(course name: Life in the Universe and the Space Environments) National Taiwan Normal University
Online Course Teaching Plan

Instructions: According to **Article 6 of the Implementation Regulations Regarding Distance Learning by Universities**, Departments/Programs offering distance learning courses, shall present a course plan and submit it for approval by the university-level academic affairs committee. The course plan referred to in the preceding paragraph shall set forth learning objectives, the target student group, a course outline, teaching methods, interactive student-teacher discussion, grading and course requirements. The course plan shall be posted on the Internet.

1. Course start date: _Fall_ semester of _2022_ (academic year):

2. Course review submission record:

☐**It is a new online course or an existing face-to-face course switching to online course in this semester**

■**It is an existing online course; the latest University's Course Committee approval was in the _Spring_ semester of 2020 (academic year)**

☐**Approved by the University's Course Committee and within the 5-year validity period.**

☐**The 5-year validity period has expired; a new application is required.**

■**In case of a major change in the original approved course or if the revision ratio exceeds 30%, reapplication is required.**

3. Basic Course Information (check ✓ or ■ if applicable)

(1)	Chinese Course Title	宇宙中的生命與太空環境
(2)	English Course Title	Life in the Universe and the Space Environments
(3)	Teaching Format	■Asynchronous Distance Teaching ☐Synchronous Distance Teaching Broadcast University Please fill-in the sign-off university and department for this course: (1) University: Department:
(4)	Instructor Name & Title	Dr. Yasuhiro Hashimoto
(5)	Instructor Sources	■Appointed by Departments ☐Appointed by General Education Center ☐Both of Above ☐Others:
(6)	College/Department/Center	Center for General Education
(7)	School System	■Undergraduate Program ☐Master's Program ☐Undergraduate-master Program Joint Course ☐Undergraduate-postgraduate Joint Course ☐PhD Program ☐Continuing Education Master's Program
(8)	Program Type	■Full-time Program ☐Part-time Program ☐Others:

(9)	Course Type	☐Common Courses ■General Courses ☐School Required Courses ☐Professional Courses ☐Educational Courses ☐Other:
(10)	Required Courses	■University-required ☐College-required ☐Graduate Institute-required ☐Department-required ☐Others:
(11)	Course Duration	■One Semester (half year) ☐Two Semesters (one year) ☐Others:
(12)	Required/Elective Course	☐Required ■Elective ☐Others:
(13)	Course Credits	2
(14)	Face-to-Face Teaching Hours Per Week	0 hour(s)/week (For asynchronous distance teaching, fill-in the average of "face-to-face teaching" hours per week, which include the hours of face-to-face teaching and synchronous distance teaching. Divide the total "face-to-face teaching" hours by the total number of course weeks.)
(15)	Number of Classes	1
(16)	Estimated Total Number of Students	150
(17)	Fully English-Taught Course EMI Courses	■Yes ☐No
(18)	Cooperative Foreign University (Please fill-in the cooperative universities if applicable)	Names of foreign cooperative universities and departments/institutes: _____ ☐Domestic Broadcast ☐Domestic Sign-off ☐Overseas Special Program ☐Dual-Degree Program ☐Others:
(19)	Course Platform Website (asynchronous teaching is required)	NTNU online learning platform: https://moodle.ntnu.edu.tw/
(20)	Syllabus Website	http://courseap.itc.ntnu.edu.tw/acadmOpenCourse/index.jsp

4. Course Teaching Design and Implementation Method

<table>
<tr><td>(1)</td><td>Course Goals</td><td>Searching for the life in the Universe and investigating the necessary conditions about existence of the life in the Universe is one of the most fundamental and outstanding astronomical questions human can ask.
Those questions will not only broaden our knowledge about extraterrestrial world, but more importantly, our knowledge about ourselves. The necessary conditions, and therefore the significance and fragility of our existence in the space and time can be only proved by investigating the alien world.
To research the life in the Universe will have a deep impact on students` knowledge and attitude towards the future technology and environmental problems on Earth, as well.</td></tr>
<tr><td>(2)</td><td>Target Student Group</td><td>Everyone</td></tr>
<tr><td>(3)</td><td>Prerequisite(s)</td><td>None</td></tr>
<tr><td>(4)</td><td colspan="2">Course Content Outline: Please fill in the weekly teaching content and course outline (multiple teaching methods can be selected and filled in, for example: If the weekly face-to-face teaching is 2 hours and asynchronous teaching is 1 hour, write 2 in the "face-to-face" field, write 1 in the "asynchronous" field, and leave the "synchronous" field blank)
<table>
<tr><td rowspan="2">Face-to-Face Teaching</td><td colspan="2">Distance learning</td></tr>
<tr><td>Synchronous</td><td>Asynchronous</td></tr>
<tr><td>at least 2 weeks</td><td>at least 3 weeks</td><td>at least 8 weeks</td></tr>
</table>
<table>
<tr><td rowspan="3">Week</td><td rowspan="3">Topics</td><td rowspan="3">Learning Objectives
(Brief Description)</td><td rowspan="3">Teaching Interactive Design
(topic discussion, peer review, etc.)</td><td rowspan="3">Testing/Evaluation Activities
(omit if not designed for the week)</td><td colspan="3">Teaching Method and Hours
(fill-in the number of hours, omit if none)</td></tr>
<tr><td rowspan="2">Face-to-Face Teaching</td><td colspan="2">Distance learning</td></tr>
<tr><td>Synchronous</td><td>Asynchronous</td></tr>
<tr><td>1</td><td>Introduction</td><td>.What is human? What is the life?
.What defines the life on Earth?
.Bias: Must they be similar to life on</td><td></td><td></td><td></td><td></td><td>2</td></tr>
</table></td></tr>
</table>

				Earth? .History of non-Earth life search .Extreme Biology on Earth: Life in hostile environments .Asteroids in Antarctic: Life from Mars?						
		2	Life in the Solar System: Life in the Neighborhood (I)	.Moon .Venus and global warming: Was Venus habitable before? .Mars: Are Martian there ? .Titan: Giant moon around Saturn .Galileo moons around Jupiter -- Salt water ocean? .Jovian atmosphere .Comets and Asteroids: DNA in comets? .Interplanetary space					2	
		3	Life in the Solar System: Life in the						2	

			Neighborhood (II)						
		4	Astrobiology by Space Missions and Probes: Sending Robot Astronomers (I)	.Viking 1 and 2: First little Martian search .Path Finder: First moving robot scientists .Spirit and Opportunity .Phoenix: Landing on the Martian ice .Curiosity Rover: Modern robot biologist .Stardust/Hayabusa: Bringing dusts back to Earth .Voyager I and II: Voyage to outer planets .Galileo: Monitoring Galileo moons .Cassini and Huygens lander: Landing on methane ocean .Future Europa mission: Submarine in the ocean					2
		5	Astrobiology by						2

			Space Missions and Probes: Sending Robot Astronomers (II)						
		6	Human Mission to Mars: Can we send people to Mars?	.Oxygen, Water, Food supply .Current shortest duration plan .Current park-orbit plan					2
		7	Search for Ingredients of Life	.Water, Methane, Oxygen, CO2, and Amino Acids .Sample return mission .Spectroscopic analysis of organic molecules					2
		8	Midterm			Midterm			2
		9	Exoplanets: Planets around other Suns (I)	.Binary stars and brown dwarfs: Too small Sun. .Hot Jupiters: Easy-to-find planets .Habitable Zones: Not too hot, not too cold .Direct method and corona graph: How to see planets, directly?					2

				.Eclipsing, transit, and micro lensing: Blinking Sun .Pulsar decay .Radial velocity methods: Watch Sun to move .Gliese system (Gliese 581d): First good candidate .Future experiments: Find small planets around small stars					
		10	Exoplanets: Planets around other Suns (II)						2	
		11	Technology of Space Travel (Let's go Interstellar space!) (I)	.Early rocket and liquid fuel rocket: Modern rockets .Solid motors: Old technology with new idea .Gravitational assist: How to accelerate without gasoline .Atmospheric brake: How to slow down .Ion engine:					2	

				Weak but long push .Solar sailor: Catching 'solar wind' .Nuclear engine .Special relativity and time delay: Time machine .General relativity, singularity in space-time: Warm hole ?						
		12	Technology of Space Travel (Let's go Interstellar space!) (II)							2
		13	Long Term Influence from Space Environments: Can human survive in the space?	.Solar wind and Galactic cosmic rays: Risk for Cancer? .Calcium depletion and loss of the muscle .Oxygen, Water, and Food supplies: Need to bring little Earth ? .Mental effects: Home sick in space .Evolutions.. : Can life adapt to the						2

				space environments					
		14	Probability of Extraterrestrial Life in the Universe: Are really someone there?	.Minkowski space and light cone: The space is too big to communicate? .Drake's equation: Calculate the percentage of life					2
		15	Probing the edge of the solar system and sending message beyond	.Pioneer 10 and 11: First messengers .Voyager I and II: Golden records .New Horizons: Mission beyond Kuiper Belt					2
		16	Final exam			Final exam			2
(5)	Teaching Method	(if included, check ✓; multiple choices allowed) ■ 1. Provide primary and supplementary materials for online courses ■ 2. Provide online asynchronous teaching, number: 16 time(s), total hour(s): 32 hour(s) ☐ 3. Have online teacher or online assistant ☐ 4. Provide face-to-face teaching, number: ____ time(s), total hour(s): ____ hour(s) ☐ 5. Provide online synchronous teaching, number: ____ time(s), total hour(s): ____ hour(s) ■ 6. Provide topic discussion activities ☐ 7. Provide cooperative learning activities between students ☐ 8. Other: (please specify)							
(6)	Learning Management System	Does the content include the following roles and functions? (if included, check ✓; multiple choices allowed) 1. For learning management system database management by the system administrator ■ Personal data							

		■ Course information ■ Other related information management functions 2. Provide the necessary learning management system functions for teachers (teaching assistants) and students ■ Latest News release, browse ■ Textbook content design, viewing, download ■ Grade system management & inquiry ■ Perform online testing ■ Learning information releasing ■ Interactive learning design (chat room or discussion area) ☐ Function presentation for various teaching activities ☐ Other related functions: (please specify)
(7)	Public Information about Interactive Teaching	Instructor Profile and Published Works (webpage link instructions can be attached):
		Instructor E-mail: Hashimot@ntnu.edu.tw
		Online Office Hours (at least 1 hour per week): 12:10-13:10,15:10-16:10, Wed 16:00-18:00, Thu
		Teaching Assistant's Name/E-mail (omit if inapplicable): 61073007H@gapps.ntnu.edu.tw
		Other(omit if inapplicable):
(8)	Course Material Production	(if included, check ✓; multiple choices allowed) ■ 1. Provides appropriate reminders of key points ☐ 2. Provides teaching-related examples ☐ 3. Provides teaching-related exercises and reflective activities ☐ 4. Provides supplementary teaching materials or online resources ☐ 5. Provides instructions for self-directed learning

		■ 6. Unit goals are consistent with course goals □ 7. Other:
(9)	Assignment Submission Method	(if included, check ✓; multiple choices allowed) ■ 1. Provides online assignment content description □ 2. Online real-time assignment ■ 3. Assignment file upload and download ■ 4. Online testing ■ 5. Grade inquiry □ 6. Other:
(10)	Assessment Plan	**※ To comply with the spirit of online course design, you must understand and agree to the contents of the following 3 items, and provide detailed description after checking ✓ the box for item 3)** ■ 1. The course can provide evaluation results and feedback for each learning evaluation ■ 2. The evaluation has taken the students online learning history and participation level into account ■ 3. The percentage of each score is explained in detail below: (testing method and items, and their total score percentage)
(11)	Precautions for Class:	
(12)	**<u>Observe intellectual property rights in the creation of course content.</u>** ※ Pay attention to any infringement of copyright or other rights in the creation of relevant teaching content. ※ If the copyright for any part of the teaching content is owned by others and authorization has been obtained from the rights holder, please indicate the source of the material.	