**ESG Science Subjects**

### Biology

**ES.7012 Introductory Biology**
Prereq: None
U (Fall)
5-0-7 BIOLOGY
Credit cannot also be received for 7.012, 7.013, 7.014, 7.015, 7.016, ES.7013

Equivalent to 7.012; see 7.012 for description. Instruction provided through small, interactive classes. Limited to students in ESG.

*P. Christie*

**ES.7013 Introductory Biology**
Prereq: None
Acad Year 2014–2015: Not offered
Acad Year 2015–2016: U (Fall)
5-0-7 BIOLOGY
Credit cannot also be received for 7.012, 7.013, 7.014, 7.015, 7.016, ES.7012

Equivalent to 7.013; see 7.013 for description. Instruction provided through small, interactive classes. Limited to students in ESG.

*P. Christie*

### Chemistry

**ES.3091 Introduction to Solid-State Chemistry**
(Subject meets with 3.091)
Prereq: None
Acad Year 2014–2015: Not offered
Acad Year 2015–2016: U (Fall)
5-0-7 CHEMISTRY
Credit cannot also be received for 5.111, 5.112, CC.5111, ES.5111, ES.5112

Equivalent to 3.091; see 3.091 for description. Students attend regular 3.091 lectures and are assigned to recitations taught by ESG staff. Limited to students in ESG.

*P. Christie*

### Mathematics

**ES.5111 Principles of Chemical Science**
Prereq: None
U (Spring)
5-0-7 CHEMISTRY
Credit cannot also be received for 3.091, 5.111, 5.112, CC.5111, ES.3091, ES.5112

Equivalent to 5.111; see 5.111 for description. Instruction provided through small, interactive classes taught by ESG staff. Limited to students in ESG.

*P. Christie*

**ES.5112 Principles of Chemical Science**
Prereq: None
U (Fall)
5-0-7 CHEMISTRY
Credit cannot also be received for 3.091, 5.111, 5.112, CC.5111, ES.3091, ES.5112

Equivalent to 5.112; see 5.112 for description. Instruction provided through small, interactive classes taught by ESG staff. Limited to students in ESG.

*P. Christie*

**ES.1801 Calculus**
Prereq: None
U (Fall)
5-0-7 CALC I
Credit cannot also be received for 18.01, 18.014, 18.01A, CC.181A, ES.181A

Equivalent to 18.01; see 18.01 for description. Instruction provided through small, interactive classes. Limited to students in ESG.

*G. Stoy*

**ES.1802 Calculus**
Prereq: Calculus I (GIR)
U (Fall, Spring)
5-0-7 CALC II
Credit cannot also be received for 18.02, 18.022, 18.023, 18.024, 18.02A, CC.1802, CC.182A, ES.182A

Equivalent to 18.02; see 18.02 for description. Instruction provided through small, interactive classes. Limited to students in ESG.

*G. Stoy*

**ES.1803 Differential Equations**
Prereq: None. Coreq: Calculus II (GIR)
U (Fall, Spring)
5-0-7 REST
Credit cannot also be received for 18.03, 18.03A, 18.036, CC.1803

Equivalent to 18.03; see 18.03 for description. Instruction provided through small, interactive classes. Limited to students in ESG.

*J. Orloff*

**ES.181A Calculus**
Prereq: Knowledge of differentiation and elementary integration
U (Fall)
5-0-7 CALC I
Credit cannot also be received for 18.01, 18.01A, CC.181A

Equivalent to 18.01A; see 18.01A for description. Instruction provided through small, interactive classes. Limited to students in ESG.

*J. Orloff*

**ES.182A Calculus**
Prereq: Calculus I (GIR)
U (Fall, IAP)
5-0-7 CALC II
Credit cannot also be received for 18.02, 18.02A, CC.182A

Equivalent to 18.02A; see 18.02A for description. Instruction provided through small, interactive classes. Limited to students in ESG.

*J. Orloff*

### Physics

**ES.801 Physics I**
Prereq: None
U (Fall)
5-0-7 PHYSICS I
Credit cannot also be received for 8.01, 8.011, 8.012, 8.01L, CC.801, CC.8012, ES.8012

Equivalent to 8.01; see 8.01 for description. Instruction provided through small, interactive classes. Limited to students in ESG.

*A. Barrantes*
EXPERIMENTAL STUDY GROUP

438

EXPERIMENTAL STUDY GROUP

perspective. Empowers students specifically to present these problems through compelling illustrations, demonstrations, animation, and commentary, all from the student's perspective. The resulting videos develop communication and media skills to teach elements of MIT's curriculum. Each student creates a series of short videos that concisely explain and contextualize specific problems of importance to disciplines at MIT, especially physics, math, chemistry, biology, or the humanities. The resulting videos present these problems through compelling use of illustrations, demonstrations, animation, and commentary, all from the student's perspective.

Students conceive, plan, script, shoot and edit video content to teach elements of MIT's curriculum. Each student creates a series of short videos that concisely explain and contextualize specific problems of importance to disciplines at MIT, especially physics, math, chemistry, biology, or the humanities. The resulting videos develop communication and media skills to teach elements of MIT's curriculum. Each student creates a series of short videos that concisely explain and contextualize specific problems of importance to disciplines at MIT, especially physics, math, chemistry, biology, or the humanities. The resulting videos present these problems through compelling use of illustrations, demonstrations, animation, and commentary, all from the student's perspective.

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ES.8012 Physics I
Prereq: None
U (Fall)
5-0-7 PHYSICS I
Credit cannot also be received for 8.01, 8.011, 8.012, 8.01L, CC.801, CC.802, ES.801
Equivalent to 8.012; see 8.012 for description. Also covers connections to astrophysics; students complete individual and group projects. Limited to students in ESG.
P. Rebusco

ES.8012 Physics II
Prereq: Physics I (GIR), Calculus I (GIR)
U (Spring)
5-0-7 PHYSICS II
Credit cannot also be received for 8.02, 8.021, 8.022, CC.802, ES.8022
Equivalent to 8.02; see 8.02 for description. Instruction done through small, interactive classes. Limited to students in ESG.
A. Barrantes

ES.8022 Physics II
Prereq: Physics I (GIR); Coreq: Calculus II (GIR)
U (Spring)
5-0-7 PHYSICS II
Credit cannot also be received for 8.02, 8.021, 8.022, CC.802, ES.802
Equivalent to 8.022; see 8.022 for description. Students complete individual and group projects; content for the last week of the term is decided by students. Limited to students in ESG.
P. Rebusco

ES.333J Production of Educational Videos: Skills for Communicating Academic and Professional Content
(Same subject as CMS.333J)
Prereq: None
U (Spring)
3-1-3 [P/D/F]
Develops communication and media skills through the production of educational videos. Students conceive, plan, script, shoot and edit video content to teach elements of MIT's curriculum. Each student creates a series of short videos that concisely explains and contextualizes specific problems of importance to disciplines at MIT, especially physics, math, chemistry, biology, or the humanities. The resulting videos present these problems through compelling use of illustrations, demonstrations, animations, and commentary, all from the student's perspective. Empowers students specifically to communicate their MIT expertise to communities of learners and generally to reach broad audiences with quality, accessible online content. Preference to students in ESG.
D. Custer, G. Ramsay

ES.729 Engineering Communication in Context (ES.033)
(Same subject as 21W.729J)
Prereq: None
U (Fall)
3-1-8 HASS-E; CI-H
Introduces writing, graphics, meetings, reading, oral presentation, collaboration, and design as tools for product development. Students work in teams to conceive, design, prototype, and evaluate energy-related mechanical engineering products. Instruction focuses on communication tasks that are integral to the design process, including design notebooks, email, informal and formal presentations, meeting etiquette, literature searches, white papers, proposals, and reports. Other assignments address the cultural situation of engineers and engineering in the world at large. Limited to 18; preference to ESG students.
D. Custer

ESG SEMINARS

ES.010 Chemistry of Sports: Understanding How Exercise Affects Your Body
Prereq: None
U (Spring)
2-1-3 [P/D/F]
Students apply chemistry knowledge to physical fitness through the study of three sports: swimming, cycling, and running. Classroom component focuses on nutrition, exercise, anatomy, physiology, and the chemistry of supplements and sports equipment. Laboratory component focuses on training for and completion of triathlon competition. Students may earn up to 2 PE points during the term by attending supervised triathlon training workouts. Preference to students in ESG.
P. Christie, S. Lyons

ES.011 Kitchen Chemistry
Prereq: None
U (Spring)
2-1-3 [P/D/F]
An experimental and "hands-on" approach to applied chemistry in cooking. Students perform experiments to illustrate chemical principles, such as extraction, denaturation, and phase changes. Preference to students in ESG.
P. Christie

ESG TEACHING AND RESEARCH

ES.200 ESG Undergraduate Teaching
Prereq: Permission of instructor
U (Fall, Spring)
Units arranged [P/D/F]
Can be repeated for credit
An opportunity to assist in the teaching of subjects in ESG in biology, chemistry, humanities and social sciences, mathematics, and physics. Student instructors may be involved in grading, running problem-solving sessions, or teaching classes depending on experience and interest. Qualified students may also develop and teach undergraduate seminars under the supervision of an appropriate faculty or staff member. Student instructors meet weekly with staff to discuss their teaching and cover a variety of topics related to effective teaching techniques. Limited to students in ESG.
P. Christie, G. Ramsay, G. Stay

ES.210 ESG Independent Study
Prereq: Permission of instructor
U (Fall, IAP, Spring)
Units arranged [P/D/F]
Can be repeated for credit
Opportunity for independent study under regular supervision by a staff member. Projects require prior approval, as well as a written proposal and a final report. Limited to students in ESG.
L. Royden

ES.UR Undergraduate Research in ESG
Prereq: None
U (Fall, IAP, Spring, Summer)
Units arranged [P/D/F]
Can be repeated for credit
For students wishing to pursue undergraduate research opportunities in the Experimental Study Group. Limited to students in ESG.
L. Royden

ESG SPECIAL SUBJECTS

ES.510 Special Seminar in Science
Prereq: None
U (Fall)
Units arranged [P/D/F]
Can be repeated for credit with permission of instructor
Covers topics not included in the permanent curriculum. May not be used for GIR credit. Topic for Fall 2014: Drugs and the Brain. Preference to students in ESG.
Z. Fallows
ES.S11 Special Seminar in Science
Prereq: None
U (Fall)
Units arranged [P/D/F]
Can be repeated for credit with permission of instructor
Covers topics not included in the permanent curriculum. May not be used for GIR credit. Topic for Fall 2014: There is more to physics than Newton. Preference to students in ESG.
A. Barrantes

ES.S20 Special Seminar in Mathematics
Prereq: None
U (Fall, IAP, Spring)
Not offered regularly; consult department
Units arranged [P/D/F]
Can be repeated for credit
ES.S21 Special Seminar in Mathematics
Prereq: None
U (Fall, IAP, Spring)
Not offered regularly; consult department
Units arranged [P/D/F]
Can be repeated for credit with permission of instructor
Covers topics not included in the permanent curriculum. May not be used for GIR credit. Preference to students in ESG.

ES.S30 Special Seminar in Engineering and Computer Science
Prereq: None
U (Fall, IAP, Spring)
Not offered regularly; consult department
Units arranged [P/D/F]
Can be repeated for credit
ES.S31 Special Seminar in Engineering and Computer Science
Prereq: None
U (Fall, IAP, Spring)
Not offered regularly; consult department
Units arranged [P/D/F]
Can be repeated for credit with permission of instructor
Covers topics not included in the permanent curriculum. May not be used for GIR credit. Preference to students in ESG.
Staff

ES.S40 Special Seminar in the Humanities
Prereq: None
U (Spring)
Not offered regularly; consult department
Units arranged [P/D/F]
Can be repeated for credit with permission of instructor
Covers topics not included in the permanent curriculum. May not be used for GIR credit. Preference to students in ESG.

ES.S41 Special Seminar in the Humanities
Prereq: None
U (Spring)
Not offered regularly; consult department
Units arranged [P/D/F]
Can be repeated for credit with permission of instructor
Covers topics not included in the permanent curriculum. May not be used for GIR credit. Preference to students in ESG.
Staff

ES.S50 Special Seminar in the Arts
Prereq: None
U (Fall, IAP, Spring)
Not offered regularly; consult department
Units arranged [P/D/F]
Can be repeated for credit
ES.S51 Special Seminar in the Arts
Prereq: None
U (Fall, IAP, Spring)
Not offered regularly; consult department
Units arranged [P/D/F]
Can be repeated for credit with permission of instructor
Covers topics not included in the permanent curriculum. May not be used for GIR credit. Preference to students in ESG.
Staff

ES.S60 Special Seminar in Social Science
Prereq: None
U (Spring)
Not offered regularly; consult department
Units arranged [P/D/F]
Can be repeated for credit with permission of instructor
Covers topics not included in the permanent curriculum. May not be used for GIR credit. Preference to students in ESG.
Staff

ES.S61 Special Seminar in Social Science
Prereq: None
U (Spring)
Not offered regularly; consult department
Units arranged [P/D/F]
Can be repeated for credit with permission of instructor
Covers topics not included in the permanent curriculum. May not be used for GIR credit. Preference to students in ESG.
Staff

ES.S70 Special Seminar in Interdisciplinary Studies
Prereq: None
U (Spring)
Not offered regularly; consult department
Units arranged [P/D/F]
Can be repeated for credit
ES.S71 Special Seminar in Interdisciplinary Studies
Prereq: None
U (Fall, IAP, Spring)
Not offered regularly; consult department
Units arranged [P/D/F]
Can be repeated for credit with permission of instructor
Covers topics not included in the permanent curriculum. May not be used for GIR credit. Preference to students in ESG.
Staff