<u>**PHYS 8150 Selected Topics in Astrophysics**</u>
Spring Semester, 2015
3 Credits

<u>**Course Time:**</u> noon-1:30 pm

<u>**Instructor:**</u> Prof. Oleg Kargaltsev

<u>**Course Place:**</u> Corcoran 209

<u>**Office Hours:**</u> by appointment

<u>**Office:**</u> Samson 214

<u>**Contact information (E-Mail):**</u> kargaltsev@gwu.edu

Prerequisites: core graduate physics courses

Synopsis

After taking this course, students will be able to translate astronomical phenomenon into physics concepts and solve a wide range astrophysical problems using their physics knowledge. Class activities are mainly represent instructor-facilitated problem solving at the blackboard with participation of all students and discussions. The instructor at the beginning of the class may give brief introductions to various astrophysical phenomena. Students are expected to continue working at home on the problems introduced in class.

Table 1. Capstone Course Objectives

Content Objectives	Skills Objectives
1. Become familiar with a wide range of complex astronomical phenomena 2. Learn how to find and isolate specific physical laws and concepts while describing a complex astronomical phenomenon	1. Problem-solving and analytical skills 2. Group work 3. Facilitating discussion
Assessments and grade calculation: ▪ Discussion participation (40%) ▪ Problem solving at the blackboard (40%) ▪ Problem solving at home (20%)	

Course Schedule. A schedule of topics covered in Spring 2015 course is shown below in Table 2.

Table 2. Classroom Schedule and Activities (assignments and deliverables in bold)

Class	Topics for Class Lectures and Activities
1	Equation of state for a degenerate star. Mass-Radius relation for WDs.
2	Tidal disruption by a black hole or a neutron satr.
3	N-body systems with gravity.
4	N-body systems with gravity.
5	N-body systems with gravity.
6	Strömgren sphere and Saha equation. Application to neutron stars.
7	Landau damping. Astrophysical implications.
8	Adiabatic Invariants. Astrophysical applications.
9	Turbulence. Kolmogorov's law. Relation between fours spectrum and autocorrelation function.
10	Equations of hydrodynamics. Sound waves. General approach to derive the dispersion relation in linear approximation.
11	Equations of hydrodynamics. Stationary solutions. de Laval nozzle. Critical point. Trans-sonic flow.
12	Parker model for stellar wind (isotropic gas outflow with gravity).
13	Energy loss due to sound waves. Connection to EM waves. Relation between the Fourier spectrum for the variability and spectrum of electromagnetic radiation.
14	Concluding remarks, student questions.

<u>Course Format</u>

This course is primarily focused on group discussions and group problem solving in class. Therefore, class attendance is absolutely necessary. There is no single textbook for the course. Many problems solved in class come from research papers written by the instructor and others.

There are no exams in this course.

<u>Grading:</u> Numerical course grades translate into letter grades using the following scale:

≥ 94.00	**A**	$70.00 - 73.99$	**C**
$90.00 - 93.99$	**A-**	$66.00 - 69.99$	**C-**
$86.00 - 89.99$	**B+**	$61.00 - 65.99$	**D+**
$82.00 - 85.99$	**B**	$55.00 - 60.99$	**D**
$78.00 - 81.99$	**B-**	$50.00 - 54.99$	**D-**
$74.00-77.99$	**C+**	≤ 49.99	**F**

<u>Absences and Excuses</u>: All requests to have an absence excused must follow standard University policy, that is, there must be a written note and supporting documentation to the instructor, explaining the absence. Verbal explanations cannot be accepted.

Academic Integrity

Compliance with the GW Code of Academic Integrity is mandatory. The code states: "Academic dishonesty is defined as cheating of any kind, including misrepresenting one's own work, taking credit for the work of others without crediting them and without appropriate authorization, and the fabrication of information." For the remainder of the code, see: http://www.gwu.edu/~ntegrity/code.html

Support for Students Outside the Classroom

DISABILITY SUPPORT SERVICES (DSS)
Any student who may need an accommodation based on the potential impact of a disability should contact the Disability Support Services office at 202-994-8250 in the Marvin Center, Suite 242, to establish eligibility and to coordinate reasonable accommodations. For additional information please refer to: http://gwired.gwu.edu/dss/

UNIVERSITY COUNSELING CENTER (UCC) **202-994-5300**
The University Counseling Center (UCC) offers 24/7 assistance and referral to address students' personal, social, career, and study skills problems. Services for students include: crisis and emergency mental health consultations, confidential assessment, and counseling services (individual and small group), and referrals.
http://gwired.gwu.edu/counsel/CounselingServices/AcademicSupportServices

Security

In the case of an emergency, if at all possible, the class should shelter in place. If the building that the class is in is affected, follow the evacuation procedures for the building. After evacuation, seek shelter at a predetermined rendezvous location.