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, 2019 – December 31, 2019. 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 17, 2020**. Name the report using the format LastName_annual_report_2019.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 2019 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

Response:

I was a coauthor on three papers regarding experimental measurements of meson photoproduction off the proton [1-3]. Of those papers, two were with the GlueX Collaboration [1,2], while the remaining paper [3] was with the CEBAF Large Acceptance Spectrometer (CLAS) Collaboration.

[1] S. Adhikari *et al*., *Beam Asymmetry Σ for the photopriduction of the η and η' Mesons at Eγ = 8.8 GeV*, Phys. Rev. **C100** (2019), 052201.

[2] A. Ali *et al*., *First Measurement of Near-Threshold J/ψ Exclusive Photoproduction off the Proton*, Phys. Rev. Lett. **123** (2019), 07201.

[3] P. Roy *et al*., *First Measurements of the Double-Polarizatoin Observables F, P, and H in ω Photoproduction off Transversely Polarized Protons in the N* Resonance Region*, Phys. Rev. Lett. **122** (2019), 162301.

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: $145,000).

5. Proposals submitted. Include funding agency, amount requested, degree of involvement (%, PI, Co-PI, etc.), and dates.

6. Invited addresses, such as keynotes

7. Conference presentations and papers

8. Professional-development workshops attended

9. Travel to collections for research purposes

Response:
I travelled to Jefferson Lab in Newport News Virginia from Oct. 10 through Oct. 15 for the purpose of maintenance and testing of the ASU polarimeter that I designed and built for the Hall-D GlueX collaboration. While at lab I gave a presentation regarding the test results [1]. After the routine maintenance, the device was successfully used for the purpose of obtaining scientific data.
[4] https://www.public.asu.edu/~dugger/polarimeter/hardwareF19.pdf presentation at the GlueX beamline meeting 10-14-2019

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)[4-10,13,15-17]:
    - Maintenance, testing and threshold study of TPOL [4]
    - Comparison of results between software revisions [5-10]
    - Dead sector and energy distributions for 2018 dataset [13]
    - Filter board plans and potential dead-sector fix [15]
    - Cable swaps, dead-sector corrections and filter board creation [16]
    - Results for data using 75-micron beryllium convertor [17]
- Presentations related to hyperon (Λ, Σ, Ξ) production [11,12,14]:
    - Lambda baryons with the GlueX detector [11]
    - Discovery of missing Ξ states ? [12]
    - Study of data inconsistencies for GlueX kaon data [14].

[5] https://userweb.jlab.org/~dugger/triPol/oldNewComp.pdf presentation at the GlueX beamline meeting 1-9-2019
[6] https://userweb.jlab.org/~dugger/triPol/oldNewComp2.pdf presentation at the GlueX beamline meeting 1-23-2019
[7] https://userweb.jlab.org/~dugger/triPol/oldNewComp3.pdf presentation at the GlueX beamline meeting 2-4-2019
[8] https://www.public.asu.edu/~dugger/polarimeter/w19DuggerV2-2-22-19.pdf presentation at the Winter GlueX Collaboration meeting 2-22-2019
[9] https://userweb.jlab.org/~dugger/triPol/eDiffCut.pdf presentation at the GlueX beamline

meeting 3-18-2019
[10] https://www.public.asu.edu/~dugger/polarimeter/spring2019Dugger-5-14-19.pdf presentation at the Summer GlueX Collaboration meeting 5-14-19
[11] https://userweb.jlab.org/~dugger/glueX/glueXAnaV1.pdf presentation at the GlueX physics working group meeting 7-9-2019
[12] https://userweb.jlab.org/~dugger/glueX/glueXAnaV2c.pdf presentation at the GlueX hyperon working group meeting 7-25-2019
[13] https://userweb.jlab.org/~dugger/triPol/tpol18DataT1.pdf presentation at the GlueX beamline meeting 8-5-2019
[14] https://userweb.jlab.org/~dugger/glueX/glueXAnaV3.pdf presentation at the GlueX hyperon meeting 8-8-2019
[15] https://userweb.jlab.org/~dugger/triPol/tpol18DataT2.pdf presentation at the GlueX beamline meeting 9-4-2019
[16] https://www.public.asu.edu/~dugger/polarimeter/tpolFall19Dugger.pdf presentation at the GlueX collaboration meeting 10-3-2019
[17] https://userweb.jlab.org/~dugger/triPol/tpol18DataT3.pdf presentation at the GlueX beamline meeting 12-9-2019

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 S19, Su19, and F19 (add more lines as needed).

Semester/ Year	Prefix/ Number	Course Title	Enrollment number	Credit hours	SCH
S19	PHY321	Vector Mechanics and Vibration	39	3	117
Su19	PHY112	General Physics	26	3	78
Su19	PHY792	Research	1	1	1
F19	PHY321	Vector Mechanics and Vibration	38	3	114
F19	PHY495	Project Research	1	3	3
F19	PHY792	Research	2	3	6
				Total SCH =	319

Special circumstances: Su19 PHY112 was a first-time prep.

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 19	PHY321; 25147	Lecture	1.9
Summer 19	PHY112; 41612	Lecture	1.3
Fall 19	PHY 321; 86446	Lecture	1.2
Fall 19	PHY 495; 94788	Lecture	1.0

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.

As can be seen in the above table, the response from my students for Question 17 were close to the optimal value for the summer and fall semesters. The resulting score from the spring semester was 1.9 and was further than optimal than I like. A breakdown of the scores for Question 1 through 17 are shown in Figure 1 below. In general, the scores improved as 2019 progressed. I am trying to keep the results of all questions below a value of 2 and that was achieved for the fall 2019 semester.

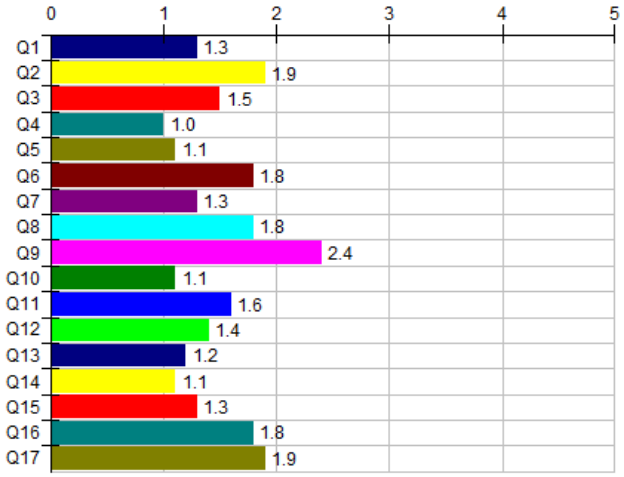

Figure 1: PHY 321, Spring 2019

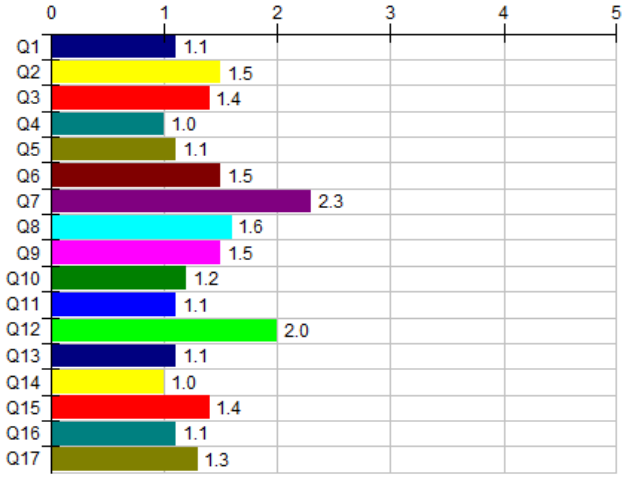

Figure 2:PHY 112, Summer 2019

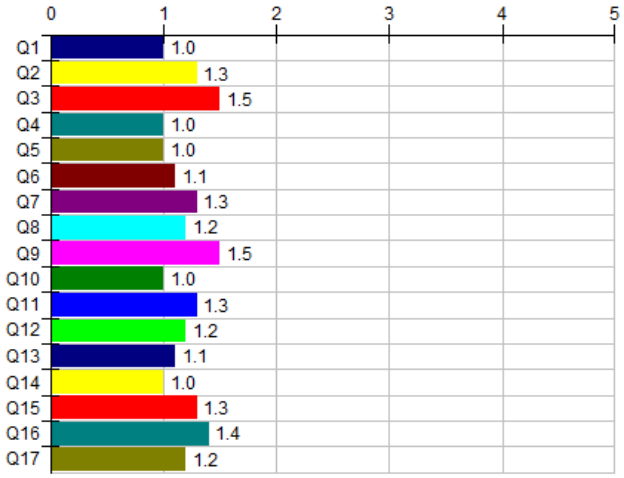

Figure 3: PHY 321, Fall 2019

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 has given several presentations during my time mentoring him over this year [18-22].
- Brandon Sumner (graduate student): I supervised Brandon for PHY 792, I am his advisor and will be the chair of his committee when it has been formed. Brandon is taking over the analysis of possible new hyperon Ξ states that were explored in a presentation I gave to the GlueX hyperon group [12].
- 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 PHY 495 from me during the fall 2019 semester and presented a poster related to his work with me [23]. Mohamed also helped construct the electronic filter boards that can be found on slide 13 of the talk I gave at the GlueX Collaboration meeting [16].

[18] http://www.public.asu.edu/~dugger/student2019/KStarK_new-8-22-19.pdf presentation at the GlueX hyperon meeting 8-22-2019
[19] http://www.public.asu.edu/~dugger/student2019/DeltaTStudy_new-9-5-19.pdf presentation at the GlueX hyperon meeting 9-5-2019
[20] http://www.public.asu.edu/~dugger/student2019/KStarK_Oct4_2019_CollaborationMeeting.pdf presentation at the GlueX Collaboration meeting 10-4-2019
[21] http://www.public.asu.edu/~dugger/student2019/KStarK-DNP-10-14-19.pdf presentation at the Fall Meeting of the American Physical Society Division of Nuclear Physics, 10-14-2019, Crystal City VA.
[22] http://www.public.asu.edu/~dugger/student2019/DeltaTStudyResponse-11-14-19.pdf presentation at the GlueX hyperon meeting 11-14-2019
[23] http://www.public.asu.edu/~dugger/student2019/PosterMoMoV2.pdf presentation at the CISA Student Research Forum on 12-4-2019.

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.

8. Teaching awards you have received.

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

Response:

I have put together a medical physics course at ASU (PHY 394) and am instructing that course during this 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 mentored undergraduate student Eric Bryan during the spring semester. Eric worked on particle identification studies using data from Jefferson Lab.
- I have been mentoring undergraduate student Rebecca Osar since the fall semester. Rebecca is a very talented freshman and she has been working on C++ code related to the creation of a neural net to be used for particle identification studies.

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, 2017, 2018, 2019.

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 three articles and two proceedings:

- Article review for Physical Reviews C (10-23-2017 to 12-11-2017).
- 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).

Committee work to the profession:

- Member of the International Advisory Committee for the MENU (Meson Nucleon) 2019 Conference, 2018-2019.
- Review Committee member of the 2018 Division of Nuclear Physics, Conference Experience for Undergraduates, 2018.

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

Response:
I have been designated within the CLAS collaboration as the coordinator for Ω^- and Ξ baryon analyses. This position started in July 2017 and is ongoing.

I served on several collaboration review committees over the past three years:

- GlueX collaboration analysis/paper review committee member for "Measurement of the beam asymmetry Σ for π^0 and η photoproduction on the proton at E = 9 GeV". Started 10-8-2016 and ended 3-20-2017.
- CLAS collaboration analysis review committee member for "Photoproduction of 3 π with CLAS g12". Started 4-5-2017 and is ongoing.
- CLAS collaboration paper review committee member for "The Beam-Target E asymmetry for $\gamma n \rightarrow \pi^- p$ in the N^* resonance region". Started 3-14-2017 and ended on 4-1-2017.
- CLAS collaboration paper review committee member for "$\gamma n \rightarrow \pi^- p$ Differential Cross Section Measurements with CLAS". Started 3-9-2017 and ended on 5-11-2017.
- CLAS collaboration analysis review committee member for "*Determination of E double polarization observable for the reaction gn—>K+Sigma- from g14*" Started on 11-9-2017 and is ongoing.
- CLAS collaboration analysis review committee member for "*E asymmetry for g n -> π^- p from g14 (HDice) data*". Started 4-8-2017 and ended on 9-9-2017.

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 and 2019.

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 2019 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 2020 year, my goal is to assist my graduate students in discovering new baryonic Ξ states and hybrid mesons.

Teaching goals: During the 2020 year my goal is to keep 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	**2017**	**2018**	**2019**	**2020 (projected)**
Teaching	20%	20%	30%	40%
Research/Creative Activity	20%	20%	30%	40%
Service	10%	10%	15%	20%

Supplemental material for PHY 321 (fall 2019):

Supplemental material for PHY 112 (summer 2019):

PHY-321
Vector Mechanics and Vibration
Polytechnic campus | TTh | 3:00-4:15am | SANTN bldg., room 132

Instructor information

Name:Dr. Michael Dugger
Office Location: Wanner Hall 340B (Poly), Physical Sciences F-wing 319 (Tempe)
Office Hours: My office hours will be on Tuesday and Thursday from 4:30 pm to 5:30 pm at the Poly location. You can also make an appointment by contacting me via email.
Email: dugger@asu.edu or dugger@jlab.org
Phone Number:480-727-1109 (Poly), 480-727-0024 (Tempe office), and 480-965-0728 (Tempe 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 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 8
Chapter 12:	Starts January 22
Chapter 13:	Starts February 5
Chapter 14:	Starts February 12
Chapter 15:	Starts February 26
Chapter 16:	Starts March 14
Chapter 17:	Starts March 21

Chapter 19:	Starts April 4

Tentative exam dates:

January 31:	Chapter 11 and 12
February 21:	Chapter 13 and 14
April 2:	Chapter 15, 16, 17 and 18
April 23:	Chapter 19
April 30:	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):

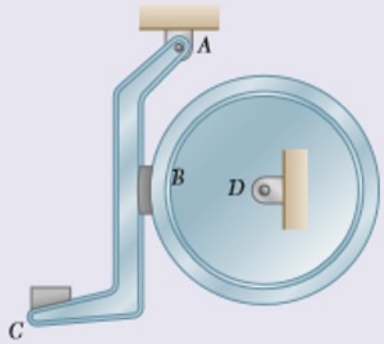

Fig. P15.1

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.

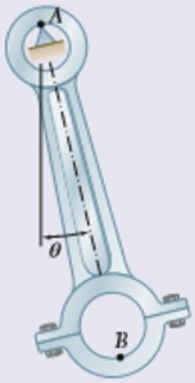

Fig. P15.6

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.

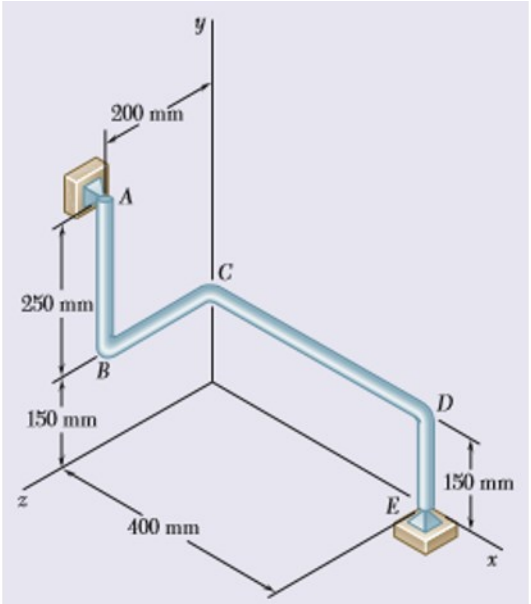

Fig. P15.10

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*.

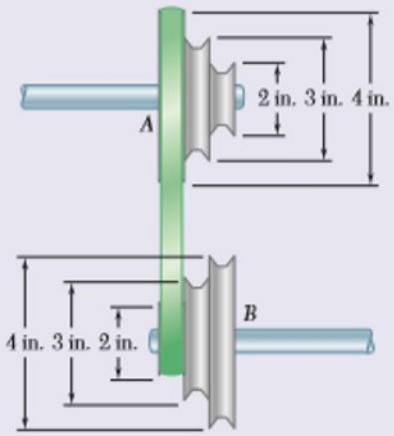

Fig. P15.22

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.

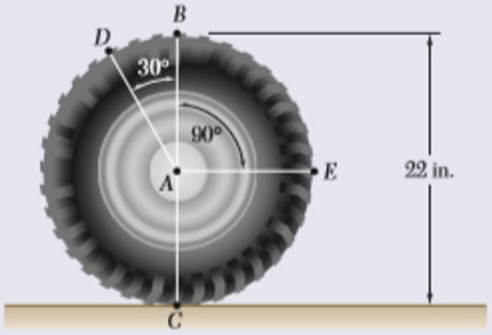

Fig. P15.38

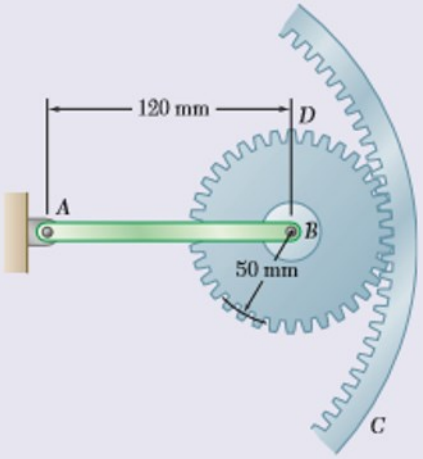

Fig. P15.50

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*.

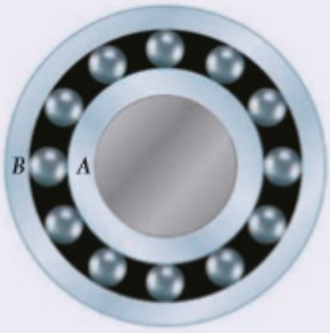

Fig. P15.51

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.

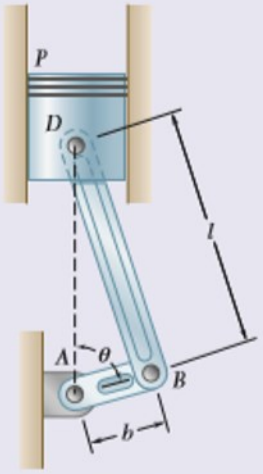

Fig. P15.61 and P15.62

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 $\theta = 60°$.

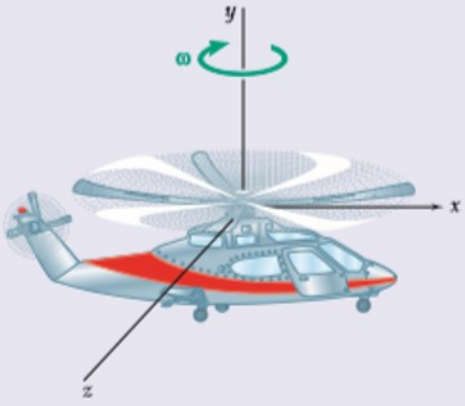

Fig. P15.75

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.

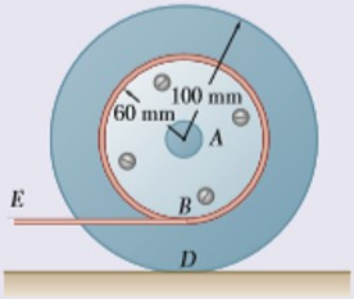

Fig. P15.76

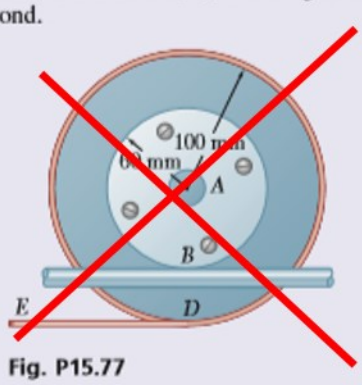

Fig. P15.77

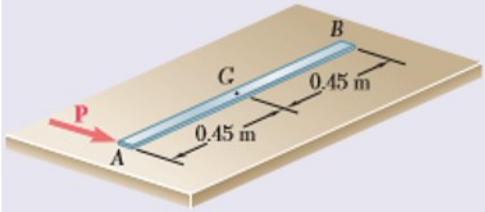

Fig. P15.107 and P15.108

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.

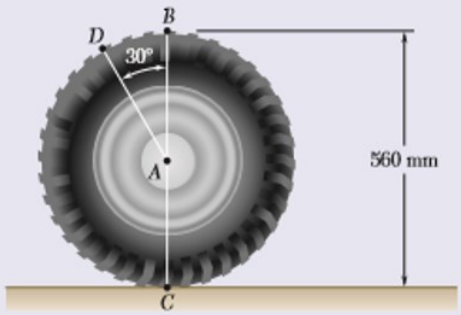

Fig. P15.111

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.

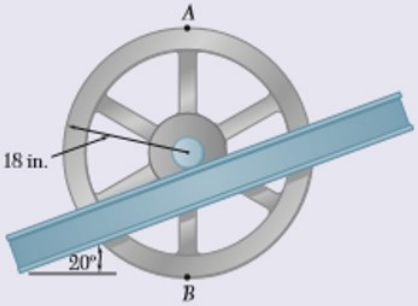

Fig. P15.112

PHY-112
General Physics
Polytechnic campus | M-Th | 9:00-10:45am | Peralta Hall, room 130

Instructor information

Name: Dr. Michael Dugger
Office Location: Wanner Hall 340B (Poly), Physical Sciences F-wing 319 (Tempe)
Office Hours: My office hours will be Monday through Thursday from 11:00 am to 12:00 pm at the Poly location. You can also make an appointment by contacting me via email.
Email: dugger@asu.edu or dugger@jlab.org
Phone Number:480-727-1109 (Poly), 480-727-0024 (Tempe office), and 480-965-0728 (Tempe 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 M-Th from 10:00 am to 10:45 am.

Course Description: This course is the second semester of College Physics. The focus of this class is on electricity, magnetism, electric current, the behavior of waves, and optics.

Required Textbook:

2. ***College Physics, a strategic approach*** (4^{th} edition) by Knight.

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 20 (Electric field and forces):	Starts July 3
Chapter 21 (Electric potential):	Starts July 9
Chapter 22 (Current and resistance):	Starts July 11
Chapter 23 (Circuits):	Starts July 16
Chapter 24 (Magnetic fields and forces):	Starts July 22
Chapter 25 (Electromagnetic induction and E-M waves):	Starts July 25
Chapter 26 (AC electricity):	Starts July 31
Chapter 18 (Ray optics):	Starts August 5

Chapter 17 (Wave optics):	Starts August 6
Chapter 29 (Atoms and molecules)	Starts August 8

Tentative exam dates:

July 18;	Chapter 20, 21, 22 and 23
August 1:	Chapter 24, 25 and 26
August 13:	Chapter 17, 18 and 29

Assignments and Exams:

Percentage Distribution:	
Homework assignments	20%
Recitation	20%
Exam 1	20%
Exam 2	20%
Exam 3	20%
Total	**100%**

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):

27. I In Figure Q25.27, a square loop is rotating in the plane of the page around an axis through its center. A uniform magnetic field is directed into the page. What is the direction of the induced current in the loop?
A. Clockwise.
B. Counterclockwise.
C. There is no induced current.

FIGURE Q25.27

29. II Figure Q25.29 shows a triangular loop of wire in a uniform magnetic field. If the field strength changes from 0.30 to 0.10 T in 30 ms, what is the induced emf in the loop?
A. 0.08 V B. 0.12 V
C. 0.16 V D. 0.24 V
E. 0.36 V

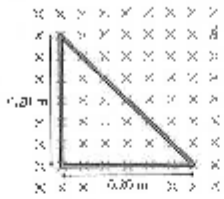

FIGURE Q25.29

31. The electromagnetic waves sent every FM radio range in frequency from 87.9 MHz to 107.9 MHz. What is the range of wavelengths of these radio waves?
A. 500–750 nm B. 0.87–91.06 m
C. 2.78–3.41 m D. 278–341 m
E. 234–410 km

33. I A spacecraft in orbit around the moon measures its altitude by reflecting a pulsed 10 MHz radio signal from the surface. If the spacecraft is 10 km high, what is the time between the emission of the pulse and the detection of the echo?
A. 33 ns B. 67 ns
C. 33 μs D. 67 μs

35. I A 10-cm-long wire is pulled along a U-shaped conducting rail in a perpendicular magnetic field. The total resistance of the wire and rail is 0.20 Ω. Pulling the wire with a force of 1.0 N causes 4.0 W of power to be dissipated in the circuit.
a. What is the speed of the wire when pulled with a force of 1.0 N?
b. What is the strength of the magnetic field?

5. II A 50 g horizontal metal bar, 12 cm long, is free to slide up and down between two tall, vertical metal rods that are 12 cm apart. A 0.050 T magnetic field is directed perpendicular to the plane of the rods. The bar is raised to near the top of the rods, and a 1.0 Ω resistor is connected across the two rods at the top. Then the bar is dropped. What is the terminal speed at which the bar falls? Assume the bar remains horizontal and in contact with the rods at all times.

7. I A delivery truck with 2.8-m-high aluminum sides is driving west at 75 km/h in a region where the earth's magnetic field is $\vec{B} = (5.0 \times 10^{-5}\ \text{T, north})$.
a. What is the potential difference between the top and the bottom of the truck's side panels?
b. Will the top of the panels be positive or negative relative to the bottom?

9. I Figure P25.9 is an edge-on view of a 10-cm-diameter circular loop rotating in a uniform 0.050 T magnetic field. What is the magnetic flux through the loop when θ is 0°, 30°, 60°, and 90°?

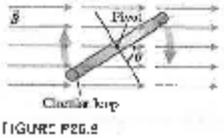

FIGURE P25.9

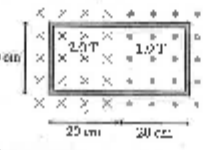

FIGURE P25.10

11. I The 2.0-cm-diameter solenoid in Figure P25.11 passes through the center of a 5.0-cm-diameter loop. The magnetic field inside the solenoid is 0.20 T. What is the magnetic flux through the loop (a) when it is perpendicular to the solenoid and (b) when it is tilted at a 60° angle?

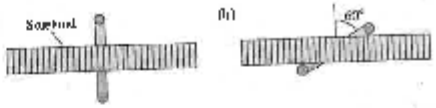

FIGURE P25.11

13. I The metal equilateral triangle in Figure P25.13, 20 cm on each side, is halfway into a 0.10 T magnetic field.
a. What is the magnetic flux through the triangle?
b. If the magnetic field strength decreases, what is the direction of the induced current in the triangle?

FIGURE P25.13

15. I A 1000-turn coil of wire 2.0 cm in diameter is in a magnetic field that drops from 0.10 T to 0 T in 10 ms. The axis of the coil is parallel to the field. What is the emf of the coil?

17. I Figure P25.17 shows a 10-cm-diameter loop in three different magnetic fields. The loop's resistance is 0.10 Ω. For each case, determine the induced emf, the induced current, and the direction of the current.

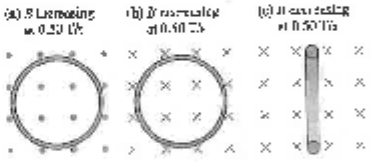

FIGURE P25.17

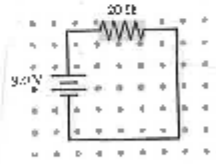

FIGURE P25.21

21. II The circuit of Figure P25.21 is a square 20 cm on a side. The magnetic field increases steadily from 0 T to 0.50 T in 10 ms. What is the current in the resistor during this time?

25. I What is the electric field amplitude of an electromagnetic wave whose magnetic field amplitude is 2.0 mT?

35. The intensity of a polarized electromagnetic wave is 10 W/m². What will be the intensity after passing through a polarizing filter whose axis makes the following angles with the plane of polarization? (a) $\theta = 0°$, (b) $\theta = 30°$, (c) $\theta = 45°$, (d) $\theta = 60°$, (e) $\theta = 90°$.

37. II Only 25% of the intensity of a polarized light wave passes through a polarizing filter. What is the angle between the electric field and the axis of the filter?

39. || A 50 mW laser beam is polarized horizontally. It then passes through two polarizers. The axis of the first polarizer is oriented at 30° from the horizontal, and that of the second is oriented at 60° from the horizontal. What is the power of the transmitted beam?

41. | What is the energy (in eV) of an x-ray photon that has a wavelength of 1.0 nm?

47. | The intensity of electromagnetic radiation from the sun reaching the earth's upper atmosphere is 1.37 kW/m^2. Assuming an average wavelength of 680 nm for this radiation, find the number of photons per second that strike a 1.00 m^2 solar panel directly facing the sun on an orbiting satellite.