contest any grades.

All assignments, unless otherwise announced by the instructor, MUST be submitted to the designated area of Canvas. Do not submit an assignment via email.

Assignment due dates follow Arizona Standard time. Click the following link to access the Time Converter to ensure you account for the difference in time zones. Note: Arizona does not observe daylight savings time.

Course Time Commitment

Coursework includes all learning activities including reading, watching videos, studying, and completing assignments. Arizona Board of Regents (ABOR) requires 45 hours of coursework per credit for college-level courses, which translates to:

- 1 credit hour = 45 total hours
- 2 credit hours = 90 total hours
- 3 credit hours = 135 total hours
- 4 credit hours = 180 total hours
- 5 credit hours = 225 total hours

ASU courses range in length from 6 weeks to 15 weeks. Below is a breakdown of the 135-hour required time commitment for a three-credit course divided among weeks for courses of various lengths.

Course Length	**Time on Coursework per Week for a 3-credit course**	**Total Time Requirement for a 3-credit Course**
6 weeks	22.5 hours	135 hours
7.5 weeks	18 hours	135 hours
8 weeks	17 hours	135 hours
15 weeks	9 hours	135 hours

Drop and Add Dates/Withdrawals

If you are unable to take this course for any reason, be aware that there is a limited timeline to drop or add the course. Consult with your advisor and notify your instructor to add or drop this course. If you are considering a withdrawal, review the following ASU policies: Withdrawal from Classes, Withdrawing as a Financial Aid Recipient, Medical/Compassionate Withdrawal, and a Grade of Incomplete.

Grade Appeals

Students must first speak with the instructor of the class to discuss any disputed grades. If, after review, a resolution is not achieved, students may proceed with the appeal process. Student grade appeals must be processed in the regular semester immediately following the issuance of the grade in dispute (by commencement for fall or spring), regardless whether the student is enrolled at the university. Complete details are available in the CISA Grade Appeals policy.

Academic Integrity

Academic honesty is expected of all students in all examinations, papers, laboratory work, academic transactions and records. The possible sanctions include, but are not limited to, appropriate grade penalties, course failure (indicated on the transcript as a grade of E), course failure due to academic dishonesty (indicated on the transcript as a grade of XE), loss of registration privileges, disqualification and dismissal. For more information, see provost.asu.edu/academicintegrity.

If you fail to meet the standards of academic integrity in any of the criteria listed on the university policy website, sanctions will be imposed by the instructor, college, and/or dean. Academic dishonesty includes, but is not limited to, cheating on an academic evaluation or assignment, plagiarizing, academic deceit (such as fabricating data or information), or falsifying academic records. Turning in an assignment (all or in part) that you completed for a previous class is considered self-plagiarism and falls under these guidelines. Any infractions of self-plagiarism are subject to the same penalties as copying someone else's work without proper citations. Students who have taken this class previously and would like to use the work from previous assignments should contact the instructor for permission to do so.

If you have any questions about your work and the academic integrity policy, please discuss your assignment or concerns with your instructor, teaching assistant, or your college Academic Integrity Officer in advance of submitting an assignment. Student resources on Sun Devil Integrity and strategies for completing your work with integrity and avoiding plagiarism are available here: ASU Student Resources for Academic Integrity or provost.asu.edu/academicintegrity for more information.

Harassment Prohibited

ASU policy prohibits harassment on the basis of race, sex, gender identity, age, religion, national origin, disability, sexual orientation, Vietnam era veteran status, and other protected veteran status. Violations of this policy may result in disciplinary action, including termination of employees or expulsion of students. Students are encouraged to report harassment to instructors and the Dean of Students Office.

Student Conduct

ASU and the College of Integrative Sciences and Arts expects and requires its students to act with honesty, integrity, and respect. Required behavior standards are listed in the Student Code of Conduct and Student Disciplinary Procedures, Computer, Internet, and Electronic Communications policy, ASU Student Academic Integrity Policy, and outlined by the Office of Student Rights & Responsibilities. Anyone in violation of these policies is subject to sanctions. Students are entitled to receive instruction free from interference by other members of the class. An instructor may withdraw a student from the course when the student's behavior disrupts the educational process per Instructor Withdrawal of a Student for Disruptive Classroom Behavior. The Office of Student Rights and Responsibilities accepts incident reports from students, faculty, staff, or other persons who believe that a student or a student organization may have violated the Student Code of Conduct.

Students must refrain from uploading to any course shell, discussion board, or website used by the course instructor or other course forum, material that is not the student's original work, unless the students first comply with all applicable copyright laws; faculty members reserve the right to delete materials on the grounds of suspected copyright infringement.

Title IX

Title IX is a federal law that provides that no person be excluded on the basis of sex from participation in, be denied benefits of, or be subjected to discrimination under any education program or activity. Both Title IX and university policy make clear that sexual violence and harassment based on sex is prohibited. An individual who believes they have been subjected to sexual violence or harassed on the basis of sex can seek support, including counseling and academic support, from the university. If you or someone you know has been harassed on the basis of sex or sexually assaulted, you can find information and resources at https://sexualviolenceprevention.asu.edu/faqs.

As a mandated reporter, I am obligated to report any information I become aware of regarding alleged acts of sexual discrimination, including sexual violence and dating violence. ASU Counseling Services, https://eoss.asu.edu/counseling, is available if you wish to discuss any concerns confidentially and privately.

Disability Accommodations

Qualified students with disabilities who will require disability accommodations in this class are encouraged to make their requests to the instructor at the beginning of the semester either during office hours or by appointment. Note: Prior to receiving disability accommodations, verification of eligibility from the Disability Resource Center (DRC) is required. Disability information is confidential.

Disability Resource Center (eoss.asu.edu/drc)
Email: DRC@asu.edu
DRC Phone: 480-965-1234
DRC FAX: 480-965-0441

Statement on Inclusion

Arizona State University is deeply committed to positioning itself as one of the great new universities by seeking to build excellence, enhance access, and have an impact on our community, state, nation, and the world. To do that requires our faculty and staff to reflect the intellectual, ethnic, and cultural diversity of our nation and world so that our students learn from the broadest perspectives, and we engage in the

advancement of knowledge with the most inclusive understanding possible of the issues we are addressing through our scholarly activities. We recognize that race and gender historically have been markers of diversity in institutions of higher education. However, at ASU, we believe that diversity includes additional categories such as socioeconomic background, religion, sexual orientation, gender identity, age, disability, veteran status, nationality, and intellectual perspective.

Mental Health

As a student, like anyone else, you may experience a range of challenges that can interfere with learning, such as strained relationships, increased anxiety, substance use, feeling down, difficulty concentrating, and/or lack of motivation. These emotional health concerns or stressful events may diminish your academic performance and/or reduce your ability to participate in daily activities. ASU Counseling Services provides counseling and crisis services for students who are experiencing a mental health concern. Any student may call or walk-in to any ASU counseling center for a same-day or future appointment to discuss any personal concern. Here is the website: eoss.asu.edu/counseling. After office hours and 24/7 ASU's dedicated crisis line is available for crisis consultation by calling 480-921-1006.

Establishing a Safe Environment

Learning takes place best when a safe environment is established in the classroom. In accordance with SSM 104-02 of the Student Services Manual, students enrolled in this course have a responsibility to support an environment that nurtures individual and group differences and encourages engaged, honest discussions. The success of the course rests on your ability to create a safe environment where everyone feels comfortable to share and explore ideas. We must also be willing to take risks and ask critical questions. Doing so will effectively contribute to our own and others' intellectual and personal growth and development. We welcome disagreements in the spirit of critical academic exchange, but please remember to be respectful of others' viewpoints, whether you agree with them or not.

All incidents and allegations of violent or threatening conduct by an ASU student (whether on- or off-campus) must be reported to the ASU Police Department (ASU PD) and the Office of the Dean of Students. If either office determines that the behavior poses or has posed a serious threat to personal safety or to the welfare of the campus, the student will not be permitted to return to campus or reside in any ASU residence hall until an appropriate threat assessment has been completed and, if necessary, conditions for return are imposed. ASU PD, the Office of the Dean of Students, and other appropriate offices will coordinate the assessment in light of the relevant circumstances.

Prohibition of Commercial Notetaking Services

In accordance with ACD 304-06 Commercial Note Taking Services, written permission must be secured from the official instructor of the class in order to sell the instructor's oral communication in the form of notes. Notes must have the note taker's name as well as the instructor's name, the course number, and the date.

Course Evaluation

Students are expected to complete the course evaluation. The feedback provides valuable information to the instructor and the college and is used to improve student learning. Students are notified when the

online evaluation form is available. The results are always anonymous and cannot be reviewed by the instructor/department until after final grades have been posted.

Trigger Warning

Please note that some course content may be deemed offensive by some students, although it is not my intention to offend anyone. In addition, some materials that we link with online might also be considered offensive, troubling, or difficult to review in terms of language or graphics. I attempt to provide warnings when introducing this kind of material; yet, if I forget to do so, or if something else (in my materials or posts from fellow students) seems offensive, please contact me at **dugger@asu.edu**, or the faculty head.

Academic Affairs Manual

For a complete guide to Arizona State University course policies, please refer to the Academic Affairs Manual (ACD).

Syllabus Disclaimer

The syllabus is a statement of intent and serves as an implicit agreement between the instructor and the student. Every effort will be made to avoid changing the course schedule but the possibility exists that unforeseen events will make syllabus changes necessary. Remember to check your ASU email and the course site often.

1.5 • How many years older will you be 1.00 gigasecond from now? (Assume a 365-day year.)

1.6 • The following conversions occur frequently in physics and are very useful. (a) Use 1 mi = 5280 ft and 1 h = 3600 s to convert 60 mph to units of ft/s. (b) The acceleration of a freely falling object is 32 ft/s^2. Use 1 ft = 30.48 cm to express this acceleration in units of m/s^2. (c) The density of water is 1.0 g/cm^3. Convert this density to units of kg/m^3.

1.9 •• **Neptunium.** In the fall of 2002, scientists at Los Alamos National Laboratory determined that the critical mass of neptunium-237 is about 60 kg. The critical mass of a fissionable material is the minimum amount that must be brought together to start a nuclear chain reaction. Neptunium-237 has a density of 19.5 g/cm^3. What would be the radius of a sphere of this material that has a critical mass?

1.11 • With a wooden ruler, you measure the length of a rectangular piece of sheet metal to be 12 mm. With micrometer calipers, you measure the width of the rectangle to be 5.98 mm. Use the correct number of significant figures: What are (a) the area of the rectangle; (b) the ratio of the rectangle's width to its length; (c) the perimeter of the rectangle; (d) the difference between the length and the width; and (e) the ratio of the length to the width?

1.13 •• A useful and easy-to-remember approximate value for the number of seconds in a year is $\pi \times 10^7$. Determine the percent error in this approximate value. (There are 365.24 days in one year.)

1.24 •• Let θ be the angle that the vector $\vec{A}$ makes with the $+x$-axis, measured counterclockwise from that axis. Find angle θ for a vector that has these components: (a) $A_x = 2.00$ m, $A_y = -1.00$ m; (b) $A_x = 2.00$ m, $A_y = 1.00$ m; (c) $A_x = -2.00$ m, $A_y = 1.00$ m; (d) $A_x = -2.00$ m, $A_y = -1.00$ m.

1.25 • Compute the x- and y-components of the vectors $\vec{A}$, $\vec{B}$, $\vec{C}$, and $\vec{D}$ in Fig. E1.22.

1.32 •• Vector $\vec{A}$ has magnitude 8.00 m and is in the xy-plane at an angle of 127° counterclockwise from the $+x$-axis (37° past the $+y$-axis). What are the magnitude and direction of vector $\vec{B}$ if the sum $\vec{A} + \vec{B}$ is in the $-y$-direction and has magnitude 12.0 m?

1.34 • In each case, find the x- and y-components of vector $\vec{A}$: (a) $\vec{A} = 5.0\hat{i} - 6.3\hat{j}$; (b) $\vec{A} = 11.2\hat{j} - 9.91\hat{i}$; (c) $\vec{A} = -15.0\hat{i} + 22.4\hat{j}$; (d) $\vec{A} = 5.0\vec{B}$, where $\vec{B} = 4\hat{i} - 6\hat{j}$.

1.35 •• Write each vector in Fig. E1.22 in terms of the unit vectors $\hat{i}$ and $\hat{j}$.

1.36 •• Given two vectors $\vec{A} = 4.00\hat{i} + 7.00\hat{j}$ and $\vec{B} = 5.00\hat{i} - 2.00\hat{j}$. (a) find the magnitude of each vector; (b) use unit vectors to write an expression for the vector difference $\vec{A} - \vec{B}$; and (c) find the magnitude and direction of the vector difference $\vec{A} - \vec{B}$. (d) In a vector diagram show $\vec{A}$, $\vec{B}$, and $\vec{A} - \vec{B}$, and show that your diagram agrees qualitatively with your answer to part (c).

1.39 • Given two vectors $\vec{A} = -2.00\hat{i} + 3.00\hat{j} + 4.00\hat{k}$ and $\vec{B} = 3.00\hat{i} + 1.00\hat{j} - 3.00\hat{k}$, (a) find the magnitude of each vector; (b) use unit vectors to write an expression for the vector difference $\vec{A} - \vec{B}$; and (c) find the magnitude of the vector difference $\vec{A} - \vec{B}$. Is this the same as the magnitude of $\vec{B} - \vec{A}$? Explain.

1.40 •• (a) Find the scalar product of the vectors $\vec{A}$ and $\vec{B}$ given in Exercise 1.36. (b) Find the angle between these two vectors.

1.41 • For the vectors $\vec{A}$, $\vec{B}$, and $\vec{C}$ in Fig. E1.22, find the scalar products (a) $\vec{A} \cdot \vec{B}$; (b) $\vec{B} \cdot \vec{C}$; (c) $\vec{A} \cdot \vec{C}$.

1.42 •• Find the vector product $\vec{A} \times \vec{B}$ (expressed in unit vectors) of the two vectors given in Exercise 1.36. What is the magnitude of the vector product?

1.43 •• Find the angle between each of these pairs of vectors:
(a) $\vec{A} = -2.00\hat{i} + 6.00\hat{j}$ and $\vec{B} = 2.00\hat{i} - 3.00\hat{j}$

1.45 • For the two vectors $\vec{A}$ and $\vec{D}$ in Fig. E1.22, find the magnitude and direction of (a) the vector product $\vec{A} \times \vec{D}$; (b) the vector product $\vec{D} \times \vec{A}$.

1.46 • For the two vectors $\vec{A}$ and $\vec{B}$ in Fig. E1.37, find (a) the scalar product $\vec{A} \cdot \vec{B}$; (b) the magnitude and direction of the vector product $\vec{A} \times \vec{B}$.