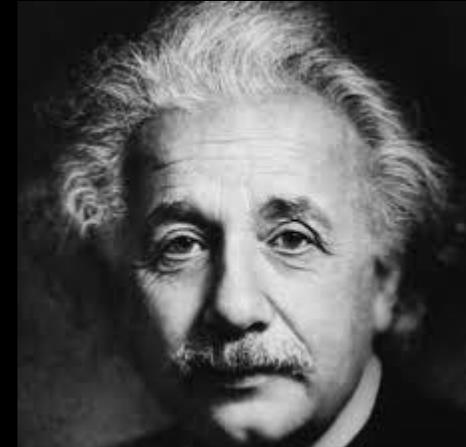




THE UNIVERSE TO YOUR COMPUTER

Or “A Hitchhikers Guide to learning the galaxy for free. . .”

YOU TOO CAN BE A GREAT MIND!



THE MENU

- There is an extensive array of online educational resources for the budding or accomplished astronomer.
 - Astronomy
 - Astrophysics
 - Cosmology
 - Radio Astronomy
 - Astrobiology
 - Space Exploration
 - Etc.
- CAVEAT – The internet is not under configuration management and stuff might disappear (in a great big bag) at any time . . .

THE DELIVERY MODELS

- All these are available online (as of 16 Nov 2020)
 - Some are self-paced (download as you want them)
 - Some are scheduled (available at a scheduled date/time once a semester or once a year - presumably live streamed from the lecture)
 - Some are “archived” (not clear what this actually means . . .)
 - Some are supported by downloadable reference material – particularly the one from MIT!
- Ages from kids (~8yrs) and upwards

THE PROVIDERS

MITOPENCOURSEWARE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

Yale



Caltech



RUTGERS



Australian
National
University



THE UNIVERSITY OF HONG KONG



SEOUL
NATIONAL
UNIVERSITY

PRINCETON
UNIVERSITY



EPFLx
(École polytechnique
fédérale de Lausanne)

European
Schoolnet | Academy

THE DURATION

- Podcasts (not listed in this presentation) – 3 minutes to several hours
- TED Talks (not listed in this presentation) – 3 minutes to 20+ mins
- Interesting snippets (some listed here) – about 1 hour
- Short courses (some listed here) – 3 weeks to ~3 months of 4 to 8 hours per week
- Long courses (some listed here) – 3 to ~6 months of 4 to 8 hours per week

THE EDUCATIONAL MODEL

- Models vary as one or more of the following-
 - Free stuff on line for intellectual stimulation and general learning
 - Some require an enrolment process
 - +\$pay for a completion certificate (something to hang on the wall)
 - +\$pay to do the exercises and assignments (a kind of self flagellation)
 - +\$pay to have them marked (a genuine assessment to see how well you are actually doing)
 - +\$pay to sit the exam, have it marked and receive a qualification if you pass (just like at university!)
- Also webpodintercasts and Edward Speaks (TED Talks) which are more numerous than stars in a nebular . . .

THE COMPREHENSIVE PROVIDERS

- Comprehensive providers (my terminology) have a large number and a few have downloadable reference material as well

MITOPENCOURSEWARE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY



Australian
National
University

A FEW EXAMPLES

- Astronomy 101 – Penn State University
 - <https://itunes.apple.com/us/itunes-u/astronomy-001/id430629972?mt=10>
- Particle Physics of the Early Universe - MIT
 - <https://ocw.mit.edu/courses/physics/8-962-general-relativity-spring-2020/>
- Star Stuff (general info only)
 - <https://tunein.com/podcasts/Exploration/StarStuff-p1200/>
- Space Nuts (general info only)
 - <https://spacenubspodcast.com/>
- And big long spreadsheet list for you to search

Course name	Provider	Web Address	Presenter	Duration	Self-paced	Notes	
1	Astronomy and Space Exploration	Stanford	https://www.youtu.be.com/watch?v=8W0Uj2n6k4k	Lynn Rothschild	01:30	No	
2	Astronomy 101	Penn State University	https://itunes-u.com/itunes-u/astronomy-001/id430629972?mt=10	Scott Miller, Richard S. Richardson & Stephen Redman	00:00	No	
3	Exploring Black Holes: General Relativity & Astrophysics	MIT	https://ocw.mit.edu/courses/physics/8-962-general-relativity-spring-2020/	Edward Verheggen	00:40	No	
4	Frontiers and Controversies in Astrophysics	Yale	https://www.youtu.be.com/watch?v=8W0Uj2n6k4k	Charles Bailyn	24 x 45:00	No	
5	Introduction to Astrophysics	UC Berkeley	https://archive.org/details/introduction-to-astrophysics-2010-1st-berkeley-lecture-series-40	Joshua Bloom	01:25 (audio)	No	
6	Introduction to Cosmology	UC Berkeley	https://www.youtube.com/watch?v=8W0Uj2n6k4k	James Bullock	14 x 01:00	No	99% slides + homework + solutions
7	Introduction to General Astronomy	UC Berkeley	https://archive.org/details/introduction-to-general-astronomy-2010-1st-berkeley-lecture-series-40	Alex Filippenko	01 x 00:50 (audio)	No	
8	Life in the Universe	Ohio State	https://www.youtube.com/watch?v=8W0Uj2n6k4k	Richard Pogge	04 x 05:00 (audio)	No	5 LECTS, 84 lectures in total on audio with PPT slides
9	Survey of Astronomy	Missouri State	https://www.youtube.com/watch?v=8W0Uj2n6k4k	Nicky Baker	08 x 40:00	No	08 videos, lectures
10	The Planets (Christmas Lecture for Kids)	Royal Institution	https://www.youtube.com/watch?v=8W0Uj2n6k4k	Carl Sagan	0 x 1:00:00	No	8 Videos, lectures from 1977 (Dr Carl is looking very old!)
11	Astronomy: Exploring Time and Space	University of Arizona	https://www.youtube.com/watch?v=8W0Uj2n6k4k	Chris Tappin	11 x 00:00	5 Yes	Self-paced, enrollment required but this is free

THE MAJOR SEARCH WEB SITES

- These two will point you to many other source providers
 - Coursera
 - edX
- MIT OpenCourseWare (does it all on its own!)

THE LAST WORD

- These courses/sources/resources have been found using the following key word searches:-
 - Astronomy
 - Astrophysics
 - Cosmology
 - Exobiology
 - Astrobiology
- There are other interesting looking courses (and sites) whose title or categorisation did not include these key words
- There are some courses (notably from ANU) that are available for a modest fee from AUS\$16 (see <https://www.udemy.com/>). Others range up to full degree qualification for a whole lot more!

#	Course name	Provider	Web Address	Presenter	Duration (hh:mm)	Certificate?	X'tras
1	Astrobiology and Space Exploration	Stanford	https://www.youtube.com/watch?v=zBuW-odYWY4	Lynn Rothschild	1:16	No	
2	Astronomy 101	Penn State University	https://itunes.apple.com/us/itunes-u/astronomy-001/id430629972?mt=10	Scott Miller, Mercedes Richards & Stephen Redman	0:59	No	
3	Exploring Black Holes: General Relativity & Astrophysics	MIT	https://ocw.mit.edu/courses/physics/8-224-exploring-black-holes-general-relativity-astrophysics-spring-2003/	Edmund Bertschinger	6:40	No	
4	Frontiers and Controversies in Astrophysics	Yale	https://www.youtube.com/playlist?list=PLD1515420F4E601A4&feature=plcp	Charles Bailyn	24 x 45:00	No	
5	Introduction to Astrophysics	UC Berkeley	https://archive.org/details/Astronomy_7B_001_Spring_2010_UC_Berkeley_Introduction_to_Astrophysics	Joshua Bloom	01:22 (audio)	No	
6	Introduction to Cosmology	UC Berkeley	https://itunes.apple.com/us/course/introduction-to-cosmology/id516349888	James Bullock	14 x 01:00	No	PPT slides; Homework + solutions

7	Introduction to General Astronomy	UC Berkeley	https://archive.org/details/Astro_C10_LS_C70U_Fall_2006_UC_Berkeley/Astro_C10_LS_C70U_Fall_2006_UC_Berkeley_Lecture_01_A_Grand_Tour_of_the_Cosmos_15815.mp3	Alex Filippenko	41 x 00:50 (audio)	No	
8	Life in the Universe	Ohio State	http://www.astronomy.ohio-state.edu/~pogge/Ast141/#lectures	Richard Pogge	44 x 45:00 (audio)	No	5 Units, 44 lectures in total on audio with PPT slides
9	Survey of Astronomy	Missouri State	https://www.youtube.com/playlist?list=PLdLiRaajwSXRYPwqLkyZCm7619qtzjwBI	Becky Baker	29 x 40:00	No	29 video lectures
10	The Planets (Christmas Lectures for Kids)	Royal Institution	https://www.openculture.com/2012/08/carl_sagan_presents_six_lectures_on_exploring_mars.html	Carl Sagan	6 x 1:00:00	No	6 video lectures from 1977 (Dr Carl is looking very young!)

11	Astronomy: Exploring Time and Space	University of Arizona	https://www.coursera.org/learn/astro?ranMID=40328&ranEAID=Cu8bOePBZBg&ranSiteID=Cu8bOePBZBg-.REAdCDfZ608vkLrh2eEKw&siteID=Cu8bOePBZBg-.REAdCDfZ608vkLrh2eEKw&utm_content=10&utm_medium=partners&utm_source=linkshare&utm_campaign=Cu8bOePBZBg	Chris Impey	11 x 60:00	\$ Yes	Full uni course. Enrolment required but this is free
12	Data-driven Astronomy	The University of Sydney	https://www.coursera.org/learn/data-driven-astronomy?ranMID=40328&ranEAID=Cu8bOePBZBg&ranSiteID=Cu8bOePBZBg-qsFuGZCXoQfHFLuTkqYNTA&siteID=Cu8bOePBZBg-qsFuGZCXoQfHFLuTkqYNTA&utm_content=10&utm_medium=partners&utm_source=linkshare&utm_campaign=Cu8bOePBZBg	Tara Murphy Simon Murphy	24:00:00	\$ Yes	Full uni course. Enrolment required but this is free

13	Confronting The Big Questions: Highlights of Modern Astronomy	University of Rochester	https://www.coursera.org/learn/astronomy?ranMID=40328&ranEAID=Cu8bOePBZBg&ranSiteID=Cu8bOePBZBg-cVbEWEevfH7sU7_W9pBH6Q&siteID=Cu8bOePBZBg-cVbEWEevfH7sU7_W9pBH6Q&utm_content=10&utm_medium=partners&utm_source=linkshare&utm_campaign=Cu8bOePBZBg	Adam Frank	11:00	\$ Yes	Full uni course. Enrolment required but this is free
14	The Radio Sky I: Science and Observations	EPFL École polytechnique fédérale de Lausanne	https://www.edx.org/course/radio-sky-1	Vasileios ANGELOPOULOS, Frédéric COURBIN, Griffin FOSTER, Jean-Paul KNEIB	7 weeks at 3 - 4 hrs per week	\$ Yes	Instructor-led on a course schedule. (Archived)
15	Astrophysics: Cosmology	ANU	https://www.edx.org/course/astrophysics-cosmology	Brian Schmidt, Paul Francis	10 weeks at 2 - 4 hours per week	\$ Yes	Self-paced on your time
16	Astrophysics: The Violent Universe	ANU	https://www.edx.org/course/astrophysics-the-violent-universe	Brian Schmidt, Paul Francis	11 weeks at 2 - 4 hours per week	\$ Yes	Self-paced on your time
17	Super-Earths and Life	Harvard	https://www.edx.org/course/super-earths-and-life	Dimitar Sasselov	15 weeks 3 - 5 hours per week	\$ Yes	Self-paced on your time (Archived)

18	Introduction to Astrophysics	EPFL École polytechnique fédérale de Lausanne	https://www.edx.org/course/introduction-to-astrophysics	Frédéric COURBIN, Vivien Bonvin, Thibault Kuntzer, Pierre North	7 weeks 3 - 4 hours	\$ Yes	Self paced on your time
19	Our Place in the Universe	University of Hong Kong	https://www.edx.org/course/our-place-in-the-universe	Sun Kwok	4 weeks 1 - 3 hours per week	\$ Yes	Self paced on your time
20	Astrophysics: Exploring Exoplanets	ANU	https://www.edx.org/course/astrophysics-exploring-exoplanets	Brian Schmidt, Paul Francis	9 weeks 2 - 4 hours per week	\$ Yes	Self paced on your time
21	Greatest Unsolved Mysteries of the Universe	ANU	https://www.edx.org/course/greatest-unsolved-mysteries-of-the-universe	Brian Schmidt, Paul Francis	10 weeks 2 - 4 hours per week	\$ Yes	Self paced on your time
22	Big Bang and the Origin of Chemical Elements	Seoul National University	https://www.edx.org/course/big-bang-and-the-origin-of-chemical-elements	Hie-Joon Kim, Tony Cho, Grace Park	4 weeks 4 - 5 hours per week	\$ Yes	Self paced on your time
23	Frontiers and Controversies in Astrophysics	Yale	https://oyc.yale.edu/NODE/56	Charles Bailyn	24 x 45:00	No	PDF course notes
24	Relativity and Astrophysics	Cornell	https://www.edx.org/course/relativity-and-astrophysics	David F. Chernoff	4 weeks 4 - 8 hours per week	\$ Yes	Instructor-led on a course schedule (Archived)

25	The Evolving Universe	CALTEC	https://www.edx.org/course/the-evolving-universe	S. George Djorgovski	4 weeks 4 - 6 hours per week	\$ yes	Instructor-led on a course schedule (Archived)
26	Analysing the universe	Rutgers	https://www.coursera.org/learn/analyze?	Dr. Terry A. Matilsky	6 weeks 4 - 5 hours per week	\$ Yes	Instructor-led on a course schedule
27	Our Wonderful Universe	European Schoolnet Academy	https://www.classcentral.com/course/independent-our-wonderful-universe-8915	Eleftheria Tsourlidaki, Teodora Ioan and Anastasiya Boiko	6 weeks 2 - 3 hours per week	No	Self paced
28	AstroTech: The Science and Technology behind Astronomical Discovery	The University of Edinburgh	https://www.coursera.org/learn/astronomy-technology?	Andy Lawrence, Catherine Heymans	6 weeks 1 hour per week	\$ Yes	Instructor-led on a course schedule
29	Astrobiology and the Search for Extraterrestrial Life	The University of Edinburgh	https://www.coursera.org/learn/astrobiology?ranMID=40328&ranEAID=SAyYsTvLiGQ&ranSiteID=SAyYsTvLiGQ-F4pH6qa2CFd0LsHfjY0gg&siteID=SAyYsTvLiGQ-F4pH6qa2CFd0LsHfjY0gg&utm_content=10&utm_medium=partners&utm_source=linkshare&utm_campaign=SAyYsTvLiGQ	Charles Cockell	4 weeks of 3 hours per week	\$ Yes	Instructor-led on a course schedule

30	Astrobiology: Exploring Other Worlds	University of Arizona	https://www.coursera.org/learn/astrobiology-exploring-other-worlds#about	Chris Impey	4 weeks 3 - 4 hours per week	\$ Yes	Instructor-led on a course schedule
31	Introduction to Astronomy	MIT	https://ocw.mit.edu/courses/physics/8-282j-introduction-to-astronomy-spring-2006/index.htm	Saul Rappaport	37 x 60:00 lectures	No	PDF study materials, PDF quizzes, PDF assignments
32	Hands-On Astronomy: Observing Stars and Planets	MIT	https://ocw.mit.edu/courses/earth-atmospheric-and-planetary-sciences/12-409-hands-on-astronomy-observing-stars-and-planets-spring-2002/	James Elliot	12 lectures	No	PDF study materials,
33	Astrophysics I	MIT	https://ocw.mit.edu/courses/physics/8-901-astrophysics-i-spring-2006/	Prof. Deepto Chakrabarty	26 lectures, 01:30 per session	No	PDF study materials, PDF problem sets
34	Modern Astrophysics	MIT	https://ocw.mit.edu/courses/physics/8-284-modern-astrophysics-spring-2006/	Prof. Paul Schechter	38 lectures, 01:00 per lecture	No	11 PDF assignments
35	Astrophysics II	MIT	https://ocw.mit.edu/courses/physics/8-902-astrophysics-ii-fall-2004/	Prof. Paul Schechter	38 lectures, 01:00 per lecture	No	Some PDF lecture notes

36	Exploring Black Holes: General Relativity & Astrophysics *(8.033 Relativity, or prerequisites 8.20 Introduction to Special Relativity.)	MIT	https://ocw.mit.edu/courses/physics/8-224-exploring-black-holes-general-relativity-astrophysics-spring-2003/	Prof. Edmund Bertschinger Prof. Edwin F. Taylor	14 lectures 01:30 per session	No	Some video lectures, No course notes, PDF assignments and exams
37	The Solar System	MIT	https://ocw.mit.edu/courses/earth-atmospheric-and-planetary-sciences/12-400-the-solar-system-spring-2006/	Prof. Richard Binzel	23 lecture, 01:30 per lecture	No	Some PD study materials, PDF assignments
38	The Early Universe *(Prerequisites 18.03 Differential Equations, 8.02 Physics II: Electricity and Magnetism)	MIT	https://ocw.mit.edu/courses/physics/8-286-the-early-universe-fall-2013/	Prof. Alan Guth	23 lecture, 01:30 per lecture	No	All video lecture, Most PDF slides, 10 assignments, 3 review problems, 3 quizzes (with answers)
39	Cosmology	MIT	https://ocw.mit.edu/courses/physics/8-942-cosmology-fall-2001/	Prof. Edmund Bertschinger	26 lectures, 01:30 per lecture	No	11 problem sets

40	Particle Physics of the Early Universe *(Prerequisites Relativistic Quantum Field Theory I (8.323), and Relativistic Quantum Field Theory II (8.324)	MIT	https://ocw.mit.edu/courses/physics/8-952-particle-physics-of-the-early-universe-fall-2004/	Prof. Frank Wilczek	18 lectures of 01:30 each	No	Some lecture notes, 3 problem sets
41	General Relativity *(Prerequisites 18.03 Differential Equations, 18.06 Linear Algebra, and 8.07 Electromagnetism II)	MIT	https://ocw.mit.edu/courses/physics/8-962-general-relativity-spring-2020/	Prof. Scott Hughes	25 lectures 01:30 each lecture	No	23 video lectures, 11 problem sets
42	Astronomy	Brilliant.org	https://brilliant.org/courses/astronomy/	Unknown	Unstated	No	6 free modules, then 24 paid modules
43	Star Stuff	ABC	https://tunein.com/podcasts/Exploration/StarStuff-p1200/	Stuat Gary	50+ podasts at 40:00 + each	General information only	
44	Space Nuts	BITESZ.com	https://spacenutspodcast.com/	Prof Fred Watson and Andrew Dunkley	50+ podasts at 30:00 each	General information only	