



The Physics and Astronomy Department at Western welcomes you to the Academic Year 2020/2021 edition of

### **Astronomy 2021a: Life in the Universe**

Typically, you would have heard about this course from peers, but in the era of COVID–19, we should not assume what was normal before, so let me say a few things about the *raison-d'être* of this course.

Both the quest for extra–terrestrial life and the origin of the Universe (discussed in A2022B) are topics with ramifications far beyond the natural sciences; one may, fairly so, call these questions metaphysical and thus even reaching beyond the boundaries of human knowledge. For a lecturer to approach these topics with narrow blinkers — I like the German term *Scheuklappen* better, as it captures their purpose to counter the irritability of the wearer; it seems indeed to be irritability what scientists in the postmodern era too often display when their naive views of human almightiness are no longer taken for self–evident — does neither justice to their topics, nor to the fair expectations with which students approach these courses. When I have to compromise in this matter, then only because of the unfortunate fact of University life that the need to calculate marks for each student tops attending to your desire to learn, to understand and to find meaning in the world in which you live.

The syllabus to follow tries to convey how I intend to cope with the sudden paradigm shift towards online learning. Course delivery is hampered by the need to fill numbers into transcripts, often treated as the main purpose of higher education (but luckily completely ignored by employers and, more recently, even professional schools as they state “we don’t need people who know how to write tests, we need people with problem solving skills”). To that end, please refer to the Evaluation Summary of the Syllabus, outlining the marking scheme to which all Physics and Astronomy courses adhere; if you find the current uncertainty unsettling take this course as a Discovery Credit and get exposed to the most fundamental questions about life and the Universe you’ll ever encounter without worries about marks.

## Course Outline — General Comments

A course outline gives you an overview of the course, in particular (1) its content, (2) its evaluation schemes and (3) the rules. It is required at Western University to provide you with a fully accountable product with maximum fairness and equal treatment of all students participating in the course. In this, I adhere to Immanuel Kant's categorical imperative, which you find quoted sometimes in this form: *Never do for one what you are not willing to do for all!*

Western requires all Course Outlines to be filed with the Dean's office by the first day of class. They obviously don't read this material, but if a student disputes the application of any rule in a course, the Dean's office will check what the syllabus states.

When we implement a novel course component or refine an existing one, or, like in the academic year 2020/2021, deal with unprecedented shifts in the educational landscape, then an initially developed set of rules may not meet the objectives as hoped. To remedy this concurrent with the current delivery of the course, syllabus rules may have to be revised or supplemented. **Rules affected in this way will appear in the Course Outline for the current year in pink, the same colour in which this sentence is highlighted.** We will make every effort to avoid a negative impact on any student's learning experience caused by rule changes after the first day of class. We will disclose the added text to the Dean if a challenge is based on a provision added in pink. Based on past experience, we are confident that we will meet everyone's expectations of fairness in such cases.

## Instructor Access

Western University requires us to keep a record of all official course correspondence for one year after the completion of the course. Official course correspondence is defined as correspondence received through the meeting point listed below, which is embedded within your OWL website. Messages sent through any other channel, particularly messages sent via email or phone messages are not retained, may not be answered, and are not considered official communications regarding this course. Even if you receive a response, please be advised that such responses might be inaccurate and do not supersede statements made in the course syllabus, the course announcements or through the official meeting point. If communications with students result in amendments to the course syllabus, these are provided in Announcements on your A2021 OWL.

### ► Instructor

Dr. M. Zinke–Allmang (working in 2020/2021 from home).

Meeting Point: OWL Astronomy 2021 → Messages → Compose Message: To Zinke–Allmang, Martin (mzinke)

Note: Messages sent this way are **not visible** to other students.

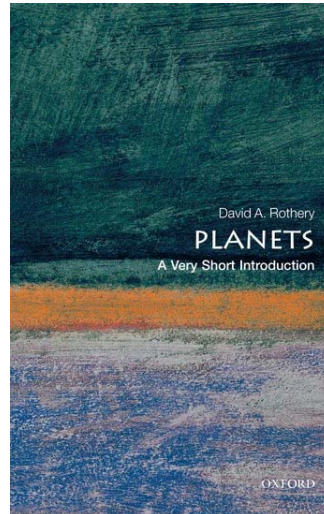
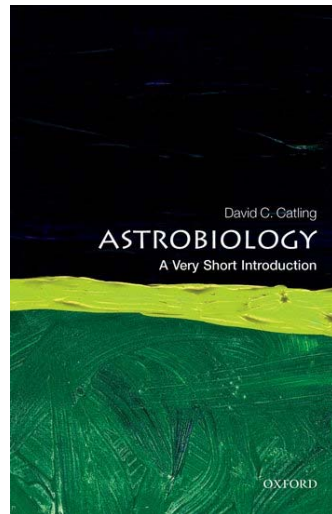
## Required Course Material

- **Textbooks**

Astrobiology — A Very Short Introduction, Vol. 370, David C. Catling, Oxford University Press (Abbreviated as AS)  
Planets — A Very Short Introduction, Vol. 254, David A. Rothery, Oxford University Press (Abbreviated as PL)

- **Access to OWL**

You need to have access to a desktop computer or laptop with internet connection. After entering your user id and password, you click on the course tab for your Astronomy course: **ASTRONOMY 2021A 001 FW20**



## A2021A Organon

Course Component	Textbook Pages	Title
1 — Listen to this first	—	Content and Form of online [in two parts, recorded together]
2 — Motivation	—	The Discovery of the Self in the vast Universe — why does it matter? [in 4 bonus parts]
3 — Introduction	AS 1 – 6 AS 120 – 124	Where do we stand in the search of extraterrestrial intelligence? [in 6 bonus parts]
4a — Unit 1	AS 14 – 21 PL 3 – 6	Our place in the Universe [contains 11 compulsory parts and 1 bonus part] The Life of Stars (BBC-4) The Sun (BBC-4)
4b — Unit 2	AS 22 – 27 PL 4 – 27	Solar System and its Formation [contains 7 compulsory parts and 1 bonus part] Ageing the Earth (BBC-4) The Earth's Origins (BBC-4) The Planets (BBC-4)
4c — Unit 3	AS 44 – 58	Physical Conditions on Earth, with Comparisons across the Solar System [contains 8 compulsory parts and 1 bonus part] Plate Tectonics (BBC-4) The Moon (BBC-4)
4d — Unit 4	PL 30 – 70 PL 82 – 100	Two Worlds of Particular Interest: Mars and Europa (a Galilean Moon) [contains 7 compulsory parts and 1 bonus part] Mars (BBC-4)
4e — Unit 5	AS 6 – 13 AS 28 – 43 AS 58 – 62	Life and its History on Earth [contains 8 compulsory parts and 1 bonus part] Human Origins (BBC-4) The Neanderthals (BBC-4) The Origins of Life (BBC-4)
4f — Unit 6	AS 63 – 81	Human Life and Intelligence [contains 8 compulsory parts and 2 bonus parts] Imagination and Consciousness (BBC-4) Intelligence (BBC-4) Perception and the Senses (BBC-4) The Mind/Body Problem (BBC-4)
4g — Unit 7	AS 82 – 109 PL 27 – 29	A problematic concept: Habitability Zone [contains 6 compulsory parts and 2 bonus parts] Extra Terrestrials (BBC-4) The Scientific Method (BBC-4) Venus (BBC-4)
4h — Unit 8	AS 110 – 119 AS 125 – 129 PL 116 – 125	An unreachable frontier: Extrasolar Planets [contains 6 compulsory parts and 1 bonus part] Exoplanets (BBC-4)
5 — Farewell	—	What does it all mean? The Meaning of Life [contains 7 bonus parts]

IN BLUE — Compulsory Material: on the exams

IN GREEN — Bonus Material: not needed for the exam

# Astronomy 2021A

## Learning Outcomes

### (1) Broad Learning Outcomes

At the end of the course you will be able to

- assess within the framework of the natural sciences the uniqueness of Earth and life on Earth;
- demonstrate a conceptual understanding (comprehension) of those physical, chemical, geological and biological processes that determine the probability to find Earth-like life anywhere in the Solar system;
- demonstrate a conceptual understanding (comprehension) of the physical, chemical, geological and biological parameters of Exoplanets, and the measurement of these parameters; and,
- know the definitions of terms and explain the basic models/theories associated with the formation of planetary systems, planetary lithospheres, hydrospheres and atmospheres, as well as life, its evolution, intelligence and the development of intelligent species.

### (2) Granular Learning Outcomes

Note that some of these learning outcomes encompass quite a bit of background material that is implicitly assumed to be understood! By the stated point in the course, you should be able to

#### 1. Unit 1 (Our place in the Universe)

- a. define and use the terms *star*, *planet*, *solar system*, *galaxy*, and *nebula*;
- b. define lengths scales and distance in various astronomical units (e.g., *astronomical unit* and *light year*), and relate it to the size of astronomical objects;
- c. give approximate ages of astronomical objects;
- d. define the term nuclear fusion and apply it to the generation of energy in stars;
- e. define and use the term energy: (gravitational) potential energy, radiative energy, thermal energy and mass-energy;
- f. name the components of the *electromagnetic spectrum* in wavelength order;
- g. correctly use solar composition terminology including *atom*, *electron*, *proton*, *plasma* and *photon*;
- h. describe the structure of the sun and the physical parameters of the various layers;
- i. describe the transport of energy from the Sun's core to the surface;

- j. Reproduce, understand and explain the Hertzsprung-Russell diagram;
- k. relate the spectral type of a star directly to its surface temperature, and indirectly to its mass;
- l. relate the luminosity of a star to its mass;
- m. list the main features of a stellar life cycle for our Sun and for a larger star, including the chronological stages;
- n. identify the origin of elements heavier than helium and their abundance with respect to the life cycle of a star, identify the origin of the chemical elements on Earth;
- o. discuss which stars may have planetary systems, and which stars may have planetary systems long enough in existence to bear life

## 2. Unit 2 (Solar System and its Formation)

- a. describe the relative sizes of Solar System objects;
- b. describe the order of events in the Solar System's and Earth's history;
- c. reproduce, understand and explain the conservation of energy;
- d. describe basic factors about the Solar System: constituents and their orbits, mass; its location in the Milky Way;
- e. explain and use the term angular momentum, explain and use the concept of conservation of angular momentum;
- f. explain the nebular theory and how it relates to Solar System properties;
- g. explain and use the terms contraction, condensation, accretion and clearing and their chronological relation in the nebular theory;
- h. describe how and when Earth's Moon was formed, and its stabilizing effects on Earth's axis tilt;
- i. describe and explain the apparent motion of Solar System planets in the sky;
- j. identify the contributions of Kepler and Newton to the understanding of the motion of planets;
- k. reproduce, understand and explain Kepler's laws and their implications for the solar system;
- l. reproduce, understand and explain Newton's law of gravity;
- m. name the terrestrial planets and their major moon, qualitatively describe its differences relative to Earth;
- n. define meteorites and impact craters, use cratering (e.g., on the Moon) to determine age

## 3. Unit 3 (Physical Conditions on Earth, with Comparisons across the Solar System)

- a. describe how rocks are analyzed and how their age is determined;
- b. define and use the term isotopes;
- c. reproduce, understand and explain the basic nuclear decay processes;
- d. define and use the concept of half-life and its application in radiometric dating;
- e. describe the role of foraminifera in the carbon-dioxide cycle;
- f. define the terms outgassing and describe its role in the carbon-dioxide cycle ;
- g. describe the inner structure of Earth, and the role of differentiation;

- h. describe the mechanism of plate tectonics, how it relates to subduction, and the differences between seafloor and continental crust;
- i. explain the origin of the Earth's magnetic field and its role in solar wind stripping;
- j. explain the greenhouse effect and its role in the surface temperature on Earth;
- k. describe how carbon-dioxide and the greenhouse effect regulate Earth's climate;
- l. identify processes that cause long-term changes in Earth's climate, such as Ice Ages and the so-called Snowball Earth;
- m. define and use the concept of phase changes of matter;
- n. explain the difference between fusion and fission;
- o. describe the properties of water and explain how these properties are related to the water molecule as an electric dipole;
- p. describe the role of an atmosphere in the formation of liquid water on a planetary or moon's surface;
- q. describe Earth atmosphere, in particular its variations in pressure and temperature with height above sea level;
- r. list the properties of water that make it essential for life (as distinguished from other small molecules);

#### 4. Unit 4 (Two Worlds of Particular Interest: Mars and Europa)

- a. list the physical and astronomical parameters of Mars;
- b. explain why Mars has no surface water at present;
- c. characterize the Martian seasons and winds, relate these to its astronomical and physical parameters;
- d. list the seasonal composition of the Martian polar caps;
- e. identify the major geological features of the Martian surface, and its differing surface regions;
- f. discuss volcanism and tectonics on Mars, in comparison to Earth;
- g. list evidence of past presence of liquid water on the Martian surface, identify each as to its detection method;
- h. describe the experiments aboard the Viking missions, and their results analyzing Martian soil samples;
- i. describe the climate history of Mars, and relate it to its lack of a magnetic field;
- j. identify the age of the main regions of Mars, identify the method of age detection;
- k. discuss the variability with time of the axis tilt of Mars and the role of its orbital eccentricity on the Martian seasons;
- l. discuss the pros and cons for a manned mission to Mars;
- m. identify the internal composition of the Jovian planets;
- n. describe the steps in Jovian planet and moon formation and how it differs from terrestrial planet formation;
- o. explain the concept of tidal heating, and its role on Europa (Jupiter's 2<sup>nd</sup> moon);
- p. explain the evidence for a possible ocean on Europa;
- q. discuss the possibility of subsurface life on Europa



## 5. Unit 5 (Life and its History on Earth)

- a. Summarize the standard definitions of life, and compare to the definition used in exobiology;
- b. describe the working definition of biology that life is built from cells;
- c. describe the current paradigm on the origin of life on Earth;
- d. identify the locations where the building blocks of life occur;
- e. describe the evolutionary theory;
- f. describe the phylogenetic tree of life and the role of an oxygen atmosphere in its development;
- g. understand the role of extinction rate and mass extinctions on the development of diversity of life on Earth;
- h. summarize the pathway of evolution from single-cell organisms to humans, in particular during the last 7 million years;
- i. describe the main misconceptions about evolution;
- j. describe what Mendel's work tells us about the mechanisms of inheritance;
- k. understand the function of chromosomes;
- l. outline the mechanism of gene expression;
- m. describe brain sizes and brain size development among hominins.

## 6. Unit 6 (Human Life and Intelligence)

- a. Describe the basic dualism, materialism and idealism models of the human mind;
- b. distinguish the current paradigm of signal transport through the brain;
- c. describe the individual components of the mind based on Kant's model, and their contribution to the online and offline pathways in the brain;
- d. describe the main analytical processing of images formed on the retina, such as edge formation and orientation, colour and motion;
- e. describe the Young-Helmholtz theory of colour vision and the role of the chromaticity diagram;
- f. explain the difference between the concepts of light wavelength and colour;
- g. explain the dorsal and ventral streams and the functions attributed to these;
- h. summarize the logical functions of the mind, and their role in Kant's model of the mind;
- i. describe the various illusions and errors that can occur in the human brain.

## 7. Unit 7 (A Problematic Concept: Habitability Zone)

- a. Name the environmental requirements of life and habitability of a planet or moon;
- b. describe where we can expect to find sufficient energy for life to evolve;
- c. explain why life is not possible on the Moon and Mercury;
- d. list the environmental parameters that act adverse on the existence of life on Mars and Venus;
- e. define the term Habitability Zone;
- f. explain which important surface parameters are included and which ones are omitted in the definition of habitability zones;

- g. explain why the existence of a Habitability Zone is neither sufficient nor necessary to find life on a planet or moon;
- h. discuss what would happen to Earth if it were moved inwards towards Venus, or outwards towards Mars;
- i. identify the reasons why Venus has presently no surface water and why it has a very thick carbon-dioxide atmosphere;
- j. discuss observational evidence for volcanism and the lack of plate tectonics on Venus;
- k. explain what a runaway greenhouse effect is, and what effects it has on water on the surface of a planet, distinguish it from a moist greenhouse effect;
- l. describe the role of the distance from a star for the habitability of a planet, list the atmospheric parameters required for a planet in the habitability zone to possibly carry life;
- m. explain the boundaries of the habitability zone of our Sun, and how these change with time.

## 8. Unit 8 (An Unreachable Frontier: Extrasolar Planets)

- a. describe how we detect planets around distant stars;
- b. distinguish and list the key features of the four extrasolar planet detection methods used to date to find most exoplanets;
- c. describe the Doppler effect for light and its limitations as a method for exoplanet detection;
- d. describe the concept of centre of mass, and its role in the astrometric method to detect exoplanets;
- e. define brightness of a star and describe how a planet orbiting the star can affect its brightness;
- f. distinguish the terms transit and eclipse, and describe the use of transit and eclipse observations to characterize exoplanets;
- g. list the physical and astronomical parameters of exoplanets that we can measure to date;
- h. identify (statistical and physical) differences and similarities of the planets of the Solar System with those found orbiting other stars;
- i. describe what a hot Jupiter and a super-Earth are;
- j. identify the methods of detection of composition and temperatures of the atmospheres of exoplanets;
- k. define differences in habitability zones in star systems studied with the Kepler mission.

## Evaluation Summary

Fall/Winter 2020/2021

Course Component	Available: OWL Tests&Quizzes	Component Weight	
Unit Content Review Quizzes 1 – 8	September 9 – December 9 (always from Noon to Noon)	Duration: 15 min * 10 Questions	14 %
In Our Time broadcast Quizzes (19 recordings available)	September 9 – December 9 (always from Noon to Noon)	Duration: 1 hour * 4 Questions	cumulative need 40 for 20 %
Exam Component I ** (Unit 1 – Unit 4)	December 11 – December 22 (always from Noon to Noon)	Duration: 1 hour * 40 Questions	33 %
Exam Component II ** (Unit 5 – Unit 8)	December 11 – December 22 (always from Noon to Noon)	Duration: 1 hour * 40 Questions	33 %

\* The Teaching Support Centre at Western advised instructors as follows:

*Arranging Accommodated Exams for Students with Disabilities (Fall 2020)*

*For online timed assessments:*

*Instructors are very strongly encouraged to employ the principles of Universal Instructional Design (i.e. providing 4 hours to all students to complete a 2-hour assessment) to avoid the need to accommodate students with disabilities. This is best practice.*

I will follow this advice for Unit Content Review Quizzes (thus available 30 minutes each) and In Our Time Broadcast Quizzes (thus available 2 hours each). There are ongoing communications on this matter between the Chair of Physics and Astronomy and the Dean of Sciences with respect to the Exam Components; I will issue an announcement when a pertinent decision has been made.

\*\* Makeup privileges granted only if documentation is provided showing no availability for the entire exam period.

The Department of Physics and Astronomy may, in exceptional cases, adjust the final course marks in order to conform to Departmental policy.

## Unit Content Review Quizzes (UCRQ)

We suggest to complete Unit Content Review Quizzes once the material of a Unit has been studied, i.e., the mp3 Recordings of a Unit (utilizing the pertinent Powerpoint slides and Demonstration Videos) have been attended and the assigned sections in the textbooks have been read.

- Number of Quizzes:

8 Unit Content Review Quizzes are provided throughout the Fall term (corresponding to Units 1 to 8 of the course material), called UCRQ-1 through UCRQ-8 in Tests&Quizzes of your A2021A OWL site.

- Content of Quizzes:

Each Quiz contains 10 questions (selected randomly from a larger pool of questions for this Unit). As therefore every student will see a different set of questions, we state that these are not suitable as rehearsal material for the examinations in this course; separate Rehearsal material is provided for this purpose.

- Dates available:

Each quiz is available throughout the class-part of the term, i.e., they do not extend into Study Days or the subsequent exam period. For details on dates, please refer to the file [30\\_Evaluation\\_General](#) of the Syllabus.

Each Quiz will be accessible from Noon (12:00) on the date it opens until Noon (12:00) the date it closes.

**Note: Noon is midday, not midnight!**

- Other quiz details:

You receive one point for each correct answer. You have only one attempt, so be careful not to open the wrong quiz!

- Evaluation:

Each question in each quiz counts as 1 point (correct) or 0 points (incorrect). Thus, a maximum of 80 points can be reached — this is called your cumulative point value X. The course component contributes Z % to your Final Course mark (for the value of Z, please refer to file [30\\_Evaluation\\_General](#) of the Syllabus), so, we calculate the value of the pertinent OWL Gradebook column (Y) as:  $Y = X*Z/80$  rounded to one decimal point.

For further details on course component evaluations, please refer to the file [30\\_Evaluation\\_General](#) of the Syllabus.

- General Comment: **Check all your scores in the Gradebook of OWL at least on a weekly basis**

If there is a discrepancy, you must notify us within one (1) week of the completion of a Quiz as ITS does not like to backtrack farther than that. That is, **all marks and points posted in the Gradebook are considered final one week after posting.**

**We will not consider any adjustments for whatever reason. Each quiz is available for essentially the entire term and can be completed from a laptop/computer anywhere on the planet, even when required to self-isolate. If you miss such a significant fraction of a course, we recommend that you withdraw and retake the course the next time it is offered.**

Note that you may have to update software, such as your version of JAVA. Try first, if it doesn't work, please contact the ITS Helpdesk at Ext. 83800 (off-campus at 519 661 3800).

**Important disclaimer: *Counsellors in the various Deans' offices do not approve accommodations. They only validate documentation you submit with respect to missed course components and confirm this in your student file online. It is your obligation to contact course coordinators to discuss arrangements, but only if, as a result, an accommodation is warranted, that is in particular, the time missed includes the entire window for the affected course component.***

## In Our Time Broadcast Quizzes (IOTBQ)

As a degree holder of a Canadian University, it is assumed that you can follow conversations on a subject matter you have studied. What this means, however, is usually not evident when you take a breadth course. For this purpose, on various subjects of broader interest pertaining to the course material we cover in Astronomy 2021, we provide you with a set of mp3 Recordings of the BBC-4 programme *In Our Time*, moderated by Melvyn Bragg (<https://www.bbc.co.uk/programmes/b006qykl/episodes/guides>)\*. Your participation is recorded through a set of questions accessible with each recording. The BBC-4 broadcasts usually last for 30 to 45 minutes, the quiz questions will be available longer; thus we recommend you open the quiz, briefly review the four questions before enjoying the programme Melvyn Bragg and his guests provide.

\*On this website, you also find the rules for use of the *In Our Time* BBC Radio 4 broadcasts; please note, that these apply even if you download a broadcast from your OWL site.

- Number of Quizzes:

19 *In Our Time* Broadcast Quizzes are provided throughout the Fall term, they are labeled IOTBQ-U\*, where U\* stands for the Unit number, followed by the title of the broadcast. These are provided in Tests&Quizzes of your A2021A OWL site.

- Content of Quizzes:

Each quiz contains 4 questions (selected randomly from a larger pool of questions for this broadcast)

- Dates available:

The quizzes are available throughout the class-part of the term, i.e., they do not extend to Study Days/exam periods. For details on dates, please refer to the file [30\\_Evaluation\\_General](#) of the Syllabus

- Other quiz details:

You receive one point for each correct answer. You have only one attempt, so be careful not to open the wrong quiz! The quiz is available longer than the broadcast lasts, however, do not delay the broadcast for more than 10 minutes. Also, we **do not** recommend to listen to the broadcast first, then start the quiz, as many questions refer specifically to something (e.g., a number) mentioned in the broadcast and are impossible to memorize for later.

- Evaluation:

Each question in each quiz counts as 1 point (correct) or 0 points (incorrect). Thus a maximum of 76 points can be reached — Your cumulative point value I call X, and the threshold you need to reach for the full course component mark I call T. The course component contributes Z% to your Final Course mark (for the values of T and Z, please refer to file [30\\_Evaluation\\_General](#) of the Syllabus). At the end of the term we calculate the value of the pertinent OWL Gradebook column (Y) as:  $Y = Z$  if  $X \geq T$  and  $Y = X*Z/T$  if  $X < T$ ; rounded to one decimal point.

For further details on course component evaluations, please refer to the file [30\\_Evaluation\\_General](#) of the Syllabus.

- General Comment: [Check all your scores in the Gradebook of OWL at least on a weekly basis](#)

If there is a discrepancy, you must notify us within one (1) week of the completion of a Quiz as ITS does not like to backtrack farther than that. That is, **all marks and points posted in the Gradebook are considered final one week after posting.**

**[We will not consider any adjustments for whatever reason. Each quiz is available for essentially the entire term and can be completed from a laptop/computer anywhere on the planet, even when required to self-isolate. Once you miss such a significant fraction of a course, we recommend that you withdraw and retake the course the next time it is offered.](#)**

Quizzes can be completed at any computer connected to the internet, including at home. mp3-broadcasts can also be listened to with any computer connected to the internet and equipped with suitable speaker technology. If you require technical assistance, please contact the ITS Helpdesk at Ext. 83800 (off-campus at 519 661 3800).

**Important disclaimer: *Counsellors in the various Deans' offices do not approve accommodations.* They only validate documentation you submit with respect to missed course components and confirm this in your student file online. It is your obligation to contact course coordinators to discuss arrangements, but only if, as a result, an accommodation is warranted, that is in particular, the time missed includes the entire window for the affected course component.**

## Examinations

For this course, we run two examination components, each covering half the course — this corresponds to the traditional non-cumulative Midterm and Final approach. Each of the examinations is available to you throughout the December exam period; this allows you to accommodate your preparation most flexibly through the term, and during the exam period by taking the schedule of your other exams into consideration.

- Number of Examinations:

2 Exam Components during December Examination period —

Examination I (corresponding to Units 1 to 4 of the course material), and

Examination II (corresponding to Units 5 to 8 of the course material)

These will be called Exam–I and Exam–II and will be available through the Test&Quizzes tab on the OWL site

- Content of Examinations:

Each Examination component contains 40 questions to be completed in 1 hour (60 minutes). Note that the questions are randomly selected from a larger pool of questions for each Unit.

- Dates available:

Each Examination component is available throughout the December examination period. For details on dates, please refer to the file [30\\_Evaluation\\_General](#) of the Syllabus.

- Other Examination details:

You receive 1 point for each correct answer and 0 points for incorrect answers. Needless to say, you will have only one attempt, so be careful not to open the wrong examination!

Aids: this is an open textbooks exam, please have the textbooks and your notes ready when starting each of the examinations in this course

- Evaluation:

Each examination contributes Z% to your Final Course mark (for the value of Z, please refer in the Syllabus to file [30\\_Evaluation\\_General](#)). Assuming you answer correct X questions out of 40, we calculate the value of the pertinent OWL Gradebook column (Y) as:  $Y = X*Z/40$ , rounded to one decimal point.

For further details on course component evaluations, please refer to the file [30\\_Evaluation\\_General](#) of the Syllabus.

- Reasons the Dean's office may accept for missing the final examination:

- Serious personal illness, for which you need to provide medical documentation covering the entire examination period, see [40\\_Small Print](#);

- Bereavement of an immediate family member;

- Religious Holiday (must be a holiday officially recognized by Western and must stretch the entire exam period. It must be filed in advance of the examination period; see the Dean's office for filing deadlines, which are usually well ahead of the examination period);

- Exam scheduling conflicts — not applicable.

In each case, supporting documentation must be filed with the Office of the Dean of your Faculty. If you either know in advance that you will miss an exam or you have missed an exam, do not contact your lecturer or the Departmental office: we cannot grant you permission to write a makeup exam — you must contact the Dean's counselling office of your Faculty.

- What happens after the exam?

You have two avenues to challenge your mark on the final exam or in this course: Within one week of posting and publishing the marks (in the OWL Gradebook) ...

- you request a review of the exam (how this will be done will be determined by the Chair of the Physics and Astronomy Department of his/her delegate), then formulate a challenge to one or more questions and provide your rationale. This you submit to the course instructor who reports back to you with a decision — or, ...
- you provide a request for a mark revision on compassionate grounds. Reasons given must severely have affected your course performance, usually in more than one course, and must be supported by documentation that has been submitted prior to the Dean's office. Again, the instructor reports back to you with a decision.

If you are not satisfied with the decision, you are allowed to carry your appeal to the next stage, i.e., the Chairman of the Department of Physics and Astronomy. We will provide to the Chair your initial request for an appeal, and all material he/she considers useful to come to a decision. Prior to proceeding with such an appeal, you may consult with the Chair or the Dean's office regarding rules that govern such appeals, as these change from time to time, often without notice provided to your instructor. While you are entitled to see your exam for one year (again, what this entails will have to be decided by the Chair of the Physics and Astronomy) after the exam has been written, timely action is needed if you feel that the mark does not properly reflect your performance in the course.



## The Small Print

### Special mention for online courses in Academic Year 2020/2021

Western University is committed to a thriving campus as we deliver our courses in the mixed model of both virtual and face-to-face formats. We encourage you to check out the Digital Student Experience website to manage your academics and well-being: <https://www.uwo.ca/se/digital/>.

Learning-skills counsellors at the Student Development Centre (<http://www.sdc.uwo.ca>) are ready to help you improve your learning skills. They offer presentations on strategies for improving time management, multiple choice exam preparation and writing, textbook reading, and more. Individual support is also available.

Students who find themselves in emotional and/or mental distress should refer to Mental Health@Western ([http://www.health.uwo.ca/mental\\_health](http://www.health.uwo.ca/mental_health)) for a complete list of options about how to obtain help.

Additional student-run support services are offered by the USC at <http://westernusc.ca/services>.

### Changes to Western Bookstore Services for 2020/2021

To accommodate courses that are being offered online, and students that are not residing in London, the Bookstore will offer the following services for the Fall term:

- Online ordering of physical (paper) books and/or Custom Course Materials (e.g., lab manuals) through the Bookstore website. Items can be shipped to students directly (online order at bookstore webpage) if they are learning remotely.
- Students buying books on campus will have the option of some form of curbside pickup
- Obtaining commercial electronic books, to be sold through the Western Bookstore website (depending on publishers' availability).
- Converting Custom Course Materials (textbooks or lab manuals) to an electronic format. The e-books will be accessible only via the Bookstore's online platform. Students will not be able to download the content for offline access. But instructors can select certain pages to be printed out by the students.

If you have any questions or want to place an order, contact Rachel Sandieson, Course Materials Manager at [rsandies@uwo.ca](mailto:rsandies@uwo.ca).

### General

This file constitutes part of the Syllabus and contains two types of information:

- Information that we have to include in the Syllabus due to Senate regulations, or pertinent requests by the Dean's office or the Registrar.
- Information on bureaucratic details such as how we handle complaints, mark postings, plagiarism (cheating), student's responsibilities, medical notes, and related formalities.

### Course Description

Astronomy 2021A/B: The Search for Life in the Universe

Calendar Description: This course is designed for non-science students\* as an introduction to current scientific thinking on possibility of extraterrestrial life and intelligence. Ideas, observations and experiments from the frontiers of many areas of science converge in this unique interdisciplinary field. Emphasis will be on topics of current interest, including searches for life in our solar system, detection of extrasolar planets and the origins of life on Earth.

(\* this term is not meant as an insult to you, that is, we recognize that the endeavours of discovery and dissemination of knowledge in your field of expertise also meet the requirements of a science. The term *Non-*

*science student* is defined at Western University as describing a student whose program is not administered by the Faculty of Science.)

Antirequisite(s): Physics 1028A/1029B, 1301A/1302B, 1401A/1402B, 1501A/1502B.

Prerequisite(s): none

3 lecture hours, 0.5 course

Unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you may be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.

### **Discovery Credits**

As of the 2018–19 academic year, students have had the option to declare a course as a “Discovery Credit,” so that it is graded as pass/fail on their transcript. This privilege is open only to students in their second year or higher, and cannot be used to meet a student’s modular requirements or essay requirements. Instructors will not know which students have declared their course as a Discovery Credit, and are expected to provide the same assessments, evaluated to the same standards, to all students.

### **Complaints and Suggestions**

If you have a genuine concern about something, please communicate with us. We rely on your feedback. Please contact initially the person most directly concerned; this will usually be one of the team members. If that does not work, or there is something more general bothering you, talk it over with the Chairman of the Department of Physics and Astronomy.

### **Where do I find my marks?**

All current marks are posted and updated in a timely and regular fashion on the course OWL website. It is your responsibility to check the listings for accuracy on a regular basis. Errors must be reported to your lecturer within one (1) week of initial posting.

The course mark will be posted on this site and on the official Registrar’s site. It is your responsibility to check the accuracy of the official Registrar’s posting.

Under no circumstances will the Department of Physics and Astronomy release marks over the telephone, nor will we issue individual replies per email with final marks. If you have a valid reason to obtain this information ahead of the official posting on the Registrar’s web site, please contact us in advance.

### **Student's responsibilities**

Please contact the course instructor if you require material in an alternate format or if you require any other arrangements to make this course more accessible to you. You may also wish to contact Student Accessibility Services (SAS) at 661–2147 if you have any questions regarding accommodations.

Link to the policy on Accommodation for Students with Disabilities

[www.uwo.ca/univsec/pdf/academic\\_policies/appeals/accommodation\\_disabilities.pdf](http://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_disabilities.pdf)

You are responsible to contribute your share to an orderly conduct of the lectures and the out-of-class activities relating to this course. This includes in particular a responsibility to maintain the technical tools you are using in this course:

- **Your course OWL website**

You must access this site on a regular basis to find quizzes, updated grades, communications by the course instructor through announcements, and online course material. Neglect of maintaining an overview of the material on this site does not constitute a reason for exemption of any or all course components. For OWL-related help, contact the ITS Help Desk at Ext. 83800, or, off campus, phone 519–661–3800.

- **Data Security**

Note: all data we acquire in this course are uploaded to the Gradebook. At the end of the term, these data are downloaded into an Excel file that is maintained as the master file for this course. We retain these files for

one (1) year. After that time, we may no longer be in a position to provide details on your marks to the Dean's office. This is relevant to all those who have a dispute about course marks, or request the Dean to review their marks in a summary fashion when being asked to withdraw from the University. Thus, make sure that the Final Mark, as posted on the registrar's site, is correct.

We guarantee our students that none of their marks are released to any other party than the Dean's office of the student. All course marks are calculated and uploaded by the lecturer in this course.

- **Laptops**

Your laptop allows you access to OWL and the various components on this web page, including all online components. It is your responsibility to ensure that any equipment you use to complete tasks in this class are functioning properly. If you encounter problems with a computer, consult with the ITS HelpDesk at Ext. 83800 or, from off-campus, at 519-661-3800.

## **Plagiarism**

Plagiarism is the University's word for cheating, and there are severe penalties involved. Please refer for the definition of what constitutes a Scholastic Offence, at the following Web site:

[http://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/scholastic\\_discipline\\_undergrad.pdf](http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf)

Thus, there are further Academic Offenses not mentioned explicitly in this Course Outline which apply.

Note that these rules apply to any form of participation in a mark-sensitive component in this course. We point out in particular a few maybe less obvious cases – however, even if the particular form of cheating is not listed below, but is identified in the University Calendar, penalties still apply:

- You are not permitted to login to the course OWL website with any userID / password other than your own. In particular, by submitting an answer set to a quiz online, you confirm that its content is your own work.

## **Absences and Medical Notes**

(Policy on Academic Consideration for Student Absence)

Students have up to two (2) opportunities during the regular academic year to use an online portal to self-report an absence during the semester, provided the following conditions are met: the absence is no more than 48 hours in duration, and the assessment for which consideration is being sought is worth 30% or less of the student's final grade. Students are expected to contact their instructors within 24 hours of the end of the period of the self-reported absence, unless otherwise noted in the syllabus. NOTE: Students are not able to use the self-reporting option in the following circumstances:

- for exams scheduled by the Office of the Registrar (e.g., December and April exams)
- absence of a duration greater than 48 hours,
- assessments worth more than 30% of the student's final grade,
- if a student has already used the self-reporting portal twice during the academic year

If the conditions for a Self-reported Absence are not met, students will need to provide a Student Medical Certificate if the absence is medical, or provide appropriate documentation if there are compassionate grounds for the absence in question. Students are encouraged to contact their Faculty academic counselling office to obtain more information about the relevant documentation.

Students should also note that individual instructors are not permitted to receive documentation directly from a student, whether in support of an application for consideration on medical grounds, or for other reasons. All documentation required for absences that are not covered by the Self-reported Absence Policy must be submitted to the Academic Counselling office of a student's Home Faculty.

For policy on Academic Consideration for Student Absences, see:

[https://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/Academic\\_Consideration\\_for\\_absences.pdf](https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic_Consideration_for_absences.pdf)

and for the Student Medical Certificate (SMC), see:

[http://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/medicalform.pdf](http://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.pdf)

Note that it is your Dean's responsibility to assess your documentation and formulate a recommendation for accommodation to course instructors. Once the Dean's office and the course instructor have arrived at an appropriate accommodation, you will be informed. If this accommodation includes arrangements alternative to the regular course outline, we will discuss this with the student. If the student is agreeable to these accommodations, they will be applied; if not, additional discussions between the Dean's office, the course instructor and the student will take place to resolve outstanding issues.

### **Conflicts due to Religious Holidays**

Link to the policy on Accommodation for Religious Holidays

[www.uwo.ca/univsec/pdf/academic\\_policies/appeals/accommodation\\_religious.pdf](http://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_religious.pdf)

### **Other useful links**

Link to the website for Registrarial Services:

<http://www.registrar.uwo.ca>

Link to learning skills services at the Student Development Centre:

<http://www.sdc.uwo.ca>

Link to services provided by the University Students' Council:

<http://westernusc.ca/services/>