UC San Diego - WASC Exhibit 7.1
Inventory of Educational Effectiveness Indicators

Academic Program	(2a) What are these learning outcomes? **Students graduating with a degree should be able to:**	(3) Other than GPA, what data/evidence are used to determine that graduates have achieved stated outcomes for the degree? (e.g., capstone course, portfolio review, licensure examination)?	(4) Who interprets the evidence? What is the process?	(5) How are the findings used?
Department: Physics **Major:** B.S. in Physics/ Astrophysics **(1) Have formal learning outcomes been developed?** **Yes/No** **(6) Date of the last Academic Senate Review? [i.e. 2015-16 if the review takes place this academic year]** 2010-11	**Written Communication** Write up the results of theoretical calculations and laboratory experiments in a clear and concise manner that incorporates the stylistic conventions used by physicists worldwide Written reports on multiple projects associated with upper-division astrophysics courses	**Written Communication** Grading of homework and lab reports	**Written Communication** Grading by Instructors, Teaching Assistants	**Written Communication** Trends in class performance are noted and remedial actions discussed
	Oral Communication Orally present scientific background, hypothesis, data, analysis, and results, at the level of upper-division astrophysics courses	**Oral Communication** Oral presentations in certain upper-division astrophysics courses in front of undergraduate peers, teaching assistants and course instructor	**Oral Communication** Instructor evaluates talks	**Oral Communication**
	Quantitative Reasoning: Calculate outcomes for a wide variety of problems in mechanics, electromagnetism, quantum mechanics, and thermodynamics High-level grasp of mathematics, calculus, matrix methods, probability, estimations, and calculation using realistic numbers and units Familiarity with quantitative computing in the form of Mathematica, Matlab, and/or scientific programming in Python or C Use basic laboratory data analysis techniques, including distinguishing statistical and systematic errors, propagating errors, and representing data graphically Convert a physical situation articulated in English to a mathematical formulation, and then analyze it quantitatively Apply advanced mathematical tools, including Fourier series and transforms, abstract linear algebra, and functions of a complex variable	**Quantitative Reasoning** These aspects are pervasive in every core physics course, so no additional evidence is justified	**Quantitative Reasoning** Grading by Instructors, Teaching Assistants	**Quantitative Reasoning** Trends in class performance are noted and remedial actions discussed
	Information Literacy Access information on a topic from a variety of sources, and be able to learn new things on one's own Research literature in connection with astrophysics projects	**Information Literacy**	**Information Literacy**	**Information Literacy**
	Critical Thinking Distill a question about the physical world into the relevant and/or dominant effects, isolating (and quantifying) the key contribution(s) Evaluate a mathematical or theoretical construct for	**Critical Thinking** These aspects are pervasive in every core physics course, so no additional evidence is justified	**Critical Thinking** Grading by Instructors, Teaching Assistants	**Critical Thinking** Trends in class performance are noted and remedial actions discussed

Please date the form	logical self-consistency Recognize how observation, experiment and theory work together to continue to expand the frontiers of knowledge of the physical universe Exercise the use of physical intuition, including the ability to "guess" an approximate or conceptual answer to a physics problem and recognize whether or not the result of a calculation makes physical sense			
	All other items not color coded	All other items not color coded	All other items not color coded	All other items not color coded
	(2b) **Where are the learning outcomes published? Please provide your department/program website address.**			

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Academic Program	(2a) What are these learning outcomes? **Students graduating with a degree should be able to:**	(3) Other than GPA, what data/evidence are used to determine that graduates have achieved stated outcomes for the degree? (e.g., capstone course, portfolio review, licensure examination)?	(4) Who interprets the evidence? What is the process?	(5) How are the findings used?
Department: Physics **Major:** B.A. in Physics **(1) Have formal learning outcomes been developed?** **Yes/No** **(6) Date of the last Academic Senate Review? [i.e. 2015-16 if the review takes place this academic year]** 2010-11 Please date the form	**Written Communication** Write up the results of theoretical calculations and laboratory experiments in a clear and concise manner that incorporates the stylistic conventions used by physicists worldwide	**Written Communication** Grading of homework and lab reports	**Written Communication** Grading by Instructors, Teaching Assistants	**Written Communication** Trends in class performance are noted and remedial actions discussed
	Oral Communication N/A	**Oral Communication**	**Oral Communication**	**Oral Communication**
	Quantitative Reasoning: Calculate outcomes for a wide variety of problems in mechanics, electromagnetism, quantum mechanics, and thermodynamics High-level grasp of mathematics, calculus, matrix methods, probability, estimations, and calculation using realistic numbers and units Familiarity with quantitative computing in the form of Mathematica, Matlab, and/or scientific programming in Python or C Use basic laboratory data analysis techniques, including distinguishing statistical and systematic errors, propagating errors, and representing data graphically Convert a physical situation articulated in English to a mathematical formulation, and then analyze it quantitatively	**Quantitative Reasoning** These aspects are pervasive in every core physics course, so no additional evidence is justified	**Quantitative Reasoning** Grading by Instructors, Teaching Assistants	**Quantitative Reasoning** Trends in class performance are noted and remedial actions discussed
	Information Literacy Access information on a topic from a variety of sources, and be able to learn new things on one's own	**Information Literacy**	**Information Literacy**	**Information Literacy**
	Critical Thinking Distill a question about the physical world into the relevant and/or dominant effects, isolating (and quantifying) the key contribution(s) Evaluate a mathematical or theoretical construct for logical self-consistency Recognize how observation, experiment and theory work together to continue to expand the frontiers of knowledge of the physical universe Exercise the use of physical intuition, including the ability to "guess" an approximate or conceptual answer	**Critical Thinking** These aspects are pervasive in every core physics course, so no additional evidence is justified	**Critical Thinking** Grading by Instructors, Teaching Assistants	**Critical Thinking** Trends in class performance are noted and remedial actions discussed

	to a physics problem and recognize whether or not the result of a calculation makes physical sense			
	All other items not color coded	All other items not color coded	All other items not color coded	All other items not color coded
	(2b) **Where are the learning outcomes published? Please provide your department/program website address.**			

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Inventory of Educational Effectiveness Indicators

Academic Program	(2a) What are these learning outcomes? **Students graduating with a degree should be able to:**	(3) Other than GPA, what data/evidence are used to determine that graduates have achieved stated outcomes for the degree? (e.g., capstone course, portfolio review, licensure examination)?	(4) Who interprets the evidence? What is the process?	(5) How are the findings used?
Department: Physics **Major:** B.S. in Physics/Biophysics **(1) Have formal learning outcomes been developed?** **Yes/No** **(6) Date of the last Academic Senate Review? [i.e. 2015-16 if the review takes place this academic year]** 2010-11	**Written Communication** Writing up the results of theoretical calculations and laboratory experiments in a clear and concise manner that incorporates the stylistic conventions used by physicists worldwide Written reports on multiple projects associated with upper-division biophysics courses	**Written Communication** Grading of homework and lab reports	**Written Communication** Grading by Instructors, Teaching Assistants	**Written Communication** Trends in class performance are noted and remedial actions discussed
	Oral Communication Orally present scientific background, hypothesis, data, analysis, and results of research in biophysics	**Oral Communication** Oral presentation in front of undergraduate peers, TAs, and course instructor in certain senior level research courses	**Oral Communication** Instructor evaluates talks	**Oral Communication**
	Quantitative Reasoning: Calculate outcomes for a wide variety of problems in mechanics, electromagnetism, quantum mechanics, and thermodynamics High-level grasp of mathematics, calculus, matrix methods, probability, estimations, and calculation using realistic numbers and units Familiarity with quantitative computing in the form of Mathematica, Matlab, and/or scientific programming in Python or C Use basic laboratory data analysis techniques, including distinguishing statistical and systematic errors, propagating errors, and representing data graphically Convert a physical situation articulated in English to a mathematical formulation, and then analyze it quantitatively Apply advanced mathematical tools, including Fourier series and transforms, abstract linear algebra, and functions of a complex variable	**Quantitative Reasoning** These aspects are pervasive in every core physics course, so no additional evidence is justified	**Quantitative Reasoning** Grading by Instructors, Teaching Assistants	**Quantitative Reasoning** Trends in class performance are noted and remedial actions discussed
	Information Literacy Access information on a topic from a variety of sources, and be able to learn new things on one's own Research literature in connection with biophysics projects	**Information Literacy**	**Information Literacy**	**Information Literacy**
	Critical Thinking Distill a question about the physical world into the relevant and/or dominant effects, isolating (and quantifying) the key contribution(s) Evaluate a mathematical or theoretical construct for	**Critical Thinking** These aspects are pervasive in every core physics course, so no additional evidence is justified	**Critical Thinking** Grading by Instructors, Teaching Assistants	**Critical Thinking** Trends in class performance are noted and remedial actions discussed

Please date the form	logical self-consistency Recognize how observation, experiment and theory work together to continue to expand the frontiers of knowledge of the physical universe Exercise the use of physical intuition, including the ability to "guess" an approximate or conceptual answer to a physics problem and recognize whether or not the result of a calculation makes physical sense Solve problems in biological, biochemical, and biomedical sciences using rigorous physics-based approaches			
	All other items not color coded	All other items not color coded	All other items not color coded	All other items not color coded
	(2b) **Where are the learning outcomes published? Please provide your department/program website address.**			

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Academic Program	(2a) What are these learning outcomes? Students graduating with a degree should be able to:	(3) Other than GPA, what data/evidence are used to determine that graduates have achieved stated outcomes for the degree? (e.g., capstone course, portfolio review, licensure examination)?	(4) Who interprets the evidence? What is the process?	(5) How are the findings used?
Department: Physics **Major:** B.S. in Physics **(1) Have formal learning outcomes been developed?** **Yes/No** **(6) Date of the last Academic Senate Review? [i.e. 2015-16 if the review takes place this academic year]** 2010-11 Please date the form	**Written Communication** Write up the results of theoretical calculations and laboratory experiments in a clear and concise manner that incorporates the stylistic conventions used by physicists worldwide	**Written Communication** Grading of homework and lab reports	**Written Communication** Grading by Instructors, Teaching Assistants	**Written Communication** Trends in class performance are noted and remedial actions discussed
	Oral Communication N/A	**Oral Communication**	**Oral Communication**	**Oral Communication**
	Quantitative Reasoning: Calculate outcomes for a wide variety of problems in mechanics, electromagnetism, quantum mechanics, and thermodynamics High-level grasp of mathematics, calculus, matrix methods, probability, estimations, and calculation using realistic numbers and units Familiarity with quantitative computing in the form of Mathematica, Matlab, and/or scientific programming in Python or C Use basic laboratory data analysis techniques, including distinguishing statistical and systematic errors, propagating errors, and representing data graphically Convert a physical situation articulated in English to a mathematical formulation, and then analyze it quantitatively Apply advanced mathematical tools, including Fourier series and transforms, abstract linear algebra, and functions of a complex variable	**Quantitative Reasoning** These aspects are pervasive in every core physics course, so no additional evidence is justified	**Quantitative Reasoning** Grading by Instructors, Teaching Assistants	**Quantitative Reasoning** Trends in class performance are noted and remedial actions discussed
	Information Literacy Access information on a topic from a variety of sources, and be able to learn new things on one's own	**Information Literacy**	**Information Literacy**	**Information Literacy**
	Critical Thinking Distill a question about the physical world into the relevant and/or dominant effects, isolating (and quantifying) the key contribution(s) Evaluate a mathematical or theoretical construct for logical self-consistency Recognize how observation, experiment and theory work together to continue to expand the frontiers of	**Critical Thinking** These aspects are pervasive in every core physics course, so no additional evidence is justified	**Critical Thinking** Grading by Instructors, Teaching Assistants	**Critical Thinking** Trends in class performance are noted and remedial actions discussed

	knowledge of the physical universe Exercise the use of physical intuition, including the ability to “guess” an approximate or conceptual answer to a physics problem and recognize whether or not the result of a calculation makes physical sense			
	All other items not color coded	All other items not color coded	All other items not color coded	All other items not color coded
	(2b) **Where are the learning outcomes published? Please provide your department/program website address.**			

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Academic Program	(2a) What are these learning outcomes? Students graduating with a degree should be able to:	(3) Other than GPA, what data/evidence are used to determine that graduates have achieved stated outcomes for the degree? (e.g., capstone course, portfolio review, licensure examination)?	(4) Who interprets the evidence? What is the process?	(5) How are the findings used?
Department: Physics **Major:** B.S. in Physics/ Computational Physics **(1) Have formal learning outcomes been developed? Yes/No** **(6) Date of the last Academic Senate Review? [i.e. 2015-16 if the review takes place this academic year]** 2010-11	**Written Communication** Write up the results of theoretical calculations and laboratory experiments in a clear and concise manner that incorporates the stylistic conventions used by physicists worldwide	**Written Communication** Grading of homework and lab reports	**Written Communication** Grading by Instructors, Teaching Assistants	**Written Communication** Trends in class performance are noted and remedial actions discussed
	Oral Communication N/A	**Oral Communication**	**Oral Communication**	**Oral Communication**
	Quantitative Reasoning: Calculate outcomes for a wide variety of problems in mechanics, electromagnetism, quantum mechanics, and thermodynamics High-level grasp of mathematics, calculus, matrix methods, probability, estimations, and calculation using realistic numbers and units Familiarity with quantitative computing in the form of Mathematica, Matlab, and/or scientific programming in Python or C Use basic laboratory data analysis techniques, including distinguishing statistical and systematic errors, propagating errors, and representing data graphically Convert a physical situation articulated in English to a mathematical formulation, and then analyze it quantitatively Apply advanced mathematical tools, including Fourier series and transforms, abstract linear algebra, and functions of a complex variable	**Quantitative Reasoning** These aspects are pervasive in every core physics course, so no additional evidence is justified	**Quantitative Reasoning** Grading by Instructors, Teaching Assistants	**Quantitative Reasoning** Trends in class performance are noted and remedial actions discussed
	Information Literacy Access information on a topic from a variety of sources, and be able to learn new things on one's own	**Information Literacy**	**Information Literacy**	**Information Literacy**
	Critical Thinking Distill a question about the physical world into the relevant and/or dominant effects, isolating (and quantifying) the key contribution(s) Evaluate a mathematical or theoretical construct for logical self-consistency Recognize how observation, experiment and theory work together to continue to expand the frontiers of	**Critical Thinking** These aspects are pervasive in every core physics course, so no additional evidence is justified	**Critical Thinking** Grading by Instructors, Teaching Assistants	**Critical Thinking** Trends in class performance are noted and remedial actions discussed

Please date the form	knowledge of the physical universe Exercise the use of physical intuition, including the ability to “guess” an approximate or conceptual answer to a physics problem and recognize whether or not the result of a calculation makes physical sense Utilize physics-based computational / programming techniques for simulation based solutions to problems in physics, information science, and for instrumentation development			
	All other items not color coded	All other items not color coded	All other items not color coded	All other items not color coded
	(2b) **Where are the learning outcomes published? Please provide your department/program website address.**			

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Academic Program	(2a) What are these learning outcomes? Students graduating with a degree should be able to:	(3) Other than GPA, what data/evidence are used to determine that graduates have achieved stated outcomes for the degree? (e.g., capstone course, portfolio review, licensure examination)?	(4) Who interprets the evidence? What is the process?	(5) How are the findings used?
Department: Physics **Major:** B.S. in Physics/ Earth Sciences **(1) Have formal learning outcomes been developed? Yes/No** **(6) Date of the last Academic Senate Review? [i.e. 2015-16 if the review takes place this academic year]** 2010-11	**Written Communication** Write up the results of theoretical calculations and laboratory experiments in a clear and concise manner that incorporates the stylistic conventions used by physicists worldwide	**Written Communication** Grading of homework and lab reports	**Written Communication** Grading by Instructors, Teaching Assistants	**Written Communication** Trends in class performance are noted and remedial actions discussed
	Oral Communication N/A	**Oral Communication**	**Oral Communication**	**Oral Communication**
	Quantitative Reasoning: Calculate outcomes for a wide variety of problems in mechanics, electromagnetism, quantum mechanics, and thermodynamics High-level grasp of mathematics, calculus, matrix methods, probability, estimations, and calculation using realistic numbers and units Familiarity with quantitative computing in the form of Mathematica, Matlab, and/or scientific programming in Python or C Use basic laboratory data analysis techniques, including distinguishing statistical and systematic errors, propagating errors, and representing data graphically Convert a physical situation articulated in English to a mathematical formulation, and then analyze it quantitatively Apply advanced mathematical tools, including Fourier series and transforms, abstract linear algebra, and functions of a complex variable	**Quantitative Reasoning** These aspects are pervasive in every core physics course, so no additional evidence is justified	**Quantitative Reasoning** Grading by Instructors, Teaching Assistants	**Quantitative Reasoning** Trends in class performance are noted and remedial actions discussed
	Information Literacy Access information on a topic from a variety of sources, and be able to learn new things on one's own	**Information Literacy**	**Information Literacy**	**Information Literacy**
	Critical Thinking Distill a question about the physical world into the relevant and/or dominant effects, isolating (and quantifying) the key contribution(s) Evaluate a mathematical or theoretical construct for logical self-consistency Recognize how observation, experiment and theory work together to continue to expand the frontiers of	**Critical Thinking** These aspects are pervasive in every core physics course, so no additional evidence is justified	**Critical Thinking** Grading by Instructors, Teaching Assistants	**Critical Thinking** Trends in class performance are noted and remedial actions discussed

Please date the form	knowledge of the physical universe Exercise the use of physical intuition, including the ability to “guess” an approximate or conceptual answer to a physics problem and recognize whether or not the result of a calculation makes physical sense Solve problems in earth science, oceanography using rigorous physics-based approaches			
	All other items not color coded	All other items not color coded	All other items not color coded	All other items not color coded
	(2b) **Where are the learning outcomes published? Please provide your department/program website address.**			

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Academic Program	(2a) What are these learning outcomes? <u>Students graduating with a degree should be able to:</u>	(3) Other than GPA, what data/evidence are used to determine that graduates have achieved stated outcomes for the degree? (e.g., capstone course, portfolio review, licensure examination)?	(4) Who interprets the evidence? What is the process?	(5) How are the findings used?
Department: Physics **Major:** B.S. in Physics/Materials Physics **(1) Have formal learning outcomes been developed?** **Yes/No** **(6) Date of the last Academic Senate Review? [i.e. 2015-16 if the review takes place this academic year]** 2010-11	**Written Communication** Write up the results of theoretical calculations and laboratory experiments in a clear and concise manner that incorporates the stylistic conventions used by physicists worldwide Write research paper on materials project in journal format	**Written Communication** Grading of homework and lab reports	**Written Communication** Grading by Instructors, Teaching Assistants	**Written Communication** Trends in class performance are noted and remedial actions discussed
	Oral Communication Orally present scientific background, hypothesis, data, analysis, and results of research in condensed matter physics / materials science	**Oral Communication** Oral presentation in front of undergraduate peers, TAs, and course instructor in certain senior level research courses	**Oral Communication** Instructor evaluates talk	**Oral Communication**
	Quantitative Reasoning: Calculate outcomes for a wide variety of problems in mechanics, electromagnetism, quantum mechanics, and thermodynamics High-level grasp of mathematics, calculus, matrix methods, probability, estimations, and calculation using realistic numbers and units Familiarity with quantitative computing in the form of Mathematica, Matlab, and/or scientific programming in Python or C Use basic laboratory data analysis techniques, including distinguishing statistical and systematic errors, propagating errors, and representing data graphically Convert a physical situation articulated in English to a mathematical formulation, and then analyze it quantitatively Apply advanced mathematical tools, including Fourier series and transforms, abstract linear algebra, and functions of a complex variable	**Quantitative Reasoning** These aspects are pervasive in every core physics course, so no additional evidence is justified	**Quantitative Reasoning** Grading by Instructors, Teaching Assistants	**Quantitative Reasoning** Trends in class performance are noted and remedial actions discussed
	Information Literacy Access information on a topic from a variety of sources, and be able to learn new things on one's own Research literature in connection with materials project	**Information Literacy**	**Information Literacy**	**Information Literacy**
	Critical Thinking Distill a question about the physical world into the relevant and/or dominant effects, isolating (and quantifying) the key contribution(s) Evaluate a mathematical or theoretical construct for	**Critical Thinking** These aspects are pervasive in every core physics course, so no additional evidence is justified	**Critical Thinking** Grading by Instructors, Teaching Assistants	**Critical Thinking** Trends in class performance are noted and remedial actions discussed

Please date the form	logical self-consistency Recognize how observation, experiment and theory work together to continue to expand the frontiers of knowledge of the physical universe Exercise the use of physical intuition, including the ability to “guess” an approximate or conceptual answer to a physics problem and recognize whether or not the result of a calculation makes physical sense Develop critical thinking skills in one or more sub-topics of contemporary condensed matter physics			
	All other items not color coded	All other items not color coded	All other items not color coded	All other items not color coded
	(2b) **Where are the learning outcomes published? Please provide your department/program website address.**			