South Dakota Board of Regents

EXISTING PROGRAM: SUBSTANTIVE PROGRAM MODIFICATION
This form is used to request substantive changes in already existing programs (majors, minors, specializations).

1. INSTITUTION:   SDSU

2. CURRENT PROGRAM NAME:   BS in Physics, Flexible Emphasis

3. THIS PROPOSAL DEALS WITH A CHANGE IN:
   Distribution of Credits

   |   |   |
   |   |   |
   |   |   |

4. LEVEL:   5. CATEGORY:

   |   |   |
   |   |   |
   |   |   |

6. EFFECTIVE DATE OF CHANGE:   Summer 2012
8. PRIMARY ASPECTS OF THE MODIFICATION:

Changes only are indicated below and color coded for reference to the explanations in section 9. Complete program listings as they currently appear in the catalog and the proposed program and catalog listing appear on pages 4 – 7. Please refer there for additional detail.

<table>
<thead>
<tr>
<th></th>
<th>Existing Curriculum</th>
<th>Proposed Curriculum (Highlight Changes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Program Name:</td>
<td>Proposed Program Name:</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Pre Num</td>
<td>Title</td>
<td>Cr Hrs</td>
</tr>
<tr>
<td>IGR#1</td>
<td>3 PHYS 109</td>
<td>First Year Seminar 2</td>
</tr>
<tr>
<td>IGR#2</td>
<td>2 PHYS 109</td>
<td>IGR#2 – Social Science 3</td>
</tr>
<tr>
<td>IGR#3</td>
<td>3 PHYS 109</td>
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<tr>
<td>Physics Electives</td>
<td>10 PHYS 109</td>
<td>Physics Electives 1</td>
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<tr>
<td>Directed Electives</td>
<td>26 PHYS 109</td>
<td>Directed Electives 24</td>
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<tr>
<td>Technical Electives</td>
<td>19 PHYS 109</td>
<td>Technical Electives 3</td>
</tr>
<tr>
<td>PHYS 421 or 451 or 471 Electromagnetism or Classical Mechanics or Quantum Mechanics</td>
<td>4 PHYS 421 Electromagnetism 4</td>
<td></td>
</tr>
<tr>
<td>PHYS 451 or 471 Electromagnetism or Classical Mechanics or Quantum Mechanics</td>
<td>4 PHYS 451 or 471 Electromagnetism or Classical Mechanics or Quantum Mechanics (Thermodynamics 2c and Statistical Mechanics 2c) 4</td>
<td></td>
</tr>
<tr>
<td>PHIL 200 or 331 Introduction to Logic or Philosophy of Science</td>
<td>3 Social Science Electives 3</td>
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</tr>
<tr>
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</tr>
<tr>
<td>Total number of hours required for major, minor, or specialization</td>
<td>32 Total number of hours required for major, minor, or specialization</td>
<td>36</td>
</tr>
<tr>
<td>Total number of hours required for degree</td>
<td>128 Total number of hours required for degree</td>
<td>120</td>
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</tbody>
</table>
9. EXPLANATION OF THE CHANGE:
The changes described above fall into several categories that are color coded:

**Purple** – Elective credit hours of various types must be adjusted to accommodate
- Change in Institutional Graduation Requirements (IGRs) to reflect the decrease in credits from 8-9 to 5-6.
- BOR Policy 2-29—Definition of Credits and Related Institutional Requirements. All existing baccalaureate level degree programs offered shall require one hundred twenty (120) credit hours...by June 30th, 2012.
- Alignment of program with the additional credits required in various areas by the College of Arts and Sciences at SDSU. This is resulting from the transfer of the physics degree programs from the College of Engineering to the College of Arts and Sciences, and other changes requested for discipline specific reasons.

**Green** – Added to accommodate increased credit requirements mandated for SDSU College of Arts and Sciences BS degrees

**Yellow** – Changes due to proposed SDSU IGR changes. IGR#2 must be chosen from Social Science options in order to satisfy additional College of Arts and Sciences graduation BS degree requirements for social science credits.

**Blue** – Classical Field Theories are of fundamental importance to physics, it is being added as a required choice instead of a possible choice to strengthen the degree. Similarly the two 2c courses Thermodynamics and Statistical Mechanics are being added to the choices for the core advanced physics course as they are the fundamental courses where students get introduced to the study of physical systems as aggregate systems.

Laurie Stenberg Nichols                                      12/13/11
Institutional Authorization (President or Designee)        Date Submitted
Current as of 2011/2012 Catalog listing

Requirements for Physics Major—Flexible Emphasis, Bachelor of Science in Physics

System General Education Requirements*: 33
Goal #1 Written Communication:
ENGL 101, and
ENGL 201 or
ENGL 277 ........................................................................................................6
Goal #2 Oral Communication:
SPCM 101* ........................................................................................................3
Goal #3 Social Sciences/Diversity2 ........................................................................6
Goal #4 Arts and Humanities/Diversity2 ................................................................6
Goal #5 Mathematics:
MATH 123 ..........................................................................................................4
Goal #6 Natural Sciences:
PHYS 211-211L or
PHYS 111-111L, and
PHYS 213-213L or
PHYS 113-113L ..................................................................................................8

Institutional Graduation Requirements**: 8-9
Goal #1 Land and Natural Resource Stewardship .............................................3
Goal #2 Personal Wellness .................................................................................2-3
Goal #3 Social Responsibility/Cultural and Aesthetic Awareness ...............3

Major Requirements: 32
PHYS 316-316L, Measurement Theory and Experiment
Design and Lab (AW) .........................................................................................2
PHYS 331, Introduction to Modern Physics (COM) .........................................3
PHYS 490-590, Seminar (COM) ......................................................................1
MATH 125, Calculus II * (COM) .....................................................................4
MATH 225, Calculus III * (COM) .....................................................................4
MATH 321, Differential Equations (COM) .....................................................3
CHEM 112-112L, General Chemistry I and Lab* (COM) .......................(3, 1)
or CHEM 106-106L, Chemistry Survey and Lab* (COM) ....................(3, 1)
CHEM 114-114L, General Chemistry II and Lab * (COM) ...................(3, 1)
or CHEM 120-120L, Elementary Organic Chemistry and Lab* ................(3, 1)
CSC 150, Computer Science I (COM) ...........................................................3
or CSC 218, Introduction to C/C++/Unix for Engineers .............................3
PHYS 421-521, Electromagnetism (COM) ......................................................4
or PHYS 451-551, Classical Mechanics (COM) ............................................4
or PHYS 471-571, Quantum Mechanics (COM) ............................................4

Electives: 55
Physics Electives ..............................................................................................10
Technical Electives .........................................................................................19
Directed Electives ..........................................................................................26

Total Required Credits: 128
Proposed Modifications for Program – (Catalog Description)

Requirements for Physics Major – Bachelor of Science in Physics

System General Education Requirements*: 33
Goal #1 Written Communication:
ENGL 101, and
ENGL 201 or
ENGL 277.............................................................................................................. 6
Goal #2 Oral Communication:
SPCM 101.............................................................................................................3
Goal #3 Social Sciences/Diversity............................................................................6
Goal #4 Arts and Humanities/Diversity....................................................................6
Goal #5 Mathematics:
MATH 123, Calculus I (COM)..................................................................................4
Goal #6 Natural Sciences:
PHYS 211-211L or
PHYS 111-111L, and
PHYS 213-213L or
PHYS 113-113L.....................................................................................................8

Institutional Graduation Requirements: 5
Goal #1 First Year Seminar
PHYS109, First Year Seminar ..............................................................................2
Goal #2 Cultural Awareness and Social and Environmental Responsibility:
Choose Social Science that fulfills College of Arts and Sciences requirements.....3

College Requirements: 12
Biological Science Electives ..................................................................................6
Social Science Electives .........................................................................................3
PHIL 200, Introduction to Logic (COM).................................................................3
or PHIL 331, Philosophy of Science ....................................................................3

Major Requirements: 36
PHYS 316-316L, Measurement Theory and Experiment Design and Lab (AW)...2
PHYS 331, Introduction to Modern Physics (COM).............................................3
PHYS 490-590, Seminar (COM)...........................................................................1
MATH 125, Calculus II (COM)...........................................................................4
MATH 225, Calculus III (COM).........................................................................4
MATH 321, Differential Equations (COM).........................................................3
CHEM 112-112L, General Chemistry I and Lab* (COM).................................(3, 1)
or CHEM 106-106L, Chemistry Survey and Lab* (COM).................................(3, 1)
CHEM 114-114L, General Chemistry II and Lab * (COM).................................(3, 1)
or CHEM 120-120L, Elementary Organic Chemistry and Lab*....................(3, 1)
CSC 150, Computer Science I (COM).................................................................3
or CSC 218, Introduction to C/C++/Unix for Engineers.................................3
PHYS 421-521, Electromagnetism (COM)..........................................................4
PHYS 341, Thermodynamics (COM).................................................................2
and PHYS 343, Statistical Mechanics (COM).....................................................2
or PHYS 451-551, Classical Mechanics (COM)...................................................4
or PHYS 471-571, Quantum Mechanics (COM)..................................................4
Electives: 34
Choose one of the following four groups to fulfill the elective requirements for the BS in Physics.

Group 1 – This group prepares students for a career as a professional physicist or a research scientist in a closely allied scientific discipline. It is an excellent choice for those intending to pursue graduate study in the sciences and/or engineering.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 318</td>
<td>Advanced Laboratory I</td>
<td>1</td>
</tr>
<tr>
<td>PHYS 341</td>
<td>Thermodynamics (COM)</td>
<td>2</td>
</tr>
<tr>
<td>PHYS 343</td>
<td>Statistical Mechanics (COM)</td>
<td>2</td>
</tr>
<tr>
<td>PHYS 361</td>
<td>Optics (COM)</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 418</td>
<td>Advanced Laboratory II</td>
<td>1</td>
</tr>
<tr>
<td>PHYS 451-551</td>
<td>Classical Mechanics* (COM)</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 471-571</td>
<td>Quantum Mechanics* (COM)</td>
<td>4</td>
</tr>
<tr>
<td>EE 220-220L</td>
<td>Circuits I and Lab (COM)</td>
<td>4</td>
</tr>
<tr>
<td>GE 121</td>
<td>Engineering Design Graphics I</td>
<td>1</td>
</tr>
<tr>
<td>GE 122</td>
<td>Engineering Design Graphics II</td>
<td>1</td>
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<tr>
<td>NE 435</td>
<td>Introduction to Nuclear Engineering</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 433-533</td>
<td>Nuclear and Elementary Particle Physics (COM)</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 439-539</td>
<td>Solid State Physics (COM)</td>
<td>4</td>
</tr>
<tr>
<td>MATH 331</td>
<td>Advanced Engineering Mathematics</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 481</td>
<td>Mathematical Physics (COM)</td>
<td>4</td>
</tr>
<tr>
<td>Other Electives</td>
<td></td>
<td>7-9</td>
</tr>
</tbody>
</table>

*One of these two courses are used to fulfill four credits of the major requirements.

OR

Group 2 – This group prepares students who have career objectives in health physics, medical physics, or other areas of physics applications in the biological sciences. This is the option of choice for students who are pre-medicine majors. Pre-med students may desire additional coursework.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 318</td>
<td>Advanced Laboratory I</td>
<td>1</td>
</tr>
<tr>
<td>PHYS 418</td>
<td>Advanced Laboratory II</td>
<td>1</td>
</tr>
<tr>
<td>NE 337</td>
<td>Foundations of Health Physics</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 361</td>
<td>Optics</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 433-533</td>
<td>Nuclear and Elementary Particle Physics (COM)</td>
<td>3</td>
</tr>
<tr>
<td>NE 435</td>
<td>Introduction to Nuclear Engineering</td>
<td>3</td>
</tr>
<tr>
<td>EE 220-220L</td>
<td>Circuits I and Lab (COM)</td>
<td>4</td>
</tr>
<tr>
<td>STAT 381</td>
<td>Introduction to Probability and Statistics (COM)</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 151-151L</td>
<td>General Biology I and Lab* (COM)</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 153-153L</td>
<td>General Biology II and Lab* (COM)</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 221-221L</td>
<td>Human Anatomy and Lab (COM)</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 290</td>
<td>Seminar</td>
<td>1</td>
</tr>
<tr>
<td>BIOL 325/325L</td>
<td>Physiology and Lab (COM)</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 326-326L</td>
<td>Organic Chemistry I and Lab (COM)</td>
<td>(3, 1)</td>
</tr>
<tr>
<td>CHEM 328-328L</td>
<td>Organic Chemistry II and Lab (COM)</td>
<td>(3, 1)</td>
</tr>
</tbody>
</table>

*Six of the credits for these courses are used to fulfill the College of Arts and Sciences biological science requirement.
OR

Group 3 – This group prepares students for careers in applied physics. Students choosing this group will find opportunities to work in nuclear energy, industrial research and development, and many other areas of interest.

PHYS 318, Advanced Laboratory I ......................................................... 1
PHYS 341, Thermodynamics* (COM) .................................................. 2
PHYS 343, Statistical Mechanics* (COM) ........................................... 2
PHYS 418, Advanced Laboratory II ...................................................... 1
NE 337, Foundations of Health Physics .................................................. 3
or PHYS 361, Optics .............................................................................. 1
NE 435, Introduction to Nuclear Engineering ........................................ 2
or PHYS 433-533, Nuclear and Elementary Particle Physics (COM) .... 3
or PHYS 439, Solid State Physics (COM) ............................................... 4
MATH 331, Advanced Engineering Mathematics ................................... 3
or PHYS 481, Mathematical Physics (COM) .......................................... 4
EE 220-220L, Circuits I and Lab (COM) .................................................. 4
EM 214, Statics (COM) ......................................................................... 3
EM 321, Mechanics of Materials (COM) ............................................. 3
EM 331, Fluid Mechanics (COM) .......................................................... 3
GE 225, Introduction to Machine Tools ................................................. 1
ME 241, Engineering Materials ............................................................ 3
ME 415, Heat Transfer ........................................................................... 3
ENGL 277, Technical Writing in Engineering** ..................................... 3
ECON 202, Principles of Macroeconomics** (COM) (G) .................... 3
Other Electives ...................................................................................... 1-3

*These courses are used to fulfill four credits of the major requirements.
**These courses are used to satisfy System Goal Requirements.

OR

Group 4 – This group prepares students for a non-traditional emphasis area. All plans for Group 4 require working closely with an academic advisor to create a coherent plan of study that must be approved by the Head of the Physics Department. Many non-traditional emphasis areas are possible; examples include Science Journalism, Biophysics, Pre-Law, Chemical Physics, Digital Electronics, Financial Physics, Materials Science, etc. Electives for Group 4 must conform to the following categories.

Physics Electives ..................................................................................... 7
Technical Electives .................................................................................. 3
Directed Electives ................................................................................... 24

Total Required Credits: 120