

# Department of Earth Sciences Courses List (2012-2022) – Doctoral Program

Note :

1. The number with the break ( ) indicates the credits.
2. Color Code: **Eligible Course**, **Astronomy**, **Atmospheric Science**, **Geology**, **Geophysics**, **Ocean**, **Sci. Edu.**, **Integrated Course**.
3. Course with # are Master-Doctoral Joint Courses; courses in bold and italic are taught in English in the corresponding semester.

| 101-1<br>(2012 Fall)   | Required                         | Selected                                                                                                                                                        |
|------------------------|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ASTRONOMY              | Seminar(I)(1)<br>Seminar(III)(1) | Advanced Astronomical Observations(3)#<br>Advanced Astrophysics(3)#<br>Interstellar Medium(3)#<br><i>Tools for Modern Astronomy(3)#</i>                         |
| ATMOSPHERIC SCIENCES   |                                  | Research Methodologies in Atmospheric Sciences(3)#                                                                                                              |
| GEOLOGY                |                                  | Advanced Petroleum Geology(3)#<br>Core-Log Integration(3)#<br>Earth Sciences and Archaeology(3)#<br>Topics on Geology(3)                                        |
| GEOPHYSICS             |                                  | Gravity and Geomagnetism Laboratory(1)#<br>Gravity and Geomagnetism(2)#<br>Inverse Theory(3)#<br>The Dynamics of Fault Zone(3)#                                 |
| OCEANOGRAPHY           |                                  | NA                                                                                                                                                              |
| 101-2<br>(2013 Spring) | Required                         | Selected                                                                                                                                                        |
| ASTRONOMY              | Seminar(II)(1)<br>Seminar(IV)(1) | <i>High Energy Astrophysics(3)#</i><br><i>Introduction to Modern Cosmology(3)#</i>                                                                              |
| ATMOSPHERIC SCIENCES   |                                  | Advanced Synoptic Meteorology(3)#<br>Topics in Monsoon Dynamics(3)#                                                                                             |
| GEOLOGY                |                                  | Regional Geology(3)#                                                                                                                                            |
| GEOPHYSICS             |                                  | Seismic Stratigraphy(2)#<br>Seismic Stratigraphy Laboratory(1)#                                                                                                 |
| OCEANOGRAPHY           |                                  | Satellite Remote Data Analysis(I)(3)#<br>Applied Numerical Methods in Oceanography(3)#                                                                          |
| 102-1<br>(2013 Fall)   | Required                         | Selected                                                                                                                                                        |
| ASTRONOMY              | Seminar(I)(1)<br>Seminar(III)(1) | Advanced Astronomical Observations(3)#<br>Advanced Astrophysics(3)#<br>Interstellar Medium(3)#<br><i>Tools for Modern Astronomy(3)#</i>                         |
| ATMOSPHERIC SCIENCES   |                                  | Advanced Dynamic Meteorology(3)#<br>Meso-scale Meteorology#<br>Research Methodologies in Atmospheric Sciences(3)#<br>Topics in Numerical Weather Prediction(3)# |

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| GEOLOGY                |                                  | Advanced Geothermics(3)#<br><i>Geo-technical Writing(3)#</i><br><i>Micro-Structural Geology(3)#</i>                                                              |
| GEOFYSICS              |                                  | Engineering Geophysics(3)#<br>Theoretical Geophysics(3)                                                                                                          |
| OCEANOGRAPHY           |                                  | Numerical Ocean Circulation Modeling(3)#<br>Ocean Data Assimilation Modeling(3)<br>Global Change in the Past- Paleooceanography in the Tropical Pacific Ocean(3) |
| 102-2<br>(2014 Spring) | Required                         | Selected                                                                                                                                                         |
| ASTRONOMY              | Seminar(II)(1)                   | NA                                                                                                                                                               |
| ATMOSPHERIC SCIENCES   | Seminar(IV)(1)                   | Topic on Atmospheric Sciences(3)                                                                                                                                 |
| GEOLOGY                |                                  | Petrographic Methods(3)#<br>Strain Analysis(3)#<br><i>Stress Regimes in Lithosphere(3)#</i><br><i>Topics on Geology(3)</i>                                       |
| GEOFYSICS              |                                  | Inverse Theory(3)#<br>Theoretical Geophysics(3)                                                                                                                  |
| OCEANOGRAPHY           |                                  | Climatic and Oceanic Variability(3)#<br>Satellite Remote Data Analysis(I)(3)#<br>Ocean Modeling and Data Analysis(3)                                             |
| 103-1<br>(2014 Fall)   | Required                         | Selected                                                                                                                                                         |
| ASTRONOMY              | Seminar(I)(1)<br>Seminar(III)(1) | Advanced Astronomical Observations(3)#<br>Advanced Astrophysics(3)#<br><i>Interstellar Medium(3)#</i>                                                            |
| ATMOSPHERIC SCIENCES   |                                  | Climate Change(3)#<br>Research Methodologies in Atmospheric Sciences(3)#                                                                                         |
| GEOLOGY                |                                  | Advanced Marine Geology(3)#<br>Core-Log Integration(3)#<br>Earth Sciences and Archaeology(3)#                                                                    |
| GEOFYSICS              |                                  | Sesimomagnetism(II)(3)#                                                                                                                                          |
| OCEANOGRAPHY           |                                  | Applied Numerical Methods in Oceanography(3)#                                                                                                                    |
| 103-2<br>(2015 Spring) | Required                         | Selected                                                                                                                                                         |
| ASTRONOMY              | Seminar(II)(1)                   | <i>High Energy Astrophysics(3)#</i>                                                                                                                              |
| ATMOSPHERIC SCIENCES   | Seminar(IV)(1)                   | Advanced Synoptic Meteorology(3)#<br>Topics in Meteorological Phenomena in Eastern Asia(3)#                                                                      |
| GEOLOGY                |                                  | Petrographic Methods(3)#<br>Regional Geology(3)#<br>Stress Regimes in Lithosphere(3)#<br><i>Topics on Geology(3)</i>                                             |
| GEOFYSICS              |                                  | Advanced Geophysics(3)#<br>Theoretical Geophysics(3)#                                                                                                            |
| OCEANOGRAPHY           |                                  | Satellite Remote Data Analysis(I)(3)#                                                                                                                            |

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|                                |                                  | Topics in Marine Chemistry-Geotracer of Trace Elements and Isotopes(3)                                                                                                                                           |
| EDUCATION                      |                                  | Cognition and Instruction(3)#                                                                                                                                                                                    |
| <b>104-1<br/>(2015 Fall)</b>   | <b>Required</b>                  | <b>Selected</b>                                                                                                                                                                                                  |
| ASTRONOMY                      | Seminar(I)(1)<br>Seminar(III)(1) | Advanced Astrophysics(3)#<br>Advanced Astronomical Observations(3)#<br><i>Interstellar Medium(3)#</i>                                                                                                            |
| ATMOSPHERIC SCIENCES           |                                  | Meso-scale Meteorology(3)#<br>Research Methodologies in Atmospheric Sciences(3)#<br>Statistical Analysis in Climate Research(3)#<br>Topics in Monsoon Dynamics(3)#<br>Topics in Numerical Weather Prediction(3)# |
| GEOLOGY                        |                                  | NA                                                                                                                                                                                                               |
| GEOFYSICS                      |                                  | Engineering Geophysics(3)#                                                                                                                                                                                       |
| OCEANOGRAPHY                   |                                  | Ocean Dynamics(3)#<br>Marine Environmental Education(3)#<br>Earth System : Ocean(3)<br>Global Change in the Past- Paleooceanography in the Tropical Pacific Ocean(3)                                             |
| <b>104-2<br/>(2016 Spring)</b> | <b>Required</b>                  | <b>Selected</b>                                                                                                                                                                                                  |
| ASTRONOMY                      | Seminar(II)(1)<br>Seminar(IV)(1) | <i>Tools for Modern Astronomy(3)#</i>                                                                                                                                                                            |
| ATMOSPHERIC SCIENCES           |                                  | Advanced Synoptic Meteorology(3)#<br>Geophysical Fluid Dynamics(3)#                                                                                                                                              |
| GEOLOGY                        |                                  | <i>Stress Regimes in Lithosphere(3)#</i>                                                                                                                                                                         |
| GEOFYSICS                      |                                  | Time Series Analysis(3)#                                                                                                                                                                                         |
| OCEANOGRAPHY                   |                                  | Applied Numerical Methods in Oceanography(3)#<br>Climatic and Oceanic Variability(3)#                                                                                                                            |
| <b>105-1<br/>(2016 Fall)</b>   | <b>Required</b>                  | <b>Selected</b>                                                                                                                                                                                                  |
| ASTRONOMY                      | Seminar(I)(1)<br>Seminar(III)(1) | Advanced Astronomical Observations(3)#<br>Advanced Astrophysics(3)#<br><i>Interstellar Medium(3)#</i>                                                                                                            |
| ATMOSPHERIC SCIENCES           |                                  | Geophysical Fluid Dynamics(3)#<br>Meso-scale Meteorology(3)#                                                                                                                                                     |
| GEOLOGY                        |                                  | <i>Core-Log Integration(3)#</i><br>Earth Sciences and Archaeology(3)#<br><i>Micro-Structural Geology(3)#</i>                                                                                                     |
| GEOFYSICS                      |                                  | Topics on Seismology(3)#                                                                                                                                                                                         |
| OCEANOGRAPHY                   |                                  | Marine Environmental Education(3)#<br>Numerical Ocean Circulation Modeling(3)#                                                                                                                                   |
| <b>105-2<br/>(2017 Fall)</b>   | <b>Required</b>                  | <b>Selected</b>                                                                                                                                                                                                  |
| ASTRONOMY                      | Seminar(II)(1)<br>Seminar(IV)(1) |                                                                                                                                                                                                                  |
| ATMOSPHERIC SCIENCES           |                                  | Advanced Synoptic Meteorology(3)#<br>Research Methodologies in Atmospheric Sciences(3)#<br>Statistical Analysis in Climate Research(3)#                                                                          |

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| GEOLOGY                 |                                  | <i>Geo-technical Writing(3)#</i><br><i>Stress Regimes in Lithosphere(3)#</i><br>Topics on Geology(3)                                                                                       |
| GEOFYSICS               |                                  | Advanced Geophysics(3)#                                                                                                                                                                    |
| OCEANOGRAPHY            |                                  | Satellite Remote Data Analysis(I)(3)#                                                                                                                                                      |
| 106-1<br>(2017 Fall)    | Required                         | Selected                                                                                                                                                                                   |
| ASTRONOMY               | Seminar(I)(1)<br>Seminar(III)(1) | <i>Advanced Astronomical Observations(3)#</i><br><i>Advanced Astrophysics(3)#</i>                                                                                                          |
| ATMOSPHERIC<br>SCIENCES |                                  | Geophysical Fluid Dynamics(3)#<br>Meso-scale Meteorology(3)#<br>Research Methodologies in Atmospheric<br>Sciences(3)#<br>Topics in Numerical Weather Prediction(3)#                        |
| GEOLOGY                 |                                  |                                                                                                                                                                                            |
| GEOFYSICS               |                                  | Theoretical Geophysics(3)#                                                                                                                                                                 |
| OCEANOGRAPHY            |                                  | Marine Environmental Education(3)#<br>Global Change in the Past- Paleooceanography in the<br>Tropical Pacific Ocean(3)<br>Topics in Marine Chemistry - Oceanic CO2 and<br>Global Change(3) |
| EDUCATION               |                                  | Cognition and Instruction(3)#                                                                                                                                                              |
| 106-2<br>(2018 Spring)  | Required                         | Selected                                                                                                                                                                                   |
| ASTRONOMY               | Seminar(II)(1)<br>Seminar(IV)(1) | <i>Intergalactic Medium(3)#</i>                                                                                                                                                            |
| ATMOSPHERIC<br>SCIENCES |                                  | <i>Advanced Synoptic Meteorology(3)#</i><br>Climate Change(3)#<br>Numerical Modeling of the Atmospheric Dynamical<br>Processes(3)                                                          |
| GEOLOGY                 |                                  | <i>Advanced East Asia Regional Geology(3)</i>                                                                                                                                              |
| GEOFYSICS               |                                  | NA                                                                                                                                                                                         |
| OCEANOGRAPHY            |                                  | Satellite Remote Data Analysis(I)(3)#                                                                                                                                                      |
| 107-1<br>(2018 Fall)    | Required                         | Selected                                                                                                                                                                                   |
| ASTRONOMY               | Seminar(I)(1)<br>Seminar(III)(1) | <i>Advanced Astronomical Observations(3)#</i><br>Advanced Astrophysics(3)#                                                                                                                 |
| ATMOSPHERIC<br>SCIENCES |                                  | <i>Geophysical Fluid Dynamics(3)#</i><br>Simulation and Diagnosis of Mesoscale<br>Weathers(2)#<br><i>Statistical Analysis in Climate Research(3)#</i>                                      |
| GEOLOGY                 |                                  | <i>Core-Log Integration(3)#</i><br>Earth Sciences and Archaeology(3)#                                                                                                                      |
| GEOFYSICS               |                                  | NA                                                                                                                                                                                         |
| OCEANOGRAPHY            |                                  | Marine Environmental Education(3)#                                                                                                                                                         |
| 107-2<br>(2019 Spring)  | Required                         | Selected                                                                                                                                                                                   |
| ASTRONOMY               | Seminar(II)(1)<br>Seminar(IV)(1) | <i>Interstellar Medium(3)#</i>                                                                                                                                                             |
| ATMOSPHERIC<br>SCIENCES |                                  | <i>Research Methodologies in Atmospheric<br/>Sciences(3)#</i>                                                                                                                              |

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| GEOLOGY                 |                                  | <i>Stress Regimes in Lithosphere(3)#</i>                                                                                                   |
| GEOFYSICS               |                                  | N/A                                                                                                                                        |
| OCEANOGRAPHY            |                                  | Satellite Remote Data Analysis (I)(3)#                                                                                                     |
| 108-1<br>(2019 Fall)    | Required                         | Selected                                                                                                                                   |
| ASTRONOMY               | Seminar(I)(1)<br>Seminar(III)(1) | <i>Advanced Astrophysics(3)#</i><br><i>Advanced Astronomical Observations(3)#</i>                                                          |
| ATMOSPHERIC<br>SCIENCES |                                  | Topics in Meteorological Phenomena in Eastern Asia(3)# Geophysical Fluid Dynamics(3)# Research Methodologies in Atmospheric Sciences(3)#   |
| GEOLOGY                 |                                  | <i>Core-Log Integration(3)# Topics on Geology(3)</i>                                                                                       |
| GEOFYSICS               |                                  | <i>Theoretical Geophysics(3)#</i>                                                                                                          |
| OCEANOGRAPHY            |                                  | Marine Environmental Education(3)#                                                                                                         |
| 108-2<br>(2020 Spring)  | Required                         | Selected                                                                                                                                   |
| ASTRONOMY               | Seminar(II)(1)<br>Seminar(IV)(1) | Intergalactic Medium (3)#                                                                                                                  |
| ATMOSPHERIC<br>SCIENCES |                                  | Advanced Synoptic Meteorology(3)#<br>Climate Change(3)#<br>Topic on Atmospheric Sciences(3)                                                |
| GEOLOGY                 |                                  | NA                                                                                                                                         |
| GEOFYSICS               |                                  | NA                                                                                                                                         |
| OCEANOGRAPHY            |                                  | Satellite Remote Data Analysis (I)(3)#                                                                                                     |
| INTEGRATED              |                                  | NA                                                                                                                                         |
| 109-1<br>(2020 Fall)    | Required                         | Selected                                                                                                                                   |
| ASTRONOMY               | Seminar(I)(1)<br>Seminar(III)(1) | Advanced Astronomical Observations(3)#<br>Advanced Astrophysics(3)#<br>High Energy Astrophysics(3)#<br><i>Statistics for Astronomy(3)#</i> |
| ATMOSPHERIC<br>SCIENCES |                                  | Geophysical Fluid Dynamics(3)#<br>Statistical Analysis in Climate Research(3)#<br>Research Methodologies in Atmospheric Sciences(3)#       |
| GEOLOGY                 |                                  | <i>Advanced Igneous Petrology(3)#</i><br><i>Micro-Structural Geology(3)#</i>                                                               |
| GEOFYSICS               |                                  | The Dynamics of Fault Zone(3)#                                                                                                             |
| OCEANOGRAPHY            |                                  | Marine Environmental Education(3)#                                                                                                         |
| INTEGRATED              |                                  | NA                                                                                                                                         |
| 109-2<br>(2021 Spring)  | Required                         | Selected                                                                                                                                   |
| ASTRONOMY               | Seminar(II)(1)<br>Seminar(IV)(1) | NA                                                                                                                                         |
| ATMOSPHERIC<br>SCIENCES |                                  | Numerical Modeling of the Atmospheric Dynamical Processes(3)                                                                               |
| GEOLOGY                 |                                  | <i>Strain Analysis(3)#</i><br>Topics on Geology(3)                                                                                         |

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| GEOPHYSICS              |                                  | Topics on Seismology(3)#                                                                                                                                       |
| OCEANOGRAPHY            |                                  | NA                                                                                                                                                             |
| INTEGRATED              |                                  | NA                                                                                                                                                             |
| 110-1<br>(2021 Fall)    | Required                         | Selected                                                                                                                                                       |
| ASTRONOMY               | Seminar(I)(1)<br>Seminar(III)(1) | Advanced Astronomical Observations(3)#<br>Advanced Astrophysics (3)#                                                                                           |
| ATMOSPHERIC<br>SCIENCES |                                  | Advanced Synoptic Meteorology(3)#<br>Geophysical Fluid Dynamics(3)#<br>Meso-scale Meteorology(3)#<br>Research Methodologies in Atmospheric<br>Sciences(3)#     |
| GEOLOGY                 |                                  | Advanced Structural Geology(3)#<br>Core-Log Integration(3)#<br>Quaternary Geology and Environmental<br>Changes(3)#<br>Sequence Stratigraphy(3)#                |
| GEOPHYSICS              |                                  | Theoretical Geophysics(3)#                                                                                                                                     |
| OCEANOGRAPHY            |                                  | Marine Environmental Education(3)#                                                                                                                             |
| INTEGRATED              |                                  | NA                                                                                                                                                             |
| 110-2<br>(2022 Spring)  | Required                         | Selected                                                                                                                                                       |
| ASTRONOMY               | Seminar(II)(1)<br>Seminar(IV)(1) | NA                                                                                                                                                             |
| ATMOSPHERIC<br>SCIENCES |                                  | Statistical Analysis in Climate Research(3)#<br>Climate Change(3)#                                                                                             |
| GEOLOGY                 |                                  | Geo-technical Writing(3)#<br>Stress Regimes in Lithosphere(3)#                                                                                                 |
| GEOPHYSICS              |                                  | NA                                                                                                                                                             |
| OCEANOGRAPHY            |                                  | NA                                                                                                                                                             |
| INTEGRATED              |                                  | NA                                                                                                                                                             |
| 111-1<br>(2022 Fall)    | Required                         | Selected                                                                                                                                                       |
| ASTRONOMY               | Seminar(I)(1)<br>Seminar(III)(1) | Advanced Astrophysics(3)#<br>Advanced Astronomical Observations(3)#                                                                                            |
| ATMOSPHERIC<br>SCIENCES |                                  | Meso-scale Meteorology(3)#<br>Research Methodologies in Atmospheric<br>Sciences(3)#<br>Geophysical Fluid Dynamics(3)#<br>Special Topic on Mei-Yu in Taiwan(2)# |
| GEOLOGY                 |                                  | Topics on Geology(3)<br>Petrographic Methods(3)#<br>Earth Sciences and Archaeology(3)#<br>Core-Log Integration(3)#                                             |
| GEOPHYSICS              |                                  | NA                                                                                                                                                             |
| OCEANOGRAPHY            |                                  | Marine Environmental Education(3)#                                                                                                                             |
| INTEGRATED              |                                  | NA                                                                                                                                                             |