

SYLLABUS
PHYS. 3310.001
Mathematical Methods in the Physical Sciences

Dr. Sandra Quintanilla

Fall 2022

Lecture: Phys. 112, MWF 11:00 – 11:50 a.m.

Recitation: Phys. 112, M 2:00 – 2:50 p.m.

Reserved Recitation: Phys. 112, F 2:00 – 2:50 p.m.

Office: Phys. 309

email: squintanilla@unt.edu

Phone 565-4739 (Microsoft Teams)

Office hours: M 12:05– 1:05 p.m.

Office hours: W 12:05 – 1:05 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

Technology:

From the `unt_syllabus_template`, <https://clear.unt.edu/teaching-resources/unt-syllabus-template>: “To fully participate in this class, students will need internet access to reference content on the Canvas Learning Management System.” Please have access to Mathematica. The University has a site license for Mathematica.”

Websites:

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

Exams:

- Exams can be based on the text readings, any other assigned readings, class lectures, homework, material on Canvas and any additional material given. You are responsible for all material.
- Do not eat within classroom for hygiene.
- Closed-book exams. Calculators can not be used in exams.
- 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.
- 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 pdf format only.
- 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 Monday-Saturday for possible announcements, Mathematica files, references, quizzes, homework assignments, files, assignments etc.

Class or recitation may, or not, be recorded using Zoom. If a recording is made, the recording may be found on *Canvas*. I have set up Zoom so that recording is automatic. Any Class (and Recitation) Recordings posted on *Canvas* are specifically for this course and must not be used elsewhere.

“Class recordings are the intellectual property of the university or instructor and are reserved for use only by students in this class and only for educational purposes. Students may not post or otherwise share the recordings outside the class, or outside the Canvas Learning Management System, in any form. Failing to follow this restriction is a violation of the UNT Code of Student Conduct and could lead to disciplinary action.”

<https://vpaa.unt.edu/office-provost/covid-19-update-32720>

Reading and Preparation:

- Read appropriate sections of the book before class.
- Read from additional material if suggested.
- Please look at Mathematica files and/or pdf files that are referenced or given on *Canvas*.
- Read class notes and book after class.

Communication:

- Office, Phys. 309
- Email at squintanilla@unt.edu
- Zoom
- Microsoft Teams, 940-565-4739

Quizzes:

- Quizzes are given on Canvas. Please upload quiz onto canvas.
- The quizzes do not help directly towards your grade, but should be taken seriously.

Attendance:

- Required attendance in class and recitation.
- <https://policy.unt.edu/policy/06-039>

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

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/emergency-floor-plans>

https://emergency.unt.edu/sites/default/files/physics_building.pdf

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

Electronics: Cell phones, iPads, tablets, etc, are to be turned off during class other than for a class related activity.

Office Hours: Please come to my office Phys. 309 during office hours, or by appointment, during the first three weeks of class. If you get less than 60% on any exam, please see me. If you are having trouble with this course, please come to see me during office hours or please make an appointment to see me.

Extra Help: If you are having trouble with this class or are struggling, please let me know. I hope that I will have a TA some of the semester that may be able to tutor.

COVID-19:

<https://healthalerts.unt.edu>

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

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

Fall 2022 Registration Guide including Important Dates:

<https://registrar.unt.edu/registration/fall-registration-guide>

Student Evaluation System: “Student feedback is important part of participation in this course. The student evaluation of instruction is a requirement for all organized classes at UNT.” The plan is for the SPOT survey to be available to you end of the semester. It gives “you with an opportunity to evaluate how this course is taught.”

<https://vpaa.unt.edu/file/33330>

<http://vpaa.unt.edu/spot>

<https://vpaa.unt.edu/events/SPOTFA22>

Academic Calendar: <http://catalog.unt.edu/content.php?catoid=30&navoid=3524>

Office of Disability Access

<https://studentaffairs.unt.edu/office-disability-access>

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

<https://policy.unt.edu/policy/06-049>

<https://policy.unt.edu/sites/default/files/06.049%20Course%20Syllabi%20Requirements%20-%20Supplement.pdf>

From:

<https://studentaffairs.unt.edu/office-disability-access/faculty/resource-guide/syllabus-statement>:

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 Access (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, refer to the Office of Disability Access website at <https://studentaffairs.unt.edu/office-disability-access>. You may also contact ODA 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.

Disability Accommodation for Students and Academic Units:

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

https://policy.unt.edu/sites/default/files/06.049_Standard%20Syllabus%20Policy%20Statements_supplement.pdf

- “A. Academic Integrity Standards and Consequences. According to UNT Policy 06.003, Student Academic Integrity, academic dishonesty occurs when students engage in behaviors including, but not limited to cheating, fabrication, facilitating academic dishonesty, forgery, plagiarism, and sabotage. A finding of academic dishonesty may result in a range of academic penalties or sanctions ranging from admonition to expulsion from the University.
- B. ADA Accommodation Statement. UNT makes reasonable academic accommodation for students with disabilities. Students seeking accommodation must first register with the Office of Disability Accommodation (ODA) to verify their eligibility. If a disability is verified, the ODA will provide a student with an accommodation letter to be delivered to faculty to begin a private discussion regarding ones specific course needs. Students may request accommodations at any time, however, ODA notices of 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 accommodation for every semester and must meet with each faculty member prior to implementation in each class. For additional information see the ODA website at disability.unt.edu.”

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/>

<https://physics.unt.edu/?cta=department>

1-1	M	Aug. 29	Chp. 1	Vector Analysis
1-2	W	Aug. 31	Chp. 1	Vector Analysis
1-3	F	Sept. 2	Chp. 1	Vector Analysis
2	M	Sept. 5	Chp. 1	Labor Day
2-4	W	Sept. 7	Chp. 1	Vector Analysis
2-6	F	Sept. 9	Chp. 1	Vector Analysis
3-6	M	Sept. 12	Chp. 1	Vector Analysis
3-7	W	Sept. 14	Chp. 1	Vector Analysis
3-8	F	Sept. 16	Chp. 1	Vector Analysis
4-9	M	Sept. 19	Chp. 1	Vector Analysis
4-10	W	Sept. 21	Chp. 1	Vector Analysis
4-11	F	Sept. 23	Chp. 1	Vector Analysis
5-12	M	Sept. 26	Chp. 2	Vector Analysis in Curved Coordinates
5-13	W	Sept. 28	Chp. 2	Vector Analysis in Curved Coordinates
5-14	F	Sept. 30	Chp. 2	Vector Analysis in Curved Coordinates
6-15	M	Oct. 3	Exam I	Chps. 1 & 2
6-16	W	Oct. 5	Chp. 2	Vector Analysis in Curved Coordinates
6-17	F	Oct. 7	Chp. 2	Vector Analysis in Curved Coordinates
7-18	M	Oct. 10	Chp. 2	Vector Analysis in Curved Coordinates
7-19	W	Oct. 12	Chp. 2	Vector Analysis in Curved Coordinates
7-20	F	Oct. 14	Chp. 2	Vector Analysis in Curved Coordinates
8-21	M	Oct. 17	Chp. 2	Vector Analysis in Curved Coordinates
8-22	W	Oct. 19	Chp. 2	Vector Analysis in Curved Coordinates
8-23	F	Oct. 21	Chp. 3	Determinants and Matrices
9-24	M	Oct. 24	Chp. 3	Determinants and Matrices
9-25	W	Oct. 26	Chp. 3	Determinants and Matrices
9-26	F	Oct. 28	Chp. 3	Determinants and Matrices

10-26	M	Oct. 31	Chp. 3	Determinants and Matrices
10-27	W	Nov. 2	Chp. 15	Integral Transforms
10-28	F	Nov. 4	Exam II	Chps. 2 & 3
11-29	M	Nov. 7	Chp. 3	Determinants and Matrices
11-30	W	Nov. 9	Chp. 3	Determinants and Matrices
11-31	F	Nov. 11	Chp. 3	Determinants and Matrices
12-32	M	Nov. 14	Chp. 14	Fourier Series
12-33	W	Nov. 16	Chp. 14	Fourier Series
12-34	F	Nov. 18	Chp. 14	Fourier Series
13-35	M	Nov. 21	Chp. 11	Legendre Polynomials
13	W	Nov. 23	Thansgiving Break	
13	F	Nov. 25	Thanksgiving Break	
14-36	M	Nov. 28	Chp. 11	Legendre Polynomials
14-37	W	Nov. 30	Chp. 11	Legendre Polynomials
14-38	F	Dec. 2	Exam III	Chps. 3, 14 & 15
15-39	M	Dec. 5	Chp. 11	Legendre Polynomials
15-40	W	Dec. 7	Review	
	M	Dec. 12	Final exam	10:30 a.m - 12:30 p.m.,