

SYLLABUS
PHYS. 3310.001
Mathematical Methods in the Physical Sciences

Dr. Sandra Quintanilla

Fall 2019

Lecture: MWF 11:00 – 11:50 a.m

Physics Building Room 112

Recitation: F 2:00 – 2:50 p.m

Backup Recitation: M 2:00 – 2:50 p.m

Study Session: F 2:50 – 3:50 p.m

Physics Building Room 112

Office: Phys. 309

email: squintanilla@unt.edu

Phone 565-4739

Office hours: M 12:15 – 12:45 p.m.

W 1:00 – 1:30 p.m.

F 12:30 – 1:30 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.
- *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
- *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.

Exams: There are three term exams and one final exam. Exams will be based on the text readings, any other assigned readings, class lectures, homework and any additional material given. The plan is to give the term exams on Friday during recitation and possibly extend into Study Session. Closed book exams. Calculators can not be used in exams. No make-up exams given in general. If you are sick, provide an official medical note.

Homework: In general, homework is given weekly. 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. For homework assignments, please see canvas.

Canvas: Please check canvas daily M-F for possible handouts and announcements.

Reading: Read appropriate sections of the book before class. Read from additional material when and if suggested.

Quizzes: Quizzes may be given in recitation.

Attendance: Required attendance in class and recitation. By coming to class you can participate in class and learn in a class setting. Being actively involved and following in class should have a positive impact on your grade. Not coming to class could affect your grade negatively.

You may miss announcements and hints. Please give yourself the best opportunity to learn.
<https://policy.unt.edu/policy/06-039>

Grading:

Three unit exam average	60%	A: 90-100
Homework	15%	B: 80-89
Comprehensive final	25%	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/physics_building_emergency_floorplan_2019.pdf

If there is a tornado or hurricane, please proceed to the physics basement.

Cell phones, iPads, tablets, etc, are to be turned off during class during to class and recitation, other than when taking SPOT evaluations if done in class or recitation.

Extra Help: If you are having trouble with this class, please come by my office during office hours or make an appointment to see me. I am also available by email at squintanilla@unt.edu.

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. 26	Chp. 1	Vector Analysis
1-2	W	Aug. 28	Chp. 1	Vector Analysis
1-3	F	Aug. 30	Chp. 1	Vector Analysis
2	M	Sept. 2		Labor Day
2-4	W	Sept. 4	Chp. 1	Vector Analysis
2-5	F	Sept. 6	Chp. 1	Vector Analysis
3-6	M	Sept. 9	Ch. 1	Vector Analysis
3-7	W	Sept. 11	Chp. 1	Vector Analysis
3-8	F	Sept. 13	Chp. 1	Vector Analysis
4-9	M	Sept. 16	Chp. 1	Vector Analysis
4-10	W	Sept. 18	Chp. 1	Vector Analysis
4-11	F	Sept. 20	Chp. 2	Vector Analysis in Curved Coordinates
5-12	M	Sept. 23	Chp. 2	Vector Analysis in Curved Coordinates
5-13	W	Sept. 25	Chp. 2	Vector Analysis in Curved Coordinates
5-14	F	Sept. 27	Chp. 2	Vector Analysis in Curved Coordinates
6-15	M	Sept. 30	Chp. 2	Vector Analysis in Curved Coordinates
6-16	W	Oct. 2	Exam I	Chps. 1 & 2
6-17	F	Oct. 4	Chp. 2	Vector Analysis in Curved Coordinates
7-18	M	Oct. 7	Chp. 2	Vector Analysis in Curved Coordinates
7-19	W	Oct. 9	Chp. 2	Vector Analysis in Curved Coordinates
7-20	F	Oct. 11	Chp. 3	Determinants and Matrices
8-21	M	Oct. 14	Chp. 3	Determinants and Matrices
8-22	W	Oct. 16	Chp. 3	Determinants and Matrices
8-23	F	Oct. 18	Chp. 3	Determinants and Matrices
9-24	M	Oct. 21	Chp. 3	Determinants and Matrices
9-25	W	Oct. 23	Chp. 3	Determinants and Matrices
9-26	F	Oct. 25	Chp. 14	Fourier Series

10-26	M	Oct. 28	Chp. 14	Fourier Series
10-27	W	Oct. 30	Chp. 14	Fourier Series
10-28	F	Nov. 1	Exam II	Chps. 2, 3 & 14
11-29	M	Nov. 4	Chp. 14	Fourier Series
11-30	W	Nov. 6	Chp. 14	Legendre Polynomials
11-31	F	Nov. 8	Chp. 14	Legendre Polynomials
12-32	M	Nov. 11	Chp. 11	Legendre Polynomials
12-33	W	Nov. 13	Chp. 11	Legendre Polynomials
12-34	F	Nov. 15	Chp. 11	Legendre Polynomials
13-35	M	Nov. 18	Chp. 11	Legendre Polynomials
13-36	W	Nov. 20	Chp. 15	Integral Tranforms
13	F	Nov. 22	Thanksgiving	Break
14-37	M	Nov. 25	Chp. 15	Integral Tranforms
14-38	W	Nov. 27	Exam III	Chps. 11 & 15
14-39	F	Nov. 29	Chp. 15	Integral Transforms
15-40	M	Dec 2	Chp. 6	Functions of Complex Variables I
15-41	W	Dec. 4	Review	
	M	Dec. 9	Final exam	10:30 a.m - 12:30 p.m., Phys. 112