ISU SPACE SECTOR CRASH COURSE SYLLABUS

The Space Sector Crash Course (SSCC) is offered by the International Space University (ISU) as an unaccredited professional development program. This syllabus contains information for SSCC events in general.

COURSE DESCRIPTION

This course offers an intensive deep-dive into the global space sector using the "3-I" approach focusing on international, interdisciplinary, and intercultural education. The SSCC provides comprehensive interdisciplinary space training for current and future leaders within the space sector context. The seven departments are Space Physical Sciences, Space Life Sciences, Space Engineering, Space Policy and Law, Space Business and Management, Satellite Applications, and Space Humanities.

COURSE DURATION

The SSCC runs for five days, nominally from Monday through Friday.

PREREQUISITES

None.

COURSE MATERIALS

- Required Texts: None.
- Supplementary Materials: None.
- Tools/Software: None.

LECTURE DESCRIPTIONS

Each of the seven departments (Space Physical Sciences, Space Life Sciences, Space Engineering, Space Policy and Law, Space Business and Management, Satellite Applications, and Space Humanities) provides 2-3 hours of lectures, including an introduction of the department followed by three lectures devoted to the past, present, and future of each discipline.

SPACE PHYSICAL SCIENCES

This lecture series provides an introductory overview of space science and exploration; traces the historical development of space science from ancient astronomy to the modern era; covers current research, discoveries, and trends on

areas like the solar system, exoplanets, and astrophysics; and assesses potential future directions, including the search for life, human settlements on the Moon and Mars, and interdisciplinary collaboration. Overall, the four lectures aim to give students a comprehensive understanding of the field of space science and exploration, from its history to its exciting future.

*SPACE LIFE SCIENCES**

This lecture series introduces how spaceflight affects human physiology and psychology; provides a historical overview of research ensuring astronaut health and safety; reviews current knowledge gained from studies on the ISS and analog environments; and discusses future research plans to mitigate risks for long-duration missions to the Moon and Mars. Overall, the lectures cover the effects of spaceflight environments on humans, past and current research, and strategies to enable future deep space exploration.

SPACE ENGINEERING

This lecture series provides an introductory overview of space engineering fundamentals and applications; covers the historical development of rocketry and space stations; examines current technologies, systems, missions, and challenges; and analyzes future emerging technologies, applications like space tourism and lunar exploration, and their potential impact. Overall, the four lectures aim to give students a comprehensive understanding of space engineering, from foundational concepts to analysis of future directions.

SPACE POLICY AND LAW

This lecture series provides an introductory overview of what shapes current and future space activities, along with their impacts, benefits, and the international and national legal frameworks within which space activities are conducted.; provides historical context since Sputnik; examines current challenges as space activities expand globally; and discusses future needs for innovative policies and laws that foster responsible behavior by States and by private sector entities to ensure a sustainable space future . Overall, the lectures provide students with a comprehensive understanding of the development of space policy and law, and the future challenges to policy and law development.

SPACE BUSINESS AND MANAGEMENT

The department introduces key business practices, management strategies, organizational models, and approaches that enable effective and efficient operations in the space industry; overviews the history, major players, policy, and regulatory issues impacting the field. The history overview includes the evolution of the global space industry and covers early government space programs, changes after the Cold War, key innovations, and milestones that have driven growth. The new business models and cases will be considered that outline the New Space paradigm as well as the future public/private space industry with a strong in-space component.

SATELLITE APPLICATIONS

This lecture series surveys how satellites impact society through applications like Earth observation, satellite navigation and telecommunications; traces the history of satellite technology; examines current satellites and their diverse functions; and explores future advancements and challenges like space sustainability and orbital congestion. Overall, the lectures provide a comprehensive understanding of the practical applications of satellites, from foundational concepts and history to analysis of the current multi-billion-dollar landscape and future opportunities.

SPACE HUMANITIES

This lecture series explores the relationship between society and space activities. From the history of space exploration to the future of communities living and working in space, Space Humanities examines the societal, cultural, and commercial perspectives on space. The three lectures examine a variety of topics, including the social and cultural impact of space activities, the way space is promoted, marketed, and communicated in business, media, and society, and some of the ethical and moral implications of spaceflight, past, present, and future.

COURSE LOGISTICS

- Venue: SSCC events can be held in hotel event rooms or academic lecture facilities.
- Format: The SSCC is entirely in-person.
- Registration: All SSCC lecturers and participants must provide a $100 non-refundable fee to complete their registration.
- Meals Provided:
  - Lunch is provided every day from 12:00-13:00.
  - Two SSCC receptions are provided during the week, nominally on Sunday and Thursday evenings.
- Lodging: Lodging is typically available a special group rate. This cost is the responsibility of the participants.
- Transportation: All ground and air transportation costs are the responsibility of the participants.

REPRESENTATIVE COURSE SCHEDULE

NOTES

- All times in 24-hour format, local time.
- Each lecture is one academic hour: a 48 min lecture followed by a 12 min break.

DAY 0 (SUNDAY, NOVEMBER 12, 2023)

- 18:00-20:00: Registration and Welcome Reception

DAY 1 (MONDAY, NOVEMBER 13, 2023):

- 09:00-10:00: Introduction of Attendees and Lecturers

- 10:00-11:00: Introduction to ISU and the Space Sector Crash Course
- 11:00-12:00: Space Sector Introduction Lecture
- 13:00-17:00: Introduction to the seven departments

DAY 2 (TUESDAY, NOVEMBER 14, 2023):

- 09:00-17:00: History of the seven departments
- 17:00-18:00: Interdisciplinary discussion

DAY 3 (WEDNESDAY, NOVEMBER 15, 2023):

- 09:00-17:00: Present State of the seven departments
- 18:00-21:00: Networking reception with local ISU alumni and other invited guests

DAY 4 (THURSDAY, NOVEMBER 16, 2023):

- 09:00-17:00: Future of the seven departments
- 17:00-18:00: Interdisciplinary discussion

DAY 5 (FRIDAY, NOVEMBER 17, 2023):

- 09:00-12:00: Concluding sessions including remarks from each department.
- 12:00-13:30: Concluding Luncheon
- 14:00-17:00: Optional site visit to the NASA Johnson Space Center Visitor's Center.

REPRESENTATIVE COURSE SCHEDULE

Time	Day 0: Sunday	Day 1: Monday	Day 2: Tuesday	Day 3: Wednesday	Day 4: Thursday	Day 5: Friday
09:00 10:00		Introduction of Attendees	HUM Lecture 1	HUM Lecture 2	HUM Lecture 3	Department Closing
10:00 11:00		Introduction to ISU, SSCC	ENG Lecture 1	ENG Lecture 2	ENG Lecture 3	Q+A & Feedback
11:00 12:00		Space Sector Introduction	SCI Lecture 1	SCI Lecture 2	SCI Lecture 3	Concluding Ceremony
12:00 13:00		Lunch	Lunch	Lunch	Lunch	Concluding Luncheon
13:00 14:00		HUM Intro ENG Intro	P&L Lecture 1	P&L Lecture 2	P&L Lecture 3	Site Visit
14:00 15:00		SCI Intro P&L Intro	APP Lecture 1	APP Lecture 2	APP Lecture 3	
15:00 16:00		Break APP Intro	LIF Lecture 1	LIF Lecture 2	LIF Lecture 3	
16:00 17:00		LIF Intro BUS Intro	BUS Lecture 1	BUS Lecture 2	BUS Lecture 3	
17:00 18:00			Inter-disciplinary Discussion		Inter-disciplinary Discussion	
18:00 19:00	Welcome Reception			Networking Reception		
19:00 20:00						

Color Key:
- Discussions
- Meals & breaks
- Lectures

ABBREVIATIONS
APP = Space Applications
BUS = Space Business and Management
ENG = Space Engineering
HUM = Space Humanities
LIF = Space Life Sciences
P&L = Space Policy and Law
SCI = Space Physical Sciences

INTERACTIVITY AND ENGAGEMENT

- Group Activities: Two networking receptions and two inter-disciplinary discussions.
- Engagement Strategies: Physical and mental stimulation activities to keep participants engaged.

ADMINISTRATIVE DETAILS

COURSE POLICIES

- All lecturers and participants are bound by the ISU code of conduct as found on the www.isunet.edu website.
- There are no policies regarding tardiness or absences.
- All facilities are ADA compliant. Special needs of any participant will be accommodated to the greatest extent practicable.

RESOURCES AND SUPPORT

- Other than the ability to understand the English language, no additional resources or support mechanisms are required or recommended.
- There is no on-line component to this course. There is no technical support provided.

ASSESSMENT AND FEEDBACK

- Assignments/Quizzes: None.
- Grading/Evaluation: Participants will not be graded or evaluated.
- Feedback: Participants will have the opportunity to provide feedback in person on the final day of the course. Participants can also provide confidential feedback via email at any time by sending their comments to crashcourse@isunet.edu.

ABOUT ISU

ISU was founded in 1987 and is a private, non-profit university registered in France and the US. ISU provides "3-I" (i.e., international, interdisciplinary, and intercultural) workforce and leadership development programs for participants at the graduate student and early career professional levels for the benefit of all humanity. Find more information on the web at www.isunet.edu.

LECTURER BIOGRAPHIES

SSCC lecturers are selected from the ISU Global Faculty specifically for each event. Brief biographies of select lecturers are given below.

SPACE PHYSICAL SCIENCES: DR. FRANCOIS SPIERO

François Spiero studied science and engineering in France (Ecole Centrale de Lyon), in the USA (Cornell University) and at ISU (SSP89). After receiving his Ph.D. in Space Studies in 1990, he went to ESA/ESTEC and worked there in several areas, particularly in planetary exploration, telecommunications, and Earth observation. Francois Spiero then joined CNES in 1997 and became a member of the French delegation to ESA. In 2004, he was appointed Manager of Human Spaceflight and Exploration at CNES. In that capacity, Dr. Spiero dealt with ISS and astronaut affairs, parabolic flights, and human exploration. He chaired various European and international committees. He was also the CNES Program Manager of the French astronaut's mission on board the ISS in 2016-2017. After that mission, Dr. Spiero became the CNES Strategic Foresight Manager. He oversaw the French Space Foresight Observatory, which establishes long-term scenarios, notably related to permanent human settlements on the Moon and Mars. In 2021, he was appointed European Space Affairs Manager at the French Prime Minister's Office. In particular, he is a delegate to the Board of EUSPA, the space agency of the European Union.

SPACE LIFE SCIENCES: DR. GILLES CLEMENT

Dr. Gilles Clément received Doctoral Degrees in Neurobiology from the University of Lyon in 1981 and in Natural Science from the University of Paris in 1986. He is conducting space research in collaboration in collaboration with the COMETE laboratory at the University of Caen-Normandy in France and the Neuroscience Laboratory at the NASA Johnson Space Center in Houston. Research in neurosciences has been his primary focus with experiments flown on Salyut, Mir, Space Shuttle, and International Space Station missions. His research topics include influence of weightlessness on posture, eye movements, spatial orientation, and cognition in humans. To date, he has gathered data on more than 220 astronauts. He was also the Principal Investigator of 36 experiments performed in parabolic flight on more than 300 subjects. During these flights, he has accumulated a total of nearly two full days in weightlessness. Dr. Clément is the author of more than 200 publications in scientific journals and 4 books on the topics of space biology, space physiology, space medicine, and artificial gravity.

SPACE ENGINEERING: DR. ANGIE BUKLEY

Dr. Angie Bukley is a Technical Fellow in The Aerospace Corporation Center for Space Policy and Strategy. She earned undergraduate and master's degrees at Mississippi State University and a PhD at the University of Alabama in Huntsville. Dr. Bukley's career has spanned 40 years and includes work experience as a defense contractor, as a civil servant at the NASA Marshall Space Flight Center, in administrative and teaching positions at three universities, and nearly 20 years with Aerospace. She has been a member of the ISU faculty since 1998 and was recently granted the title of ISU Dean Emerita, as she served as ISU Dean at the Central Campus in Strasbourg for five years. Her primary areas of expertise are space systems engineering and space policy. Frequently appearing on panels, chairing sessions, and delivering presentations, Dr. Bukley is active in many professional organizations and technical societies. She actively promotes K-12 STEM education participating in outreach at every opportunity.

SPACE POLICY AND LAW: DR. LUCY STOJAK

Dr. Lucy Stojak is a space law expert and the Executive Director of Mosaic, the Creativity & Innovation Hub at HEC Montréal. She holds a doctorate in law from McGill University's Institute of Air Space Law. She is particularly interested in security and space issues, government regulation of space activities and space commercialization. She has over 30 years of experience in the development and management of international, interdisciplinary, and intercultural educational programs. She was the first director of the Space Studies Program of the International Space University and is a member of the ISU Faculty, as well as the current elected Vice chair of the ISU Academic Council. From 2017-2020, Dr. Stojak chaired the Government of Canada's Space Advisory Board. She is a fellow of the Outer Space Institute and serves on SEDS Canada's Board of Advisors. She is an associate member of the editorial board of New Space Journal. Dr. Stojak is a passionate advocate for space. She participates in outreach and education activities to engage the public in the adventure of space exploration, and to increase knowledge and awareness of the impact of space activities on society.

SPACE BUSINESS AND MANAGEMENT: DR. DMITRY PAYSON

Dr. Payson is a recognized expert in efficiency, institutions, and history in the space industry. He spent a significant part of his career participating in and leading different projects to improve the institutional environment and build the Open Innovations system for several players, including Roscosmos and Skolkovo Foundation. He now summarizes the gained experience at The Hebrew University of Jerusalem. Dmitry has extensive teaching and lecturing experience in the basics of the space industry and space activities organization, and he led several space history projects, including The Mishin Diaries (https://dpayson7.wixsite.com/diaries1). He

is an Associate Editor of New Space magazine. Dmitry holds a D.Sc. degree in Space Economy/Institutional design and Ph.D. in satellite technology.

SPACE BUSINESS AND MANAGEMENT: DR. KEN DAVIDIAN

Dr. Ken Davidian has worked over 40 years in the space sector, including 20 years at NASA (Lewis/Glenn Headquarters), 14 years at the FAA's Office of Commercial Space Transportation, and 5 years in private industry/academia. Davidian currently wears many hats, as (i) the Vice President of North American Operation for the International Space University, (ii) the Editor-in-Chief of the New Space journal, (iii) an Adjunct Professor for Virginia Tech's Pamplin College of Business, and (iv) owner of Impossible Research, a research, research consulting, and STEAM outreach company. Davidian is an Associate Fellow of the AIAA, a Full Member of the International Academy of Astronautics, and is internationally active as an officer or advisor on multiple committees and groups. Davidian received a BS degree in Aeronautical and Astronautical Engineering, a MS degree in Mechanical Engineering, and a doctorate in Business Administration focusing on market-level organizational change, innovation, and space market emergence.

SATELLITE APPLICATIONS: DR. SCOTT MADRY

Dr. Madry is a highly motivated, experienced university researcher, teacher, manager and administrator with strong technology and staff management skills. Specializing in space remote sensing, GIS, GPS, and regional, environmental, and cultural applications. An effective communicator skilled at helping people understand complex technologies and apply them to specific requirements. He was the principal investigator (PI) or co-PI on over US$5 million in grants and contracts and have managed a variety of international and regional research and applications projects. Dr. Madry has given over 150 training programs and short courses in over 30 countries and consulted for a variety of Fortune 500 corporations, governments, and organizations including NASA, NATO, the UN, the U.S. Departments of Agriculture and Commerce, the US Army Corps of Engineers, NC DOT, and several international governments. Fulbright Senior Specialist Award in 2006 and 2010.

SPACE HUMANITIES: MR. REMCO TIMMERMANS

Remco Timmermans is an independent online marketing and social media specialist for the international space sector. He is a well-known space influencer and mentor to aspiring space communicators. He is the founder of his own space marketing agency Spaceside OÜ, a faculty member of the International Space University and a member of the IAF Space Education and Outreach Committee. Remco designs and runs creative online campaigns for a variety of space organizations, both in academic, government and commercial space. He is a founding member of the new Space Communications Alliance, that brings together key media, PR, and communications organizations in the space

industry. Remco has an undergraduate degree in business administration and mechanical engineering, a master's degree in business sciences, and he is a graduate of the International Space University Space Studies Program, where he also periodically teaches space management and business, with an emphasis on marketing and communication.