Contents

Teaching Portfolio

Here you will find a summary of all courses taught by Dr. Nerem at Old Dominion University.

Update this section!!!!

> Since starting in the Spring 2018 semester, Matthew Perry Nerem has continuously taught the introductory astronomy course and the algebra based introductory physics classes. Due to demand from the undergraduate physic majors, Dr. Krafft and Mr. Nerem were able to teach a special topics course on advance theoretical mechanics. Since the Fall 2019 semester the introductory astronomy courses have been offered online. All of the online astronomy course materials are selected by and/or created by Dr. Nerem. On February 28, 2020, M. Perry Nerem successfully defended his doctoral thesis, “Experiments and Theory on Dynamical Hamiltononian Monodromy”, at the College of William & Mary. Dr. Nerem intends to continue doing research and is currently studying topological optical systems. This portfolio is sorted by most recent course taught. All documents pertinent to a course are attached at the end of this portfolio. See Appendix: B for complete list of documents.

Note

Here is a note!

And here is a code block:

```
e = mc^2
```

Check out the content pages bundled with this sample book to see more.

Markdown Files

Whether you write your book’s content in Jupyter Notebooks (`.ipynb`) or in regular markdown files (`.md`), you’ll write in the same flavor of markdown called **MyST Markdown**.

What is MyST?

MyST stands for “Markedly Structured Text”. It is a slight variation on a flavor of markdown called “CommonMark” markdown, with small syntax extensions to allow you to write **roles** and **directives** in the Sphinx ecosystem.

What are roles and directives?

Roles and directives are two of the most powerful tools in Jupyter Book. They are kind of like functions, but written in a markup language. They both serve a similar purpose, but **roles are written in one line**, whereas **directives span many lines**. They both accept different kinds of inputs, and what they do with those inputs depends on the specific role or directive that is being called.

Using a directive

At its simplest, you can insert a directive into your book’s content like so:

```
```{mydirectivename}
My directive content
```
```

This will only work if a directive with name `mydirectivename` already exists (which it doesn't). There are many pre-defined directives associated with Jupyter Book. For example, to insert a note box into your content, you can use the following directive:

```
```{note}
Here is a note
```
```

This results in:

> **Note**
>
> Here is a note

In your built book.

For more information on writing directives, see the MyST documentation.

Using a role

Roles are very similar to directives, but they are less-complex and written entirely on one line. You can insert a role into your book's content with this pattern:

```
Some content {rolename}`and here is my role's content!`
```

Again, roles will only work if `rolename` is a valid role's name. For example, the `doc` role can be used to refer to another page in your book. You can refer directly to another page by its relative path. For example, the role syntax `{doc}`intro`` will result in: Teaching Portfolio.

For more information on writing roles, see the MyST documentation.

Adding a citation

You can also cite references that are stored in a `bibtex` file. For example, the following syntax: `{cite}`holdgraf_evidence_2014`` will render like this: [HdHPK14].

Moreoever, you can insert a bibliography into your page with this syntax: The `{bibliography}` directive must be used for all the `{cite}` roles to render properly. For example, if the references for your book are stored in `references.bib`, then the bibliography is inserted with:

```
```{bibliography}
```
```

Resulting in a rendered bibliography that looks like:

[HdHPK14]
Christopher Ramsay Holdgraf, Wendy de Heer, Brian N. Pasley, and Robert T. Knight. Evidence for Predictive Coding in Human Auditory Cortex. In *International Conference on Cognitive Neuroscience*. Brisbane, Australia, Australia, 2014. Frontiers in Neuroscience.

Executing code in your markdown files

If you'd like to include computational content inside these markdown files, you can use MyST Markdown to define cells that will be executed when your book is built. Jupyter Book uses *jupytext* to do this.

First, add Jupytext metadata to the file. For example, to add Jupytext metadata to this markdown page, run this command:

```
jupyter-book myst init markdown.md
```

Once a markdown file has Jupytext metadata in it, you can add the following directive to run the code at build time:

```
```{code-cell}
print("Here is some code to execute")
```
```

When your book is built, the contents of any `{code-cell}` blocks will be executed with your default Jupyter kernel, and their outputs will be displayed in-line with the rest of your content.

For more information about executing computational content with Jupyter Book, see The MyST-NB documentation.

Content with notebooks

You can also create content with Jupyter Notebooks. This means that you can include code blocks and their outputs in your book.

Markdown + notebooks

As it is markdown, you can embed images, HTML, etc into your posts!

You can also \(add_{math}\) and

\[math^{blocks} \]
or

\[\begin{split} \begin{aligned} \mbox{mean} la_{tex} \\ \\ math blocks \end{aligned} \end{split}\]
But make sure you $Escape $your $dollar signs $you want to keep!

MyST markdown

MyST markdown works in Jupyter Notebooks as well. For more information about MyST markdown, check out the MyST guide in Jupyter Book, or see the MyST markdown documentation.

Code blocks and outputs

Jupyter Book will also embed your code blocks and output in your book. For example, here's some sample Matplotlib code:

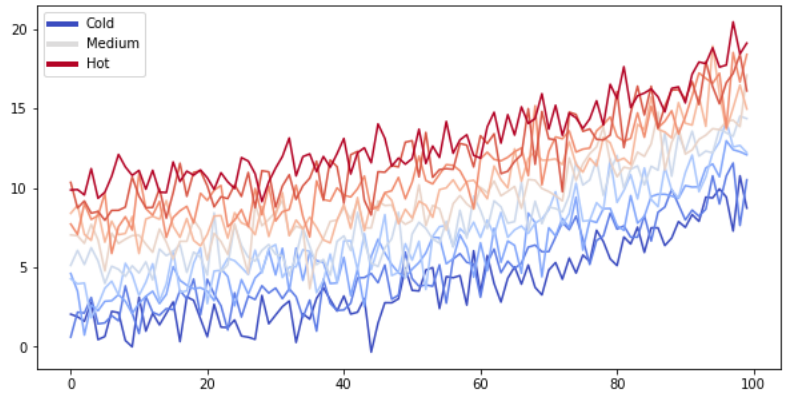
```
from matplotlib import rcParams, cycler
import matplotlib.pyplot as plt
import numpy as np
plt.ion()
```

```
# Fixing random state for reproducibility
np.random.seed(19680801)

N = 10
data = [np.logspace(0, 1, 100) + np.random.randn(100) + ii for ii in range(N)]
data = np.array(data).T
cmap = plt.cm.coolwarm
rcParams['axes.prop_cycle'] = cycler(color=cmap(np.linspace(0, 1, N)))


from matplotlib.lines import Line2D
custom_lines = [Line2D([0], [0], color=cmap(0.), lw=4),
                Line2D([0], [0], color=cmap(.5), lw=4),
                Line2D([0], [0], color=cmap(1.), lw=4)]

fig, ax = plt.subplots(figsize=(10, 5))
lines = ax.plot(data)
ax.legend(custom_lines, ['Cold', 'Medium', 'Hot']);
```



There is a lot more that you can do with outputs (such as including interactive outputs) with your book. For more information about this, see the Jupyter Book documentation

Spring 2018

Courses taught this semester

- PHYS104 (CRN: 20133) Modern Astronomy
- PHYS112 (CRN: 20136) Intro. Phys. II
- PHYS112 (CRN: 22895) Intro. Phys. II

PHYS104

Introductory Astronomy of Galaxies and Cosmology

Emphasizes the study of stars, star systems, cosmology and relativity. Emphasis on how we acquire knowledge of celestial objects to develop models of our universe.

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Syllabus

Physics 104N-0 Introductory Astronomy of Galaxies and Cosmology

- Spring 2018
- TR 1:30pm - 2:45pm
- MGB Hall 0102
- CRN 20133

Instructor Info


```
Instructor: M. Perry Nerem
Office: OCNPS 221
Phone: 757-683-3611
Email: mnerem@odu.edu
Office Hours: M-F 4:00-5:00pm
```

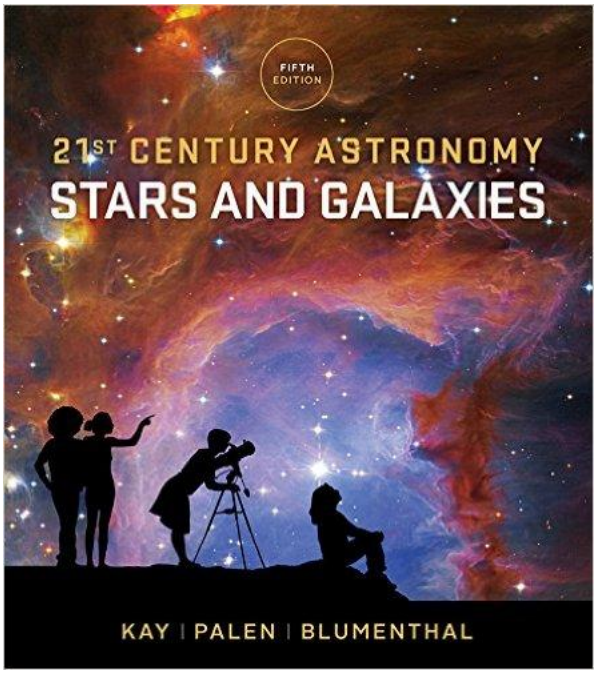

Course Description: This four credit-hour course introduces the basic concepts of astronomy. Emphasizes the study of stars, star systems, cosmology and relativity. Emphasis on how we acquire knowledge of celestial objects to develop models of our Universe.
Prerequisites: None

Course Objectives: Students will learn basic techniques of scientific investigation of objects in our galaxy and their underlying physical principles. Emphasis is on the development of models of our universe through a combination of instruction, in class participation, performing laboratory work and possibly night observations, reading and solving of homework problems.

The course consists of two weekly lectures, one weekly laboratory session, homework assignments, three in class exams and one cumulative final exam. Students will need to create an account for the online homework system Sapling Learning, and clicker from Turning Technology. Detailed information and updates/changes can be found on the ODU Blackboard course web page.

Course Textbook

21st Century Astronomy: Stars and Galaxies by L. Kay, S. Palen, G. Blumenthal, 5th edition, W. W. Norton 2016
ISBN 978-0393603361



Homework: The ability to analyze and solve problems is a very important skill to develop during this course. You can only learn science by doing problems. Homework will be assigned and managed though the Sapling Learning online service. You need to create an account at the Sapling Learning web site. Homework will be assigned as the course progresses, typically once a week. Students should regularly check the Sapling Learning web site to be aware of homework due dates. Requests for submitting homework late for legitimate reasons should be made within one week after the original due date of the assignment.

Laboratory Sessions: [Attendance & participation is required in the laboratory sessions of the course and you must receive a passing grade in the lab in order to pass the class]{style="color: red"}. Any student with more than one missed lab session will fail the laboratory part of the course and, hence, the entire course. An excused absence from a lab session can be made up during makeup lab session weeks or by participating at a different lab session during the same

week. You must get permission from your lab instructor. If you cannot avoid missing a lab session, contact the instructor in advance. You must hand in a lab report to get credit for each session. The lab instructor will detail the format of lab reports and the grading criteria to be applied. Night observations may be scheduled.

Examinations: There will be **three** in class exams and one cumulative final exam. Your lowest in class exam grade is dropped and the remaining two account for 40% of your final grade (20% each). All examinations are closed book and you should only bring a pen or pencil.

Course Grade: The following weighting will be used for the course

Course Grade Weights

```
Laboratory Session       15%
In class participation   10%
Homework                 10%
In class Exams           40% (20% each. Lowest score of the 3 in class exams is dropped)
Final Exam               25%
```

Note there will be **three** in class exams and your lowest score will be dropped for a total of three exams towards the course grade. Therefore your final grade will be based on **two** in class exams, each worth 20% of your final grade (the final exam cannot be dropped).

Final course letter grades will be assigned based on:

```
A = 93% - 100%     B = 83% - 86.99%   C = 73% - 76.99%   D = 63% - 66.99%
A-= 90% - 92.99%   B-= 80% - 82.99%   C-= 70% - 72.99%   D-= 60% - 62.99%
B+= 87% - 89.99%   C+= 77% - 79.99%   D+= 67% - 69.99%    F = 0% - 59.99%
```

Accommodation Statement: Students are encouraged to self-disclose disabilities that have been verified by the Office of Educational Accessibility by providing Accommodation Letters to their instructors early in the semester in order to start receiving accommodations. Accommodations might not be made until the Accommodation Letters are provided to the instructor.

Honor Pledge: "*I pledge to support the honor system of Old Dominion University. I will refrain from any form of academic dishonesty or deception, such as cheating or plagiarism. I am aware that as a member of the academic community, it is my responsibility to turn in all suspected violators of the honor system. I will report to Honor Council hearings if I am summoned.*" By attending Old Dominion University you have accepted the responsibility to abide by this code. This is an institutional policy, approved by the Board of Visitors.

Course Schedule: Tentative schedule for semester. Subject to change as necessary.

Date			Chapter and/or Topic	Reading Assignment
Tue	Jan	09	Course Goals, Structure and Math Review	pg 2-12,15-17
Thu	Jan	11	1 Why Learn Astronomy	pg 22-51
Tue	Jan	16	2 Patterns in the Sky	pg 58-76
Thu	Jan	18	3 Motion of Astronomical Bodies	pg 82-94
Tue	Jan	23	4 Gravity and Orbits (1/2)	pg 95-102
Thu	Jan	25	4 Tides (2/2)	pg 108-126
Tue	Jan	30	5 Light (1/2)	pg 127-134
Thu	Feb	01	5 Heat, Stefan-Boltzmann law, photons (2/2)	
Tue	Feb	06	In Class Exam 1 (Ch. 1-5)	pg 142-165
Thu	Feb	08	6 The Tools of the Astronomer	pg 172-192
Tue	Feb	13	7 The Birth and Evolution of Planetary Systems	pg 358-381
Thu	Feb	15	13 Taking the Measures of Stars	pg 390-402
Tue	Feb	20	14 Our Sun (1/2)	pg 403-412
Thu	Feb	22	14 The Atmosphere of the Sun (2/2)	pg 420-442
Tue	Feb	27	15 The Interstellar Medium and Star Formation	
Thu	Mar	01	In Class Exam 2 (Ch. 6-7,13-15)	pg 450-471
Tue	Mar	13	16 Evolution of Low-Mass Stars	pg 478-499
Thu	Mar	15	17 Evolution of High-Mass Stars	pg 506-527
Tue	Mar	20	18 Relativity and Black Holes	pg 534-556
Thu	Mar	22	19 Galaxies	pg 564-582
Tue	Mar	27	20 The Milky Way	pg 590-610
Thu	Mar	29	21 The Expanding Universe	
Tue	Apr	03	In Class Exam 3 (Ch. 16-22)	pg 616-638
Thu	Apr	05	22 Cosmology	pg 646-667
Tue	Apr	10	23 Large-Scale Structures in the Universe	pg 674-693
Thu	Apr	12	24 Life and Review (chapters 20-23)	TBD
Tue	Apr	17	Special Topic	
Thu	Apr	19	Semester Review	
Thu	Apr	26	Final Exam	

Test

Test 1

PHYS 112N. Introductory General Physics

Emphasizes electricity, light, and introduction to modern physics. Prerequisites: PHYS 111N and MATH 102M (or MATH 103M) or MATH 162M or MATH 166. (offered fall, spring, summer).

Include link to syllabus somehow

```
x=np.arange(0,105,5)
x
```

```
array([  0,   5,  10,  15,  20,  25,  30,  35,  40,  45,  50,  55,  60,
        65,  70,  75,  80,  85,  90,  95, 100])
```

Fall 2018

Courses taught this semester

- PHYS103 (CRN: 10022) Intro. Astro
- PHYS103 (CRN: 20012) Intro. Astro
- PHYS111 (CRN: Online 18049 18050) Intro. Phys. I
- PHYS451/551 (CRN: 21079) Theoretical Mechanics
