

# Tentative PHYS 5383 Syllabus

**T.E. Coan      Spring 2022**

Last edit: 17 Jan 2022

To refers to the Townsend text and Gr to the Griffiths text.

<b>Date</b>	<b>Topic</b>	<b>Reading</b>	<b>HW Due</b>
L1 18 Jan	Stern-Gerlach expts I	TO 1.1-1.6	HW1: 28 Jan
L2 20 Jan	SG Expts II	TO 1.1-1.6	HW1: 28 Jan
L3 25 Jan	Rotation, identity, projection operators	TO 2.1-2.3	HW2: 4 Feb
L4 27 Jan	Matrix representation of operators and		
L5 1 Feb	Expectation values, photon polarization and photon Spin	TO 2.6-2.8	HW3: 11 Feb
L6 3 Feb	Hamiltonian and Schrödinger equation, expectation value time dependence	TO 4.1-4.2	HW3: 11 Feb
L7 8 Feb	Precession of spin- $\frac{1}{2}$ particle in <b>B</b> -field, Magnetic Resonance	TO 4.3-4.4	HW4: 18 Feb
L8 10 Feb	The NH <sub>3</sub> molecule and maser, Energy-time uncertainty relation	TO 4.5-4.7	HW4: 18 Feb
L9 15 Feb	Basis states for 2 spin- $\frac{1}{2}$ particles Hyperfine splitting for ground state of H	TO 5.1-5.2	HW5: 25 Feb
L10 17 Feb	Addition of angular mo for 2 spin- $\frac{1}{2}$ particles EPR paradox	TO 5.3-5.4	HW5: 25 Feb
L11 22 Feb	Bell inequalities, entanglement, quantum teleportation	TO 5.5-5.6 GR 12	HW6: 4 Mar
L12 24 Feb	Nondegenerate perturbation theory	To 11.1	HW6: 4 Mar
L13 1 Mar	Degenerate perturbation theory Stark effect and NH <sub>3</sub> molecule	To 11.2-11.4	HW7: 11 Mar
L14 2 Mar	Relativistic perturbations to H-atom	To 11.5	HW7: 11 Mar

L15	8 Mar	H-atom E levels & Zeeman effect	To 11.6-11.7	HW8: 25 Mar
L16	10 Mar	Identical particles Effects of exclusion principle	To 12.1 & TEC notes	HW8: 25 Mar
	15 Mar	No class. Spring Break		
	17 Mar	No class. Spring Break		
L17	22 Mar	Degeneracy pressure & Astrophysics	TEC notes	HW9: 1 Apr
L18	24 Mar	He atom	To 12.2	HW9: 1 Apr
L19	29 Mar	Periodic Table, Covalent Bonding	To 12.3-12.4	HW10: 8 Apr
L20	31 Mar	Quantum scattering I	To 13.1	HW10: 8 Apr
L20+	2 Apr	TBD	To TBD	HW10: 8 Apr
L21	5 Apr	Born approximation, Yukawa potential	To 13.2-13.3	HW11: 15 Apr
L22	7 Apr	Partial Wave Expansion	To 13.4	HW11: 15 Apr
L23	12 Apr	Phase shift examples	To 13.5	HW12: 22 Apr
L24	14 Apr	Aharonov-Bohm effect, EM-field Hamiltonian	To 14.1-14.2	HW12: 22 Apr
L25	19 Apr	EM-field Hamiltonian, Quantization of the radiation field	To 14.2-14.3	HW13: 29 Apr
L26	21 Apr	H of the atom + EM-field Time-dependent perturbation theory	To 14.4-To 14.5	HW13: 29 Apr
L27	26 Apr	TDPT and Fermi's golden rule	To 14.5 - To 14.6	
L28	28 Apr	Spontaneous emission	To 14.7	
	9 May	<b>Final Exam: 8:00 AM - 11:00 AM</b>	Cumulative	

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# PHYS 5383 Instructor/Logistical Information -- Spring 2022

- **Lecture:** TR 9:30 AM - 10:50 AM @ rm 351 Dallas Hall.
- **Lecturer:** **Thomas E. Coan**
- **Office hours:** Wed 1:00 PM -3:00 PM in 47 Fondren Science and by appointment. Zoom only.
- **Contact:**
  - Call me (214.768.2497), or
  - Send me e-mail: [<coan@smu.edu>](mailto:coan@smu.edu), or
  - Stalk me (i.e., just find me). Social distancing required...

- **Required Texts:**

*A Modern Approach to Quantum Mechanics, 2ed.*  
John S. Townsend  
ISBN 978-1-891389-78-8

*Introduction to Quantum Mechanics, ANY edition*  
D.J. Griffiths

- **Texts on 3-hr reserve in Fondren library:**

*Feynman Lectures on Physics, v.3*  
R.P. Feynman  
QC23.F47 2006

*Feynman Lectures on Physics, v.3*  
Free Online at:  
[http://feynmanlectures.caltech.edu/III\\_toc.html](http://feynmanlectures.caltech.edu/III_toc.html)

*Quantum Mechanics*  
B.H. Bransden and C.J. Joachain  
QC174.12 .B74 2000

**Final Examination: Mon., 7 May, 8:00 AM - 11:00 AM. Online.**

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## **Masking Policy - Spring 2022**

**M**asks are required in this course. This masking requirement is subject to change during the semester, and any changes will be announced in class and posted clearly in Canvas.

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## PHYS 5383 Grading Policy -- Spring 2022

You have to break a serious sweat to learn quantum mechanics. The material is inherently difficult and it is common to be quite confused. With patience and diligence, the confusion lessens. Homework is issued weekly and is graded. **I encourage you to work together on the problems. However, the final write-up must be your own work.** Submitted homework assignments that are suspiciously similar will annoy me. There will be 2 take home tests as well as a final exam. See the [PHYS 5382 syllabus](#) for details.

Your final grade will be based on a weighted sum of your performance on homework, tests and the final exam. Individual assignments do not receive a letter grade. You should see me personally to know how you are doing in the course. **A stellar performance on the final exam can result in a course grade much better than the average course performance would yield.** The relative course component weights used to determine your course grade are:

- In-class quizzes, class participation, attendance 5%
- Homework 50% (drop lowest)
- In-semester tests 20%
- Final 25%

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# PHYS 5382/3 WWW Sites

2016-2017

Last edit: 22 Aug 2016

## Math Tools, Amusements and Physical Constants

[Integration engine for 1-D integrals](#)

[Buffon's Needle \(btw, that's one "o"\)](#)

[NIST Reference on Constants, Units and Uncertainty](#)

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## Motivation for Quantum Mechanics

[Blackbody Radiation Notes by Michael Fowler, UVa.](#)

[Blackbody radiation applet](#)

[Introduction to The Cosmic Microwave Background](#)

[Photoelectric effect applet](#)

[Bohr's atom applet](#)

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## Phase and Group Velocity

[Group and Phase velocity applet](#)

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## 2-D Quantum Box

[Two-dimension quantum box](#)

[Linear superposition in a 2D box](#)

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## The Hydrogen Atom

[Energy Levels of the Hydrogen Atom](#)

[Electron configurations](#)

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## Quantum Mechanical Scattering

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## Quantum Computation and Cryptography

[Quantum Computation Tutorial from J. Preskill, CIT](#)

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## Excused Absences for University Extracurricular Activities - Spring 2022

**S**tudents participating in an officially sanctioned, scheduled University extracurricular activity should be given the opportunity to make up class assignments or other graded assignments missed as a result of their participation. It is the **responsibility of the student** to make arrangements with the instructor **prior** to any missed scheduled examination or other missed assignment for making up the work. (University Undergraduate Catalogue)

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## Disability Accommodations - Spring 2022

**S**tudents needing academic accommodations for a disability must first register with Disability Accommodations & Success Strategies (DASS). Students can call 214-768-1470 or visit <http://www.smu.edu/Provost/SASP/DASS> to begin the process. Once approved and registered, students will submit a DASS Accommodation Letter to faculty through the electronic portal DASS Link and then communicate directly with each instructor to make appropriate arrangements. Please note that accommodations are not retroactive and require advance notice to implement.

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## **Religious Observance Accommodations - Spring 2022**

**R**eligiously observant students wishing to be absent from class on holy days specific to their religion should notify me in writing at the beginning of the semester. They will need to discuss in advance with me acceptable ways of making up any work missed because of the absence. (See University Policy No. 1.9.)

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## **Pregnant and Parenting Students - Spring 2022**

**U**nder Title IX, students who are pregnant or parenting may request academic adjustments by contacting Elsie Johnson (elsiej@smu.edu) in the Office of the Dean of Students, or by calling 214-768-4564. Students seeking assistance must schedule an appointment with their professors as early as possible, present a letter from the Office of the Dean of Students, and make appropriate arrangements. Please note that academic adjustments are not retroactive and, when feasible, require advance notice to implement.

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## Sexual Harassment - Spring 2022

All forms of sexual harassment, including sexual assault, dating violence, domestic violence and stalking, are violations of SMU's Title IX Sexual Harassment Policy and may also violate Texas law. Students who wish to file a complaint or to receive more information about the grievance process may contact Samantha Thomas, SMU's Title IX Coordinator, at [accessequity@smu.edu](mailto:accessequity@smu.edu) or 214-768-3601. Please note that faculty are mandatory reporters. If students notify faculty of sexual harassment, faculty must report it to the Title IX Coordinator. For more information about sexual harassment, including resources available to assist students, please visit [www.smu.edu/sexualmisconduct](http://www.smu.edu/sexualmisconduct)

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# Hangover Accommodations - Spring 2022



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## **SMU Firearms Policy - Spring 2022**

**S**MU is a no blasting zone. See Policy 9.5 of the SMU policy manual. SMU prohibits the possession of any dangerous weapon (either openly or in a concealed manner), or facsimiles of dangerous weapons such as water guns or toy guns and knives, on all University property, athletic venues, passenger transportation vehicles and any groups or building on which University activities are conducted. Student-owned sporting firearms or other weapons (including all BB and pellet guns) are the responsibility of the owner and must be stored at an appropriate location off campus.

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