

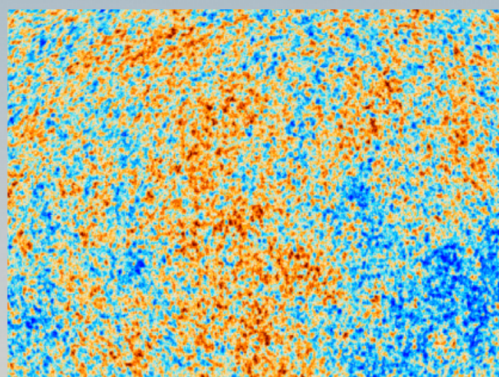
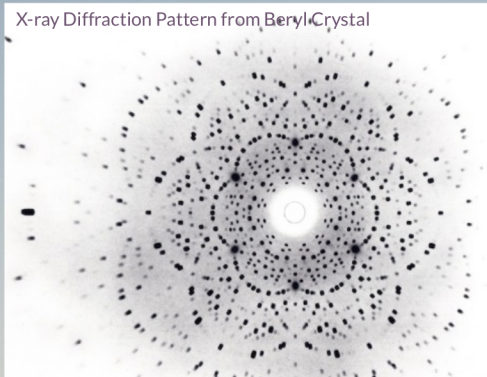
PHYS 224

Vibrations and Waves

Fall 2022

Join the SLACK:
phys224umbc.slack.com
and find class on
blackboard.umbc.edu

X-ray Diffraction Pattern from Beryl Crystal

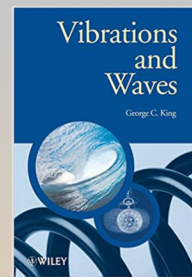


Learning Goals: To understand and quantitatively describe simple, damped, driven, and coupled oscillators, travelling and standing waves, as well as wave interference, diffraction, and dispersion of waves. Anticipate an interactive environment where your participation is expected. Demonstrations, small computer simulations, as well as quantitative and qualitative problem solving will be an integral part of the course.

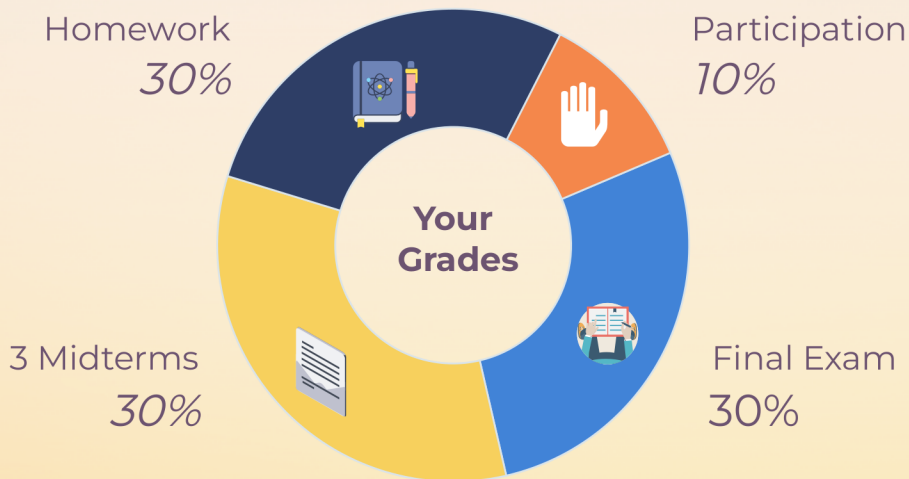
What to expect each week:

- **Class:** M/W/F 11-11:50 in Physics 201
- **Before each class:** ✓ pre-class reading
✓ problem of the day check-in on blackboard
- **Homework quiz:** 3 Problems posted on Monday, 1 is on quiz on Friday

Textbook



"Vibrations and Waves" by George King



Need Help?

- Ask on Slack!
- Office Hours!
sign up here:
tinyurl.com/phys224oh

- Get tutoring:
 <https://academicsuccess.umbc.edu/>



Contact/Find Me:

Dr. Eileen Meyer, meyer@umbc.edu, Phys 312

Syllabus

Instructor: Dr. Eileen Meyer (PHYS 312, meyer@umbc.edu tel:410-455-2534)

Lectures: M/W/F 11:00 AM - 11:50 AM in Physics 201

Office Hours: Are held by appointment in Phys 312. You must sign up at least 1 hour in advance using our appointment calendar: tinyurl.com/phys224oh

Appointment slots are 10 minutes, and you may sign up for one or more (up to 2 students per slot). Typically, appointments will be open M/F from 9-9:40 and Wednesday 8:50-10:00 AM, but may vary by week due to research travel, daycare closures, etc. Please check and sign up in advance! If you cannot find a suitable time, you may contact me on Slack to set up a meeting or to request help online.

Textbook: George C. King, *Vibrations and Waves*

Learning Goals and Course Overview: By the end of the course, students should be able to understand and quantitatively address situations including oscillations with and without damping and with or without a driving force, coupled oscillators, travelling and standing waves, as well as wave interference, diffraction, and dispersion of waves. Anticipate an interactive environment where your participation is expected. Demonstrations, small computer simulations, as well as quantitative and qualitative problem solving will be an integral part of the lectures.

Resources:

- **Blackboard.** This course will rely on blackboard for course announcements and to disseminate weekly homework, solutions, etc. Lecture notes will also be made available on blackboard.
- **Textbooks.** We will rely primarily on the required book "*Vibrations and Waves*" by George C. King, but additional material will be provided through notes, videos, and excerpts from other texts as needed (see blackboard for these postings).
- **Slack:** It is mandatory that all students sign up for the slack group for this class, phys224umbc.slack.com. Please put the slack client on at least one regularly used electronic device (laptop, phone, ipad, etc) and preferably all of those you use regularly. Be sure to sign into the class so that you receive notifications. Slack is a communication platform which you can use to ask questions in general (to the entire class) or to message me or other students individually.
- **Schedule:** Please print out and refer regularly to the course schedule posted on blackboard. In particular, *you will be expected to have done the listed reading prior to attending class.*

Academic Integrity: By enrolling in this course, each student assumes the responsibilities of an active participant in UMBC's scholarly community in which everyone's academic work and behavior are held to the highest standards of honesty. Cheating, fabrication, plagiarism,

and helping others to commit these acts are all forms of academic dishonesty, and they are wrong. Academic misconduct could result in disciplinary action that may include, but is not limited to, suspension or dismissal. To read the full Student Academic Conduct Policy, consult the UMBC Student Handbook, the Faculty Handbook, and the UMBC Policies section of the UMBC Directory.

GRADING

Your final letter grade will be determined by a numerical score, calculated as follows:

Homework (30%) Homework questions will provide good practice for the types of questions likely to be posed on the mid terms and final exams. A homework will be assigned every week. Students are expected to solve all the problems of the homework but are not required to turn them in. In the beginning of the class on the due day of the homework, students will be given 15 min to clearly reproduce the solution of one the homework problems selected by the instructor.

Midterm exams (3 total, 10% each): Each midterm will primarily focus on the new material covered since the previous exam (though in some cases it is inevitable that you will need to remember what you learned earlier in the course). Midterms are in-class unless you have an accommodation letter on file with the office of student disability services (sds.umbc.edu). In such cases please note that the student is required to file a request for use of the testing center at least two business days before the exam (and preferably, much earlier). The midterms will be held on Sep 30, Oct 28, and Nov 23. The final exam will likely be December 16th (subject to change when the actual final exam schedule is announced).

Final Exam (30%) An exam at the end of the course on all the course material.

Participation (10%) Your participation score is a combination of attendance and active participation in class, as well as regular 'check-in' problems on blackboard.

Final Grades The letter grade will be assigned from your total numerical grade as follows:

- A: >90%**
- B: 80-89%**
- C: 70-80%**
- D: 60-69%**
- F: <60%**

Grades are rounded to the nearest whole number, so for example if your final score is 89.54, you will receive an A. Inevitably, some students will score very close to the line for the next grade up. Please note that in the interest of fairness it is not possible to change your grade arbitrarily or to add unearned points to your final grade. There is no curve in this class, but there will be some opportunities (announced in class, with clear guidelines and due dates) for extra credit throughout the semester. Please let me know *in advance* if you cannot participate in any of the exams due to religious or personal or any other reasons.

Accessibility and Disability Accommodations, Guidance and Resources

Accommodations for students with disabilities are provided for all students with a qualified disability under the Americans with Disabilities Act (ADA & ADAAA) and Section 504 of the Rehabilitation Act who request and are eligible for accommodations. The Office of Student Disability Services (SDS) is the UMBC department designated to coordinate accommodations that creates equal access for students when barriers to participation exist in University courses, programs, or activities.

If you have a documented disability and need to request academic accommodations in your courses, please refer to the SDS website at sds.umbc.edu for registration information and office procedures.

SDS email: disAbility@umbc.edu

SDS phone: [410-455-2459](tel:410-455-2459)

If you will be using SDS approved accommodations in this class, please contact the instructor to discuss implementation of the accommodations. During remote instruction requirements due to COVID, communication and flexibility will be essential for success.

Sexual Assault, Sexual Harassment, and Gender Based Violence and Discrimination

[UMBC Policy](#) and Federal law (Title IX) prohibit discrimination and harassment on the basis of sex, sexual orientation, and gender identity in University programs and activities. Any student who is impacted by sexual harassment, sexual assault, domestic violence, dating violence, stalking, sexual exploitation, gender discrimination, pregnancy discrimination, gender-based harassment or retaliation should contact the University's Title IX Coordinator to make a report and/or access support and resources:

Ever Hanna, Title IX Coordinator

410-455-1026 (direct line), everhanna@umbc.edu

You can access support and resources even if you do not want to take any further action. You will not be forced to file a formal complaint or police report. Please be aware that the University may take action on its own if essential to protect the safety of the community.

If you are interested in or thinking about making a report, please use the [Online Reporting/Referral Form](#). Please note that, if you report anonymously, the University's ability to respond will be limited.

Notice that Faculty are Responsible Employees with Mandatory Reporting Obligations:

All faculty members are considered *Responsible Employees*, per [UMBC's Policy on Sexual Misconduct, Sexual Harassment, and Gender Discrimination](#). Faculty are therefore required to report any/ all available information regarding conduct falling under the Policy and violations of the Policy to the Title IX Coordinator, even if a student discloses an experience that occurred before attending UMBC and/or an incident that only involves people not affiliated with UMBC. Reports are required regardless of the amount of detail provided and even in instances where support has already been offered or received.

While faculty members want encourage you to share information related to your life experiences through discussion and written work, students should understand that faculty are required to report *past and present* sexual assault, domestic and interpersonal violence, stalking, and gender discrimination that is shared with them to the Title IX Coordinator so that the University can inform students of their [rights, resources and support](#). While you are encouraged to do so, you are not obligated to respond to outreach conducted as a result of a report to the Title IX Coordinator.

If you need to speak with someone in confidence, who does not have an obligation to report to the Title IX Coordinator, UMBC has a number of [Confidential Resources](#) available to support you:

- [Retriever Integrated Health](#) (Main Campus): [410-455-2472](#) [Monday – Friday; 8:30 a.m. – 5 p.m.] / After-Hours Support [410-455-3230](#)
- [Center for Counseling and Consultation](#) (Shady Grove Campus): [301-738-6273](#) (Messages checked hourly) [Online Appointment Request Form](#)
- Pastoral Counseling via [Interfaith Center](#): [410-455-3657](#); interfaith@umbc.edu [7 days a week; Fall and Spring 7 a.m. – 11 p.m.; Summer and Winter 8 a.m. – 8 p.m.]

Other Resources:

- [Women's Center](#) (for students of all genders): [410-455-2714](#); womenscenter@umbc.edu. [Monday – Thursday 10:00am-5:30pm and Friday 10:00am-4pm]
- [Shady Grove Student Resources](#), [Maryland Resources](#), [National Resources](#).

Child Abuse and Neglect:

Please note that Maryland law and [UMBC policy](#) require that faculty report all disclosures or suspicions of child abuse or neglect to the Department of Social Services and/or the police even if the person who experienced the abuse or neglect is now over 18.

Pregnant and Parenting Students

UMBC's [Policy on Sexual Misconduct, Sexual Harassment and Gender Discrimination](#) expressly prohibits all forms of Discrimination and Harassment on the basis of sex, including pregnancy. [Resources for pregnant, parenting and breastfeeding students](#) are

available through the University's Office of Equity and Inclusion. Pregnant and parenting students are encouraged to contact the Title IX Coordinator to discuss plans and ensure ongoing access to their academic program with respect to a leave of absence or return following leave related to pregnancy, delivery, adoption, breastfeeding and/or the early months of parenting.

Pregnant students and students in the early months of parenting may be entitled to accommodations under Title IX through the Office of Equity and Inclusion.

In addition, students who are pregnant and have an impairment related to their pregnancy that qualifies as disability under the ADA may be entitled to accommodations through the [Student Disability Service Office](#).

Religious Observances & Accommodations

UMBC [Policy](#) provides that students should not be penalized because of observances of their religious beliefs, and that students shall be given an opportunity, whenever feasible, to make up within a reasonable time any academic assignment that is missed due to individual participation in religious observances. It is the responsibility of the student to inform the instructor of any intended absences or requested modifications for religious observances in advance, and as early as possible. For questions or guidance regarding religious observance accommodations please contact the [Office of Equity and Inclusion](#) at oei@umbc.edu.

Hate, Bias, Discrimination and Harassment

UMBC values safety, cultural and ethnic diversity, social responsibility, lifelong learning, equity, and civic engagement.

Consistent with these principles, [UMBC Policy](#) prohibits discrimination and harassment in its educational programs and activities or with respect to employment terms and conditions based on race, creed, color, religion, sex, gender, pregnancy, ancestry, age, gender identity or expression, national origin, veterans status, marital status, sexual orientation, physical or mental disability, or genetic information.

Students (and faculty and staff) who experience discrimination, harassment, hate or bias or who have such matters reported to them should use the [online reporting/referral form](#) to report discrimination, hate or bias incidents. You may report incidents that happen to you anonymously. Please note that, if you report anonymously, the University's ability to respond will be limited.

August 2022

Week	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Topic	Reading
1	28	29	30	31 Class Begins	1	2	3	8/31: Introduction, Periodic Motion 9/2: Simple Harmonic Motion	1.1 1.2

September 2022

Week	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Topic	Reading
2	4	5 Labor Day – no class	6	7	8	9 HW Quiz 1	10	9/7: Complex Algebra 9/9: Complex Algebra	Supp. 1 1.3, 1.4
3	11	12 *guest lecture	13	14 *guest lecture	15	16 HW Quiz 2	17	9/12: Simple Harmonic Oscillator 9/14: Simple Harmonic Oscillator 9/16: Damped Oscillator	2.1, 2.2 2.3, 2.4
4	18	19	20	21	22	23 HW Quiz 3	24	9/19: Damped Oscillator 9/21: Damped Oscillator 9/23: Driven Oscillator	3.1, 3.2 3.3, 3.4
5	25	26	27	28	29	30 Midterm 1 in class	Oct 1	9/26: Driven Oscillator 9/28: Problems & Review 9/30: Exam 1	3.5, 3.6

October 2022

Week	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Topic	Reading
6	2	3	4	5	6	7 HW Quiz 4	8	10/3: Coupled Oscillator 10/5: Coupled Oscillator 10/7: Coupled Oscillator	4.1, 4.2 4.3, 4.4 4.5
7	9	10	11	12	13	14 HW Quiz 5	15	10/10: Coupled Oscillator 10/12: Standing Waves 10/14: Standing Waves	4.6 6.1 6.2, 6.3
8	16	17	18	19	20	21 *guest lecture HW Quiz 6	22	10/17: Normal Modes 10/19: Normal Modes 10/21: Fourier Series	6.4 Supp. 2
9	23	24	25	26	27	28 Midterm 2 in class	29	10/24: Fourier Series 10/26: Fourier Transforms 10/28: Exam 2	Supp. 3
10	30	31	*Nov 1	2	3	4 HW Quiz 7	5	10/31: Traveling Waves 11/2: Traveling Waves 11/4: Electromagnetic Waves	5.1–5.3 5.4–5.8 Supp. 4

November 2022

Week	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Topic	Reading
11	6	7	8	9	10	11 HW Quiz 8	12	11/7: Interference 11/9: Interference 11/11: Diffraction	7.1 7.2
12	13	14	15	16	17	18 HW Quiz 9	19	11/14: Dispersion 11/16: Dispersion 11/18: Dispersion	8.1–8.3
13	20	21	22	23 Midterm 3 in class	24 Thanksgiving	25 no class	26	11/21: Light and Polarization 11/23: Exam 3	Supp. 5
14	27	28	29	30	*Dec 1	2 HW Quiz 10	3	11/28: Reflection 11/30: Refraction 12/2: Mirrors	Supp. 6

December 2022

Week	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Topic	Reading
15	4	5	6	7	8	9 HW Quiz 11	10	12/5: Lenses 12/7: Lenses 12/9: Optical Instruments	Supp. 7
16	11	12	13	14	15	16 Final Exam	17	12/12: Review 12/16: Final Exam	
	18	19	20	21	22	23	24		

*Dr. Meyer away at conference in Prague 9/12-9/14 and again 10/21 for research travel. Class held as normal with sub.