

Module Handbook

This item contains selected online content. It is for use alongside, not as a replacement for the module website, which is the primary study format and contains activities and resources that cannot be replicated in the printed versions.

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1 Introduction

Welcome to *S283 Planetary science and the search for life*. We very much hope you will enjoy studying the planetary science topics covered in this module.

S283 tackles some fundamental questions about planets. How did our Solar System form and how has it evolved? Why aren't all the planets like Earth? How and why did life arise on Earth? Has life arisen elsewhere in the Solar System or beyond – could it be intelligent? We look at the exploration of the Solar System by spacecraft; planetary processes such as volcanism and impacts; the structure of planets and their atmospheres; asteroids, comets and meteorites.

The module is divided into two parts:

- An Introduction to the Solar System (ISS)
- An Introduction to Astrobiology (IA)

Each part consists of a full-colour book (revised editions reprinted with corrections 2020 [ISS] and 2021 [IA]) and web-based material. Both parts of the module are explained in more detail below.

An Introduction to the Solar System (ISS)

You will begin your studies with a look at our own Solar System, examining the layout of the planets and their basic physical properties. You will learn about the structure of the Solar System and about the distinctive differences between Solar System bodies – from asteroids and comets, to the giant planets such as Jupiter and Saturn. You will also see how planetary processes such as impact cratering and volcanism have shaped the surfaces of many bodies in the Solar System, and explore the processes at work in the atmospheres of terrestrial and giant planets. Throughout this part of your study you will see how our knowledge has been increased by a wide range of space missions.

An Introduction to Astrobiology (IA)

The Earth (given our present state of knowledge) is unique, in that it sustains a diverse range of life. But what does it take for a planet to be habitable, and how common are other Earth-like planets round other stars? These are the exciting topics of a new and rapidly changing field of planetary science known as astrobiology. You begin studying this part of the module by examining how life might have arisen on Earth, where the basic building blocks for life came from, and how widespread these might be in the Universe. You will learn about other bodies in our own Solar System that may host the right conditions for life, and examine how we might go about deciding if there is – or has ever been – life elsewhere in the Solar System.

Moving on from our own Solar System you will examine the rapidly accumulating evidence about planets around other stars and consider how we might identify any that sustain life. Finally, you will examine the possibility of intelligent life existing elsewhere in the Universe and look at humankind's attempts to search for it.

2 Aims of the module

As you might expect, one aim of S283 is to develop your knowledge and understanding of planetary science topics. In somewhat more specific terms, by the end of your study we expect that you be able to demonstrate your knowledge and understanding of the basic:

- physical processes that determine the characteristics of the planets of the Solar System
- physical processes that may have been involved in the formation and evolution of the Solar System
- principles that have led to theories for the origin of life on Earth
- principles underlying the search for planets orbiting other stars
- principles underlying the probability of life elsewhere in the Universe.

2.1 Learning outcomes

Learning outcomes are what you should know, understand and be able to do as a result of studying the module. As such, they combine a mixture of knowledge and understanding of the content with skills development.

It is important to note that the *detailed* learning outcomes for specific parts of the module are listed on the S283 website (see Section 3). We recommend you print out and keep copies of those learning outcomes so that you can return to them and assess your progress during your study.

There are several broad areas in which we expect you to develop your scientific skills over the duration of the module. On completing it, you should have achieved the following learning outcomes:

Intellectual skills (IS)

1. Recognize and use subject-specific theories, paradigms, concepts and principles.
2. Record, analyze, synthesize and summarize information critically.
3. Integrate several lines of evidence to formulate and test hypotheses.
4. Apply knowledge and understanding to address familiar and unfamiliar problems.

Practical skills (PS)

1. Plan, conduct, and report on module-based and web-based investigations.
2. Use computer spreadsheets to analyze, interpret and present data from module-based and web-based investigations.

Communication skills (CS)

1. Receive and respond to a variety of information sources (e.g. textual, numerical, verbal, and graphical sources, including material obtained from the internet).
2. Communicate appropriately to a variety of audiences in written, verbal and graphical forms.

Numeracy, and information and communication technology (ICT) skills (NI)

1. Appreciate issues of sample selection, accuracy, precision and uncertainty during collection, recording and analysis of data presented in the module.
2. Use critically the internet and the module forums as means of communication and a source of information.

Self-management skills (SM)

1. Plan and prioritize study activities in order to complete assignments to deadlines.

2.2 Assumed prior knowledge

You do not need prior knowledge of the subject to make a success of S283, but if you do have some, you are likely to find studying the module easier. We recommend that you have completed a science module at OU level 1 before undertaking this module (preferably S111 *Questions in Science* or the discontinued S104 *Exploring science*), as S283 assumes that you have an understanding of basic scientific and mathematical skills equivalent to this level. S111 or S104 would also have given you some background knowledge about the Solar System.

If you are coming to S283 without having studied any of the OU level 1 science modules listed above, then you should have already assessed your preparedness for S283 by reading and doing the self-assessment questions in the [Are you ready for S283? booklet](#). Another way to give yourself a strong start would be to read *Planets: A Very Short Introduction* (ISBN: 978 0 19 957350 9) by the Module Team Chairman, David A. Rothery. Also, even if you feel that you are well prepared for S283, you may still find the material that can be downloaded from the 'Background science' section of the module website useful (see the 'Resources' link on the website for more details).

Finally, if you have not studied with The Open University (OU) before, you may want to obtain a copy of *The Sciences Good Study Guide* (paperback ISBN: 978 0 7492 3411 9) by Northedge, Thomas, Lane and Peasegood. This book provides a good introduction to some of the basic skills that you will need to develop in order to successfully study S283. Although currently out of print, second-hand copies of this highly recommended book are available very cheaply from online sellers.

3 The S283 website and study planner

At the core of the website is an interactive 'study planner' that is calendar-driven. It provides advice and guidance on what you should study each week. We have also included a printable [Summary study calendar](#) PDF, accessed via the 'Resources' link on the module website, which summarizes tasks for each week and includes the cut-off date for each assignment.

The online study planner combines a calendar approach with guidance and the intended learning outcomes associated with particular study materials. It is intended to help you pace your study. You will find that you can look at information for several weeks ahead, as well as review past weeks, but you should not become too concerned if you are a week or two adrift from the suggested tasks. As with all modules, if you find you are getting seriously behind in your studies, you should contact your tutor.

In each week on the planner you will be advised to spend your time in a variety of ways, which will usually include reading and carrying out activities. By clicking on the 'reading' and 'activities' links for a given week, you will find information on suggested reading of the module texts and details of online activities. Guidance on how to make use of online tutorial support and forums will also be given via the weekly study planner. Further details of these aspects of the module, along with other useful parts of the module website, are given below.

The text books

The major task involved in studying S283 entails reading the module texts (Introduction to the Solar System [ISS] and Introduction to Astrobiology [IA]), and making sure you can answer the questions within those texts. In any given week, you can find out what the recommended reading is from these books by reference to the study planner.

The type of content covered by the main texts of the module are described in Section 1 of this guide. Learning outcomes for each chapter of the texts are available from the study planner via the 'reading' link in the appropriate study weeks, and you should check these to see if there is anything that you need to do more work on. PDF copies of the module texts can be found via the 'Study texts' link within the 'Resources' link on the module website.

The activities

Activities form a key part of S283. The activities are designed to allow you to develop skills and apply what you have learned to specific problems, to introduce new topics, and to give practical examples of material covered in the study texts. They may require you to watch interactives, animations, or video sequences; use the internet to search for information; use an image archive; or use spreadsheets as a tool to model and understand various aspects of planetary science.

The 'activities' links on the study planner take you to web pages giving details of the activity to complete each week. A complete set of the activities associated with each part of the module can be found via the 'Activities' link within the 'Resources' link on the module website.

Some activities are based on spreadsheet exercises using data from the module or the internet; others may ask you to watch a short video or interactive animation, and some take the form of long questions. Normally, we would prefer you to perform each activity at the point indicated on the website *before* continuing with the subsequent reading of the

module texts. You will find that it helps your learning if you do so, though we recognize that there may be occasions when your circumstances make this impracticable.

Your use and understanding of the computer-based activities will be assessed through some TMA questions, and may also be helpful when answering some of the exam questions.

It may be necessary to download third-party software for dealing with spreadsheets, text documents, and for viewing files as PDFs or movie files, if you do not already have the software on your computer to do so. Information on, and links to download these programs can be found via the following links:

[Software downloads and discounts \(open.ac.uk\)](#) and [QuickTime Player User Guide for Mac – Apple Support \(UK\)](#).

The Image archive

This has been largely superseded by the easy general availability of images on the internet, but you may find it useful.

There are a small number of animations incorporated in the Image Archive. Starting these will launch and run the animation in the browser window.

Navigating around the Image Archive is easy - if you are not sure what something does, click on it and find out. The caption that accompanies each image was obtained from the original source.

Activity spreadsheets

Some of the activities have links to spreadsheets that already contain data for you to work with. To access these spreadsheets, click on the activity name from the Study Planner. There are OpenOffice and Excel versions of the required spreadsheet files. Double-clicking on the spreadsheet file name will open the file:

- file names for use with OpenOffice end in '.sxc' or '.ods'
- file names for use with Excel end in '.xls'

Completed spreadsheets for some of the activities are provided in both sets of formats. These have 'answ.sxc', 'answ.ods' or 'answ.xls' in the file name.

Tutorials, forums and live webcasts

An outline of the S283 tutorial and forum provision is given in Section 4 of this guide. Further details will be given on the module website, where you may also see announcements of live webcasts (that may also be recorded) by the module team.

Resources

The module website also provides links to other materials and resources that you will need for your studies. These are accessed via the 'Resources' section. Some of these resources have been described above.

There is a series of useful resources available for download from the website in PDF format from the 'Background science' link. These files are designed to provide additional support for particular topics, for example additional help in mathematics, chemistry and Earth sciences. The section also includes links to other electronic resources for astronomy that are available via the OU Library.

The 'Resources' part of the website also contains links to more general supplementary materials that you may find helpful in your studies.

Given the large amount of printed and electronic material available for your study of S283 it is understandable that a small number of errors sometimes make it past our rigorous checking procedures. The 'Errata' list can be found in the 'Resources' section of the module website and will contain a list of known errors in module material and will be updated if any new errors are discovered.

News

There are two sections of the module website that provide different sorts of news and updates throughout the module.

Important updates about the module and details of new errata are released via the 'News' area of the module website. We suggest you frequently check this area so you are aware of any 'last-minute' updates to the module. (Note: a full list of errata is available from the 'Resources' link on the website.)

There is also an 'In the News' section of the website, where members of the Module Team comment on, and provide links to, news stories relating to Solar System exploration, planetary science and astrobiology as they unfold during the year. This is for your interest and does not form part of the assessed material for the module.

4 Support

There are a number of ways in which you will receive tutor (and peer) support via the module website.

Your tutor and your tutor group

During your study you will receive academic support from an OU associate lecturer (your tutor). You may contact your tutor with queries about the module via a tutor group forum (see below), by email or by phone, and you are encouraged to do so if you need assistance.

In addition to responding to individual queries, your tutor will also offer online tuition events for their group of students. These will take place in the online tutor-group room, which can be found on the [Tutorials](#) tab on the S283 website. Near the start of the module there will be an introductory session giving you an opportunity to meet your tutor and other students in your group.

Your tutor group forum

You have access to a tutor group forum from the module website. Here you can communicate exclusively with your tutor and the other students that they are supporting. When you open this forum you will find a message from your tutor that tells you more about how the forum is to be used.

Module wide support

Module-wide online tutorials take place in the online module-wide room, which can also be found on the [Tutorials](#) tab on the S283 website. Near the start of the module we will offer an online workshop, introducing you to the module and giving you the opportunity to meet other students in your group and from other tutor groups in the module. One-hour-long tutorials throughout the module cover specific sections of the module materials. There will be another workshop towards the end of the module, aimed at revision and preparation for the S283 exam.

You can attend any of these sessions, whether given by your own tutor or another S283 tutor. All sessions can be booked via StudentHome in the usual way.

Other S283 forums

Additional forums on the module website are open to all S283 students. They include:

- one for general S283 discussion and queries, where you may find responses from members of the core S283 module team as well as tutors,
- one for technical queries,
- a 'Café' for less-academic discussion where you can interact with 'Buddies' who are recent former students of S283, and
- a specific forum for each of the module books. These forums are usually lively, and we encourage you to join in.

5 Assessment

The assessment of S283 is based on two components:

- a continuous assessment component that is based on four tutor-marked assignments (TMAs)
- an examinable component that comprises a single, three-hour, online examination at the end of the module.

Tutor-marked assignments

There are four tutor-marked assignments (TMAs) associated with S283, which are spread throughout the year. These assignments, and any associated materials, will be available from the 'Study planner' on the module website. The cut-off date for each TMA is given within the 'Assessment' section, in the online study planner and also in the [Summary study calendar](#) PDF.

Each TMA has equal weighting and the length of each is intended to be three-quarters of the length of a full TMA. You must submit your TMA electronically via the University's online TMA/EMA system. Details of how to submit work are given in the [Assessments and exams | Assignments | Submitting a Tutor Marked Assignment \(TMA\)](#) page of the [Help Centre](#). Further information is also available in the online [Assessment policy documents](#).

The TMAs are designed to provide you with regular, targeted feedback in order to help you learn and to assess your own progress towards meeting the learning outcomes. You are required to send answers to your tutor in response to detailed questions and problems that address the various topics studied throughout S283. Your tutor will send you targeted feedback and advice on your answers, indicating how well your answers met those that were required, and how they might be improved, if appropriate.

Your final module result will be determined solely by your exam mark, provided that your engagement with the continuous assessment (the four TMAs) has met certain threshold standards. To be eligible for a passing grade, you must engage satisfactorily with the continuous assessment.

If your overall continuous assessment score is 40% or more you will automatically be judged to have engaged satisfactorily with this component of S283.

The TMAs are carefully designed to be a central part of your learning and you should aim for marks that are considerably higher than the minimum threshold. This should be achieved through your own efforts rather than by copying from other students, books, the internet or chatbots. This is very important if you are to be adequately prepared for the final examination. We know from many years of experience that there is a close correlation between performance in continuous assessment and in the examination. By getting high marks on the continuous assessment, you will be doing the work needed to prepare for a high exam mark, and you will be getting valuable feedback which will help you improve your performance.

The examination

A *Specimen Examination Paper* (SEP) and a practice remote exam (iCME) are available via the 'Assessment' section of the module website. These two resources provide an

example of the format of the examination paper that you will sit at the end of the module, a sense of the types of question that you may find there, and an opportunity to practise the timings and submission process of the remote exam.

The actual exam is taken online, from wherever you like, on a set date. You should be able to answer the questions in 3 hours, but we allow additional time (currently 1.5 hours) to give you time to insert scans or pictures, and to upload your answers. You are free to consult the module books or whatever else you like during the actual exam, but this can waste a lot of time. You also must answer in your own words, rather than importing someone else's text. You are not required to memorise complex equations for the exam, although you may need to recognise equations that you met during your study of the module or to infer equations from simple diagrammatic or common-sense relationships.

When you reach the end of the last scheduled study week, there will normally be about two weeks left before the exam. You are the best judge of what you most need to revise, and how to go about it. One suggestion is to revisit the lists of learning outcomes on the module website to check how much you have remembered about each part of the module, and to repeat some of the self-assessment questions for practice.

You are strongly recommended to familiarize yourself with the layout of the exam from the *Specimen Examination Paper* (including taking advantage of an opportunity to try out the submission process), and to establish the level of detail required in your answers by referring to the answers that accompany that resource.

We cannot emphasise strongly enough the recommendation that you use the *Specimen Examination Paper* and the *Practice remote exam* to help you in your preparation for the exam.

Plagiarism

The OU is currently using text-comparison software to detect potential cases of plagiarism in work that is submitted for assessment. Please note the rubric at the beginning of each TMA, which highlights the importance of avoiding plagiarism in your work.

You can find useful information on the 'Developing good academic practices' website, which is available from the ['Referencing and plagiarism'](#) section of the OU Library Services website. (Note that this resource is also available via the 'Assessment' section of the module website.) This good-practice guide covers a range of topics including how and when to reference, the difference between collusion and collaboration, and writing in your own words.

6 Contact points

6.1 General points of contact

This *S283 Module Handbook* and your StudentHome website are valuable reference sources, which should contain answers to most of the general queries you might have about studying with The OU. They are the first places where you should seek information.

The best way to contact The OU for virtually all sources of help is via StudentHome. There is a comprehensive 'Help Centre' section here; select this option to find links to a number of helpful OU websites. The 'Help Centre' page also has a link to 'More contacts'; follow this option to open up a page with various contact details organized under headings that may reflect what your query is about.

6.2 Feedback to the S283 Module Team

We welcome your comments about S283, whether positive or negative. In particular, although we have a fairly robust system of checking and quality assurance for the module materials, some errors may slip through. So if you notice any mistakes in S283 (for example, misprints that make nonsense of an important sentence or an assignment question), which you think needs correcting as soon as possible, please contact the S283 Curriculum Manager (Email: OU-Science@open.ac.uk. Please quote the module code, S283, in the subject field and your Personal Identifier in the body of the message.)

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