

SYLLABUS
PHYS. 3310.001
Mathematical Methods in the Physical Sciences

Dr. Sandra Quintanilla

Fall 2020

Lecture: MWF 11:00 – 11:50 a.m

Recitation: F 2:00 – 2:50 p.m

Partial Remote

Office: Phys. 309

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Office hours: M 12:30 – 1:00 p.m.

W 12:30 – 1:00 p.m.

F 12:30 – 1:30 p.m.

Terms exams currently scheduled on campus (Chem. 109) in person on the following Fridays:
10/02/2020, 10/30/2020 and 11/20/2020, 2:00 – 3:20 p.m.

Prerequisite(s): Phys. 2220 and Math. 1720.

Recommended:

Phys. 2700: Linear Algebra and Vector Geometry

Phys. 3410 Differential Equations I

Text: *Essential Mathematical Methods for Physicists*, Hans J. Weber and George B. Arfken, Elsevier, Academic Press, 2004, ISBN: 0-12-059877-9

Recommended Books:

- *Mathematical Methods in the Physical Sciences*, Mary L. Boas, John Wiley & Sons
- *Introduction to Electrodynamics*, David J. Griffiths, 3rd Edition, Prentice Hall.
- *Mathematical Methods for Physics and Engineering*, A comprehensive guide, K. F. Riley, M. P. Hobson and S. J. Bence, Cambridge University Press.
- *Mathematical Methods for Physicists*, George B. Arfken and Hans. J. Weber, 6th Edition, Elsevier, Academic Press.
- *Mathematics for Physical Science and Engineering, Symbolic Computing Applications in Maple and Mathematica*, Franck E. Harris, Elsevier, 2014, ISBN: 978-0-12-8010000-6
- *Basic Training in Mathematics, A Fitness Program for Science Students*, R. Shankar, Plenum Press, New York and London, 1995, ISBN 0-306-45035-6 (Hardback), ISBN 0-306-45036-4 (Paperback).
- *Course of Mathematics for Engineers and Scientists*, B. H. Chirgwin and C. Plumpton, Volumes 1 and 2. Second Edition, Pergamon Press, New York, ISBN 0 08 006 388 8 (hardcover), ISBN 0 08 021678 1 (flexicover).

Background reading for Vector Analysis:

- *Vector Analysis*, Murray R. Spiegel, Schaum's Outline Series, McGraw-Hill, Inc. New York, St. Louis, San Francisco, Auckland, Bogotá, Caracas, Lisbon, London, Madrid,

Mexico City, Milan, Montreal, New Delhi, San Juan, Singapore, Sydney, Tokyo, Toronto, 29th printing, 1993.

- *Vector Analysis for Mathematicians, Scientists and Engineers*, S. Simons, 2nd Edition, Pergamon Press.
- *Vector and Tensor Analysis with Applications*, A. I. Borisenko and I. E. Tarapov, Revised English Edition, Translated and Edited by Richard A. Silverman, Dover Publications, Inc., New York, 1968.
- *Introduction to Vector Analysis*, J. C. Tallack, Cambridge University Press, Cambridge, London, New York, New Rochelle, Melbourne, Sydney, 1970.

Mathematical Reference Books:

- *NIST Handbook of Mathematical Functions*, Cambridge University Press, Academic and Professional Books, Edited by: Frank W. J. Olver, Daniel W. Lozier, Ronald F. Boisvert, Charles Clark. <http://dlmf.nist.gov/>
- *Tables on Integrals and Other Mathematical Data*, H. R. Dwight, MacMillan Publishing Co., Inc., New York.
- *Tables of Integrals, Series, and Products*, I. S. Gradshteyn and I. M. Ryzhik, Academic Press, New York, London, Toronto, Sydney, San Francisco, 1980.
- *Mathematical Handbook of Formulas and Tables*, Murray R. Spiegel, Schaum's Outline Series, McGraw-Hill Book Company, New York, St. Louis, San Francisco, Toronto, Sydney, 1968.

Course Content: 3 hours Application of advanced mathematical techniques to the solution of problems in physics. Vector spaces, complex analysis, matrices, linear transformations, vector calculus, Fourier series and integrals, the Laplace transformation, and special functions.

Course Objectives: To learn from this course, and other mathematics courses, mathematical tools that are needed in the upper-division physics courses. To learn techniques for orthogonal polynomials.

Required Materials:

- Textbook
- Masks for term exams if held on campus (unless approved ODA approves for a student not to).
- Webcam for final exam and for any term exams that are held remotely. (Webcams Strongly encouraged for class, recitation and office hours.)
- Computer, cell phone and/or I-pad to attend class, recitation and office hours.
- Computer that enables a LockDown Browser and has a webcam. The computer with these features is required for the final exam and for any term exam if it is given remotely.

Websites:

Learn Anywhere Fall 2020 <https://online.unt.edu/learn?unttoday=081920>

Return to Learn <https://vpaa.unt.edu/return>

Exams:

- There are three term exams and one final exam. Each term exam counts 25%.
- Exams can be based on the text readings, any other assigned readings, class lectures, homework and any additional material given. You are responsible for all material.

- The plan is to give the term exams on Fridays. Please see top of syllabus on front page for currently scheduled days and times.
- Seats in the exam room are assigned. I plan to put on Canvas the assigned seating plan.
- Do not eat within classroom for hygiene.
- Closed-book exams. Calculators can not be used in exams.
- Terms exams are given on campus. Masks are required (University Policy). However, contact ODA if you need ODA accommodation and please notify me if it is granted.
- No make-up exams given in general. If you are sick, provide an official medical note.
- A computer that enables a LockDown Browser and has a webcam is required for the final exam and for any term exam if it is given remotely.
- If times, dates and/or location of term exams change, I plan to notify the class using during class or recitation and also on Canvas.

Homework:

- In general, homework is given weekly.
- For homework assignments, please see Canvas.
- Homework is to be submitted via Canvas in either pdf format or Microsoft word format.
- No-late homework accepted unless permission given by instructor under special circumstances as determined by the instructor.
- If you are sick, provide an official medical note.

Canvas: Please check Canvas daily M-F for possible handouts, announcements, assignments, quizzes, etc.

Preparation:

- Read appropriate sections of the book before class and class notes posted on Canvas,
- Read from additional material when and if suggested.

Communication:

- Email at squintanilla@unt.edu
- Zoom
- Messages can be left on work phone (940-565-4739)

Quizzes:

- In general quizzes are given each week on Canvas.
- Quizzes do not count towards grade.

Attendance:

- Required attendance in class and recitation via Zoom. I plan to record class and recitation. Zoom links for class, recitation and office hours are given on Canvas.
- Required to take term exams on campus unless there is a justifiable reason not to do so that is improved by the instructor or if the university closes.
- <https://policy.unt.edu/policy/06-039>
- Webcams are strongly recommended for class and for recitation.
- When on Zoom for class and recitation, send message in Chat on Zoom to say that you are here. You are required to do this. This gives me a record for attendance.

Study Group Session: I plan to assign study group to meet via Zoom weekly to discuss homework and/or to study for an exam.

Grading:

Three unit exam average	75%	A: 90-100
Homework	15%	B: 80-89
Comprehensive final	10%	C: 70-79
	100%	D 60 -69
		F: < 60

Policies and Procedures:

Emergency Notifications & Procedures

<https://teachingcommons.unt.edu/teaching-handbook/definitions-and-policies/unt-teaching-policies/emergency-notifications-procedures>

“Emergency Notification & Procedures. UNT uses a system called Eagle Alert to quickly notify students with critical information in the event of an emergency (i.e., severe weather, campus closing, and health and public safety emergencies like chemical spills, fires, or violence). In the event of a university closure, please refer to Blackboard for contingency plans for covering course materials.”

<https://emergency.unt.edu/>

<https://emergency.unt.edu/sites/default/files/>

Extra Help: If you are having trouble with this class or are struggling, please let me know. I have a TA that may be able to help with study groups and/or tutoring.

Face coverings: “Face coverings are required in all UNT facilities. Students are expected to wear face coverings when we meet in person. If you are unable to wear a face covering due to a disability, please contact the Office of Disability Access to request an accommodation. UNT face covering requirements are subject to change due to community health guidelines.” I plan to communicate any changes.

UNT fall schedule:

“The UNT fall schedule requires this course to have fully remote instruction beginning November 28. Additional remote instruction may be necessary if community health conditions change or you need to self-isolate or quarantine due to COVID-19.”

COVID-19:

“If you are experiencing any symptoms of COVID-19 please seek medical attention from the Student Health and Wellness Center (940-565-2333 or askSHWC@unt.edu) or your health care provider PRIOR to coming to campus. UNT also requires you to contact the UNT COVID Hotline at 844-366-5892 or COVID@unt.edu for guidance on actions to take due to symptoms, pending or positive test results, or potential exposure. While attendance is an important part of succeeding in this class, your own health, and those of others in the community, is more important.”

Student Academic Integrity: <https://policy.unt.edu/policy/06-003>

Office of the Registrar: <https://registrar.unt.edu/>

Fall 2019 Registration Guide including Important Dates:
<https://registrar.unt.edu/registration/fall-registration-guide>

Student Evaluation System: <http://vpaa.unt.edu/spot>
Office of Disability Access

<https://policy.unt.edu/policy/16-001>

<https://disability.unt.edu/parents-faculty-staff/taglines>

“The University of North Texas makes reasonable academic accommodation for students with disabilities. Students seeking reasonable accommodation must first register with the Office of Disability Accommodation (ODA) to verify their eligibility. If a disability is verified, the ODA will provide you with a reasonable accommodation letter to be delivered to faculty to begin a private discussion regarding your specific needs in a course. You may request reasonable accommodations at any time, however, ODA notices of reasonable accommodation should be provided as early as possible in the semester to avoid any delay in implementation. Note that students must obtain a new letter of reasonable accommodation for every semester and must meet with each faculty member prior to implementation in each class. Students are strongly encouraged to deliver letters of reasonable accommodation during faculty office hours or by appointment. Faculty members have the authority to ask students to discuss such letters during their designated office hours to protect the privacy of the student. For additional information see the Office of Disability Accommodation website at <http://www.unt.edu/oda>. You may also contact them by phone at 940.565.4323.”

In attachment of an email by the Physics Dept. Main Office.

The University of North Texas is on record as being committed to both the spirit and letter of federal equal opportunity legislation; reference Public Law 92-112 The Rehabilitation Act of 1973 as amended. With the passage of new federal legislation entitled Americans with Disabilities Act (ADA), pursuant to section 504 of the Rehabilitation Act, there is renewed focus on providing this population with the same opportunities enjoyed by all citizens.

<https://cos.unt.edu/>

1-1	M	Aug. 24	Chp. 1	Vector Analysis
1-2	W	Aug. 26	Chp. 1	Vector Analysis
1-3	F	Aug. 28	Chp. 1	Vector Analysis
2	M	Aug. 31	Chp. 1	Vector Analysis
2-4	W	Sept. 2	Chp. 1	Vector Analysis
2-6	F	Sept. 6	Chp. 1	Vector Analysis
3-6	M	Sept. 7		Labor Day
3-7	W	Sept. 9	Chp. 1	Vector Analysis
3-8	F	Sept. 11	Chp. 1	Vector Analysis
4-9	M	Sept. 14	Chp. 1	Vector Analysis
4-10	W	Sept. 16	Chp. 1	Vector Analysis
4-11	F	Sept. 18	Chp. 1	Vector Analysis
5-12	M	Sept. 21	Chp. 2	Vector Analysis in Curved Coordinates
5-13	W	Sept. 23	Chp. 2	Vector Analysis in Curved Coordinates
5-14	F	Sept. 25	Chp. 2	Vector Analysis in Curved Coordinates
6-15	M	Sept. 28	Chp. 2	Vector Analysis in Curved Coordinates
6-16	W	Sept. 30	Chp. 2	Vector Analysis in Curved Coordinates
6-17	F	Oct. 2	Exam I	Chps. 1 & 2
7-18	M	Oct. 5	Chp. 2	Vector Analysis in Curved Coordinates
7-19	W	Oct. 7	Chp. 2	Vector Analysis in Curved Coordinates
7-20	F	Oct. 9	Chp. 2	Vector Analysis in Curved Coordinates
8-21	M	Oct. 12	Chp. 2	Vector Analysis in Curved Coordinates
8-22	W	Oct. 14	Chp. 2	Vector Analysis in Curved Coordinates
8-23	F	Oct. 16	Chp. 3	Determinants and Matrices
9-24	M	Oct. 19	Chp. 3	Determinants and Matrices
9-25	W	Oct. 21	Chp. 3	Determinants and Matrices
9-26	F	Oct. 23	Chp. 3	Determinants and Matrices

10-26	M	Oct. 26	Chp. 3	Determinants and Matrices
10-27	W	Oct. 28	Chp. 15	Integral Transforms
10-28	F	Oct. 30	Exam II	Chps. 2 & 3
11-29	M	Nov. 2	Chp. 3	Determinants and Matrices
11-30	W	Nov. 4	Chp. 3	Determinants and Matrices
11-31	F	Nov. 6	Chp. 3	Determinants and Matrices
12-32	M	Nov. 9	Chp. 14	Fourier Series
12-33	W	Nov. 11	Chp. 14	Fourier Series
12-34	F	Nov. 13	Chp. 14	Fourier Series
13-35	M	Nov. 16	Chp. 11	Legendre Polynomials
13-36	W	Nov. 18	Chp. 11	Legendre Polynomials
13-37	F	Nov. 20	Exam III	Chps. 3, 14 & 15
14-38	M	Nov. 23	Chp. 11	Legendre Polynomials
14-39	W	Nov. 25	Chp. 11	Legendre Polynomials
14	F	Nov. 27	Thanksgiving	Break
15-40	M	Nov. 30	Chp. 11	Legendre Polynomials
15-41	W	Dec. 2	Review	
	M	Dec. 7	Final exam	10:30 a.m - 12:30 p.m.,