



## The Essentials of Astronomy

<b>Start date</b>	22 October 2021	<b>End date</b>	24 October 2021
<b>Venue</b>	Madingley Hall Madingley Cambridge CB23 8AQ		
<b>Tutor</b>	<b>Dr Matt Bothwell</b>	<b>Course code</b>	2122NRX066
<b>Director of ISP and LL</b>	Sarah Ormrod		
<b>For further information</b>	<a href="mailto:intenq@ice.cam.ac.uk">intenq@ice.cam.ac.uk</a>		

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### Tutor biography

**Dr Matthew Bothwell** is Public Astronomer at the Institute of Astronomy, University of Cambridge. He obtained a PhD at the University of Cambridge in 2011. Matt is a science communicator who gives astronomy talks and lectures on almost any area of astronomy to a wide range of ages. When he is not doing outreach, Matt is an observational astronomer, who uses a range of state-of-the-art observing facilities to study the evolution of galaxies across cosmic time. He is the author of the popular astronomy book "*The Invisible Universe: Why There's More to Reality than Meets the Eye*" (upcoming, 2021).

## Course programme

### Friday

Please plan to arrive between 16:30 and 18:30. You can meet other course members in the Terrace Bar which opens at 18:15. Tea and coffee making facilities are available in the study bedrooms.

19:00	Dinner
20:30 – 22:00	<b>Introduction: the frontiers of astronomy</b>
22:00	Terrace Bar open for informal discussion

### Saturday

07:30	Breakfast
<b>09:00 – 10:30</b>	<b>The history of radio astronomy</b>
10:30	Coffee
<b>11:00 – 12:30</b>	<b>What is in the radio sky?</b>
13:00	Lunch
14:00 – 16:00	Free time
16:00	Tea
<b>16:30 – 18:00</b>	<b>The invisible submillimetre Universe</b>
18:00 – 18:30	Free time
18:30	Dinner
<b>20:00 – 21:30</b>	<b>Seeing heat: astronomy in the infrared</b>
21:30	Terrace Bar open for informal discussion

### Sunday

07:30	Breakfast
<b>09:00 – 10:30</b>	<b>Optical astronomy: Part 1</b>
10:30	Coffee
<b>11:00 – 12:30</b>	<b>Optical astronomy: Part 2</b>
12:45	Lunch

**The course will disperse after lunch**

## **Course syllabus**

### **Aims:**

The course will allow you to:

- 1) Gain a deeper understanding of the methods of modern astronomy.
- 2) Understand how and why astronomers use different regions of the spectrum.
- 3) Gain an understanding of the types of astronomical objects we can see using different wavelengths.

### **Content:**

Astronomy is the oldest science. For thousands of years, human beings have studied the lights in the night sky and tried to understand the workings of the cosmos. But for most of our history, our view has been limited. By observing the night sky with our eyes, we are only able to see the Universe in the wavelengths of light visible to our eyes. But visible light is only a small part of the entire electromagnetic spectrum.

Over the past century astronomy has become a 'multi-wavelength' science as astronomers have begun to study the sky using other regions of the electromagnetic spectrum. And the results have been astounding. Each new type of light, from radio waves to the infra-red, has provided a whole new window to the cosmos revealing a Universe more weird and wonderful than we had ever imagined.

In this course we will look at the science of modern multi-wavelength astronomy. We will begin with long wavelength radio waves, move on to submillimetre and then infra-red light, and finally on to optical astronomy. Along the way we will encounter rapidly spinning neutron stars, hidden distant galaxies, stellar nurseries, violent supermassive black holes, and much more.

### **Presentation of the course:**

The course will involve lectures and group discussions

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## Reading and resources list

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Listed below are texts that might be of interest should you wish to supplement your learning on the course. Any essential reading is marked with an asterisk \*

General introductions to astronomy:

Michael Inglis, *Astrophysics is Easy!* Springer, 2014

Roger Freedman and William Kaufmann, *Universe*. W H Freeman & Co, 2016

Introduction to radio astronomy:

*Cosmic Noise: A History of Early Radio Astronomy*, Cambridge University Press, 2009

Introduction to infra-red astronomy:

David L Clements, *Infrared Astronomy – Seeing the Heat: from William Herschel to the Herschel Space Observatory*. CRC Press, 2014