I. Approval of the November 21, 2013, Minutes

II. Program and Curricular Changes (PCC) Report
   (Dr. Brian Ackley reporting)
   A. Program Changes:
      1. HA, PhD
      2. PHSX, MS
      3. PHSX, PhD
   B. Course Changes:
      1. New Courses: CEAS 802
      2. Course Changes: ISP 882, ISP 898

III. Old Business

IV. New Business
I. Approval of the November 21, 2013, Minutes

The University of Kansas
College of Liberal Arts & Sciences
COMMITTEE ON GRADUATE STUDIES

MINUTES
November 21, 2013, 11:00AM
STRONG HALL – ROOM 210

Members Present: Brian Ackley, Omofolabo Ajayi-Soyinka, Paulyn Cartwright, Peter Grund, Marni Kessler, ChangHwan Kim, Milena Stanislavova (Chair), and Ric Steele

Others in attendance: Bruce Hayes (FREN), Peter Welsh (MUSE), Kristine Latta (COGA), Cindy Lynn (COGA), and Emily Dodson (GA, COGA)

The meeting was called to order by Dr. Stanislavova at 11:04 a.m.

Minutes
A motion was made and seconded to approve the November 7, 2013, Minutes of the Committee on Graduate Studies, as written. The motion was approved unanimously.

Report of the Proposals, Awards, and Scholarships (PAS) Subcommittee
(Dr. Paulyn Cartwright reporting)

A motion was made and seconded to approve the MUSE Graduate Certificate proposal. The motion was approved unanimously.

Dr. Cartwright introduced Dr. Welsh, who responded on behalf of MUSE to questions from the CGS regarding the proposed new certificate.

Report of the Program and Curricular Changes (PCC) Subcommittee
(Dr. Omofolabo Ajayi-Soyinka, reporting)

A. Program Changes:

A motion was made and seconded to approve the FREN, MA program change. The motion was approved unanimously.

A motion was made and seconded to approve the FREN, PhD program change. The motion was approved unanimously.

Dr. Ajayi-Soyinka introduced Dr. Hayes, who responded to questions from the subcommittee regarding the proposed program changes.

A motion was made and seconded to approve the GERM, PhD change in Research Skills & Responsible Scholarship Requirement. The motion was approved unanimously.

A motion was made and seconded to approve the GIST, MA program change. The motion was approved unanimously.

B. Curricular Changes:


A motion was made and seconded to approve the recommendation from the subcommittee for curricular changes to the following courses:

1. New course: CEAS 700
2. Course change: POLS 706

**Old Business**
CGS subcommittees will not meet next week in observance of the legal holiday. Subcommittees will meet the week of December 5th, as needed.

**New Business**
Dr. Latta updated the CGS regarding the CAC schedule. CAC will add a January meeting to its schedule. This will streamline the process for reviewing new course and program proposals.

In addition, CAC will begin the use of electronic ballots for a vote on new program proposals. The ballot would allow the option to approve or request discussion at the next CAC meeting.

There being no further business, the meeting was adjourned by Dr. Stanislavova at 11:40 a.m.

**Upcoming Meetings**
The next meeting of the Committee on Graduate Studies is **Thursday, December 12, 2013, 11:00 a.m., 210 Strong Hall.**

*Respectfully submitted by Cynthia Lynn, COGA*

II. **Program and Curricular Changes (PCC) Report**

A. The PCC Subcommittee recommends the following program changes to the CGS:

**History of Art**

(OLD) **Current**

**Ph.D. Degree Requirements**

Within 3 semesters of admission to the Ph.D. program, each student, in consultation with a major advisor, prepares for review by the full Graduate Faculty a Doctoral Program of Study petition that proposes a primary field of specialization and 2 minor fields, 1 of which may be outside the department. The petition, as approved by the faculty, becomes the student’s program of study, which is then overseen by the major advisor and guided by a committee that includes the major- and minor-field advisors.

Ph.D. candidates must satisfy all general requirements. Ph.D. candidates must demonstrate proficiency in 2 research skills (normally foreign languages) relevant to their research; this
requirement must be met before candidates are admitted to the comprehensive examinations for the doctorate. One of the 2 research skills is normally the foreign language that met the M.A. language requirement.

**Research Skills & Responsible Scholarship Requirement:**

All graduate seminars include instruction in and discussion of appropriate research conduct and research misconduct; authorship, publication, plagiarism, copyright; peer review; and professional practices. For more information on the Research Skills and Responsible Scholarship requirement, please see the Graduate Studies section of the online catalog.

Students must take both written and comprehensive oral examinations at the end of their course work. Both written and oral examinations cover the major area and 2 minor areas specified in the student’s Doctoral Program of Study petition. The oral examination normally follows the written examination by 2 weeks.

Within no more than 2 semesters of passing the comprehensive oral examination, the candidate submits a dissertation proposal for faculty approval. Upon acceptance of the dissertation in final draft form, the candidate must successfully pass the final oral examination (the dissertation defense) to complete the degree.

**Handbook for Graduate Students**

A detailed presentation of departmental degree requirements and regulations is included in the department’s Graduate Student Handbook, available online.

**Graduate Admission**

Applicants for the Ph.D. are expected to hold an appropriate M.A. degree.

Completed applications must be submitted by **January 1** for fall admission. The Graduate Record Examination general test is required.

Submit your [graduate application online](#).

**The University of Kansas**
**Department of History of Art**
**Graduate Admissions**
**Spencer Museum of Art**
1301 Mississippi St., Room 209
Lawrence, KS 66045-7500
Ph.D. Degree Requirements

Within two semesters after the completion of M.A. coursework (not counting the semester in which the student finishes M.A. coursework), the student, in consultation with a major advisor, prepares for review by the full Graduate Faculty a Doctoral Program of Study petition that proposes a primary field of specialization and 2 minor fields, 1 of which may be outside the department. The petition, as approved by the faculty, becomes the student’s program of study, which is then overseen by the major advisor and guided by a committee that includes the major- and minor-field advisors.

Ph.D. candidates must satisfy all general requirements. Ph.D. candidates must demonstrate proficiency in 2 research skills (normally foreign languages) relevant to their research; this requirement must be met before candidates are admitted to the comprehensive examinations for the doctorate. One of the 2 research skills is normally the foreign language that met the M.A. language requirement.

Research Skills & Responsible Scholarship Requirement:

All graduate seminars include instruction in and discussion of appropriate research conduct and research misconduct; authorship, publication, plagiarism, copyright; peer review; and professional practices. For more information on the Research Skills and Responsible Scholarship requirement, please see the Graduate Studies section of the online catalog.

Students must take both written and comprehensive oral examinations at the end of their coursework. Both written and oral examinations cover the major area and 2 minor areas specified in the student’s Doctoral Program of Study petition. The oral examination normally follows the written examination by 2 weeks.

Within no more than 2 semesters of passing the comprehensive oral examination, the candidate submits a dissertation proposal for faculty approval. Upon acceptance of the dissertation in final draft form, the candidate must successfully pass the final oral examination (the dissertation defense) to complete the degree.

Handbook for Graduate Students

A detailed presentation of departmental degree requirements and regulations is included in the department’s Graduate Student Handbook, available online.

Graduate Admission
Applicants for the Ph.D. are expected to hold an appropriate M.A. degree.

**Admission to the Ph.D. program for students who receive the M.A. degree from KU:**
The M.A. student who wishes to be considered for admission to the Ph.D. program must complete and sign the Petition for Continuation in the Ph.D. Program form, which will be distributed at the M.A. exam and collected with the completed exams on day two of testing. It is expected that such students will already have expressed this interest to a potential major field advisor and received that faculty member’s support. The student must pass the M.A. exam in order for his/her petition to be considered by the graduate faculty. After receiving departmental approval for the petition and completing all requirements for the M.A. degree, the student will automatically be entered into the Ph.D. program and will be expected to maintain his/her enrollment as per Graduate Studies guidelines.

M.A. students who do not submit the petition at the time of the M.A. exam will need to reapply for admission to the art history graduate program.

The Combined M.A./Ph.D. student does not need to submit the Petition for Continuation in the Ph.D. Program form. He/she will be automatically evaluated by the graduate faculty upon successfully passing the M.A. exam to determine whether he/she remains eligible to continue to the Ph.D. or if the M.A. is the appropriate terminal degree. In most cases, Combined M.A./Ph.D. students will enter the Ph.D. program upon completion of the requirements for the M.A. degree.

Completed applications must be submitted by **January 1** for fall admission. The Graduate Record Examination general test is required.

Submit your [graduate application online](#).
The University of Kansas
Department of History of Art
Graduate Admissions
Spencer Museum of Art
1301 Mississippi St., Room 209
Lawrence, KS 66045-7500
Physics, MS

OLD (Current)

M.S. Degree in Physics

The departmental web page with some additional information, e.g., milestones, can be found at http://www.physics.ku.edu/~physics/graduate/about.shtml

Candidates must complete a minimum of 30 credit hours of advanced lecture courses (numbered 500 or above) in physics and related subjects within a period of 7 years. Program requirements include

1. An undergraduate knowledge of physics. This must be certified by the department to be at an advanced undergraduate level (600-level KU courses). The certification must be achieved within 12 months (extension possible with recommendation of the graduate admission committee) of entering the program and may require additional coursework. Extension is possible with recommendation of the graduate admission committee. Certification can be achieved in several ways:
   1. A GRE physics score greater than or equal to 650; or
   2. The determination by the graduate director and graduate advisor, based on the diagnostic exam given on entering the program combined with the student's undergraduate record, that the student understands all major elements of undergraduate physics; or
   3. Successful completion with grade of B or better on all undergraduate courses that the graduate director and/or advisor recommends based on the results of part b. above. The student who has not succeeded in certifying his or her undergraduate physics knowledge in one of the above 3 ways could, within 12 months of starting the program, petition the Graduate Committee for an oral exam on undergraduate physics. The oral exam will be administered by a committee of six faculty members assigned by the department.

4. A candidate for a Master's or Ph.D. degree who has not had the equivalent of 6 credit hours of advanced undergraduate laboratory course work (Junior/Senior level) is required to take one of the three advanced laboratory courses offered in the Department.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHSX 516</td>
<td>Physical Measurements</td>
<td>4</td>
</tr>
<tr>
<td>PHSX 536</td>
<td>Electronic Circuit Measurement and Design</td>
<td>4</td>
</tr>
<tr>
<td>PHSX 601</td>
<td>Design of Physical and Electronic Systems</td>
<td>4</td>
</tr>
</tbody>
</table>

This arrangement is pending CUSA/CAC approval in January 2014.

2. Three basic courses:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHSX 711</td>
<td>Quantum Mechanics I</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 821</td>
<td>Classical Mechanics</td>
<td>3</td>
</tr>
</tbody>
</table>
3. 2 additional courses chosen from:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHSX 721</td>
<td>Chaotic Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 741</td>
<td>Nuclear Physics I</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 761</td>
<td>Elementary Particles I</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 781</td>
<td>Solid State Physics I</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 793</td>
<td>Physical Cosmology</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 795</td>
<td>Space Plasma Physics</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 815</td>
<td>Computational Methods in Physical Sciences</td>
<td>3</td>
</tr>
</tbody>
</table>

4. A minimum of 2 hours in PHSX 899 Master’s Research/Thesis is required, with a maximum of 6 hours that count toward the master’s degree. Ordinarily no more than 2 hours will be allowed unless a thesis or written report is presented.

5. The remaining 9 to 13 hours of advanced electives must be either advanced lecture courses or advanced undergraduate laboratory courses. (This proviso excludes seminars and special problems courses.)

**Communication Skills**

All graduate students, after their first semester, will deliver at least 1 oral presentation per semester. The talk should be at least 20 minutes long. For students not yet associated with a research group, the Graduate Seminar can serve as a venue. For more advanced students the seminar of their research group would be a natural venue. The student does not need to be enrolled in the seminar to present a talk for this purpose. Off-campus venues such as collaboration meetings and physics conferences can also serve this purpose. When giving presentations, students should fill out a form available on the department web site and have it signed by 2 witnesses, 1 of which must be a Physics or Astronomy faculty and other a Ph.D. doing research in the department. The completed form must be handed to the office staff. Faculty members who sign off on the talks are expected to provide constructive feedback to the student. The graduate advisor will monitor student compliance with the requirement.

**General Examination**

Candidates must pass a general oral examination in physics. The examination is given shortly before completion of other work for the degree. A master’s thesis is not required but may be submitted if the candidate and the director of the candidate’s research believe it to be appropriate.

**M.S. Subspecialty in Computational Physics and Astronomy**

This degree is a subspecialty program for students with a background in physics, astronomy, computer science, mathematics, or engineering who wish to become familiar with computer-
based approaches to problems in these fields. Minimum preparation expected includes a year's course in general physics, mathematics through differential equations, and a knowledge of FORTRAN, C++, or another programming language.

A total of 30 hours of graduate credit is required. The 33 hours listed below under 2 and 3 may include certain undergraduate-level electrical engineering and computer science courses. (Only courses numbered 500 and above count as graduate credit.) Students entering the program may have satisfied several of these requirements, but a total of 30 hours of graduate credit is still required. No more than the required 6 hours of PHSX 899 Master’s Research/Thesis may be counted toward the degree. Degree requirements include

1. An undergraduate knowledge of physics. This must be certified by the department to be at an advanced undergraduate level (600-level KU courses). The certification must be achieved within 12 months (extension possible with recommendation of the graduate admission committee) of entering the program and may require additional coursework. Extension is possible with recommendation of the graduate admission committee. Certification can be achieved in several ways:
   1. A GRE physics score greater than or equal to 650; or
   2. The determination by the graduate director and graduate advisor, based on the diagnostic exam given on entering the program combined with the student's undergraduate record, that the student understands all major elements of undergraduate physics; or
   3. Successful completion with grade of B or better on all undergraduate courses that the graduate director and/or advisor recommends based on the results of part b above. The student who has not succeeded in certifying their undergraduate physics knowledge in one of the above three ways could, within 12 months of starting the program, petition the Graduate Committee for an oral exam on undergraduate physics. The oral exam will be administered by a committee of six faculty members assigned by the department.

4. A candidate for a Master's or Ph.D. degree who has not had the equivalent of 6 credit hours of advanced undergraduate laboratory course work (junior/senior level) is required to take one of the three advanced laboratory courses offered in the Department:

   PHSX 516    Physical Measurements    4
   PHSX 536    Electronic Circuit Measurement and Design    4
   PHSX 601    Design of Physical and Electronic Systems    4

Again, this arrangement is pending CUSA/CAC approval in January 2014.

2. Required Courses (21 credit hours)

   PHSX/ASTR 815    Computational Methods in Physical Sciences    3
   PHSX 718    Mathematical Methods in Physical Sciences    3
   MATH/EECS 781    Numerical Analysis I    3
EECS – 1 course at the 300 level or above (in addition to EECS 781) (Note: courses below the 500 level will not count towards the required 30 hours of graduate credit.)

One additional PHSX/ASTR/ATMO lecture course at the level or above

**PHSX 899** Master's Research/Thesis 1-10

3. 12 or more credits from the following list of courses:
(Note: Double counting of courses is not allowed, e.g. a course used to fulfill a requirement under part 2. (e.g. EECS 448) may not also be counted under part 3.)

- **EECS 360** Signal and System Analysis 4
- **EECS 368** Programming Language Paradigms 3
- **EECS 388** Embedded Systems 4
- **EECS 448** Software Engineering I 4
- **EECS 560** Data Structures 4
- **EECS 672** Introduction to Computer Graphics 3

Select one of the following - Special Topics (Examples of recent topics: Mathematics of Wall Street Computer-aided, Study of Differential Geometry, Chaos and Fractals, Fractional Brownian Motion and Its Applications, Wavelet Analysis, Statistical Theory, Stochastic Differential Equations and Applications)

- **MATH 596** Special Topics: _____
- **MATH 696** Special Topics: _____
- **MATH 796** Special Topics: _____
- **MATH 611** Time Series Analysis 3
- **MATH 627** Probability 3
- **MATH 647** Applied Partial Differential Equations 3
- **MATH/EECS 782** Numerical Analysis II 3
- **MATH 783** Applied Numerical Methods for Partial Differential Equations 3

PHSX/ASTR/ATMO Courses Numbered 500 and above
Courses below the 500 level do not count towards the required 30 hours of graduate credit.

4. Communication Skills: All graduate students, after their first semester, will deliver at least one oral presentation per semester. The talk should be at least 20 minutes long. For students not yet associated with a research group, the Graduate Seminar can serve as a venue. For more advanced students the seminar of their research group would be a natural venue. The student does not need to be enrolled in the seminar to present a talk for this purpose. Off-campus venues such as collaboration meetings and physics
conferences can also serve this purpose. When giving presentations, students should fill out a form available on the department web site and have it signed by two witnesses, one of which must be a Physics or Astronomy faculty and other a Ph.D. doing research in the department. The completed form must be handed to the office staff. Faculty members who sign off on the talks are expected to provide constructive feedback to the student. The graduate advisor will monitor student compliance with the requirement.

5. Thesis: An important component of this degree is the completion and documentation of a successful computer project. A thesis must be presented that describes the basic physics involved in the project, the method of implementing the project, and a discussion of the results. An oral defense of the thesis is required before a committee of at least three members of the graduate faculty.

Please go to this website to see the University's policy on time limits:
https://documents.ku.edu/policies/Graduate_Studies/maprogramtimeconstraints.htm

New (Proposed) to first appear in the 2014-15 academic catalog

M.S. Degree in Physics

The departmental web page with some additional information, e.g., milestones, can be found at http://www.physics.ku.edu/~physics/graduate/about.shtml

Candidates must complete a minimum of 30 credit hours of advanced lecture courses (numbered 500 or above) in physics and related subjects within a period of 7 years. Program requirements include

1. An undergraduate knowledge of physics. This must be certified by the department to be at an advanced undergraduate level (600-level KU courses). The certification must be achieved within 12 months (extension possible with recommendation of the graduate admission committee) of entering the program and may require additional coursework. Extension is possible with recommendation of the graduate admission committee. Certification can be achieved in several ways:
   1. A GRE physics score greater than or equal to 650; or
   2. The determination by the graduate director and graduate advisor, based on the diagnostic exam given on entering the program combined with the student's undergraduate record, that the student understands all major elements of undergraduate physics; or
   3. Successful completion with grade of B or better on all undergraduate courses that the graduate director and/or advisor recommends based on the results of part b. above. The student who has not succeeded in certifying his or her undergraduate physics knowledge in one of the above 3 ways could, within 12 months of starting the program, petition the Graduate Committee for an oral exam on undergraduate physics. The oral exam will be administered by a committee of six faculty members assigned by the department.

4. A candidate for a Master's or Ph.D. degree who has not had the equivalent of 6 credit hours of advanced undergraduate laboratory course work (Junior/Senior
level) is required to take one of the three advanced laboratory courses offered in the Department.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHSX 516</td>
<td>Physical Measurements</td>
<td>4</td>
</tr>
<tr>
<td>PHSX 536</td>
<td>Electronic Circuit Measurement and Design</td>
<td>4</td>
</tr>
<tr>
<td>PHSX 601</td>
<td>Design of Physical and Electronic Systems</td>
<td>4</td>
</tr>
</tbody>
</table>

This arrangement is pending CUSA/CAC approval in January 2014.

2. Three basic courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHSX 711</td>
<td>Quantum Mechanics I</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 821</td>
<td>Classical Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 831</td>
<td>Electrodynamics I</td>
<td>3</td>
</tr>
</tbody>
</table>

3. 2 additional courses chosen from:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHSX 721</td>
<td>Chaotic Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 741</td>
<td>Nuclear Physics I</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 761</td>
<td>Elementary Particles I</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 781</td>
<td>Solid State Physics I</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 793</td>
<td>Physical Cosmology</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 795</td>
<td>Space Plasma Physics</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 815</td>
<td>Computational Methods in Physical Sciences</td>
<td>3</td>
</tr>
</tbody>
</table>

4. A minimum of 2 hours in PHSX 899 Master’s Research/Thesis is required, with a maximum of 6 hours that count toward the master’s degree. Ordinarily no more than 2 hours will be allowed unless a thesis or written report is presented.

5. The remaining 9 to 13 hours of advanced electives must be either advanced lecture courses or advanced undergraduate laboratory courses. (This proviso excludes seminars and special problems courses.)

**Communication Skills**

All graduate students, after their first semester, will deliver at least 1 oral presentation per semester. The talk should be at least 20 minutes long. For students not yet associated with a research group, the Graduate Seminar can serve as a venue. For more advanced students the seminar of their research group would be a natural venue. The student does not need to be enrolled in the seminar to present a talk for this purpose. Off-campus venues such as collaboration meetings and physics conferences can also serve this purpose. When giving presentations, students should fill out a form available on the department website and have it signed by 2 witnesses, 1 of which must be a Physics or Astronomy faculty and other a Ph.D. doing research in the department. The completed form must be handed to the office staff. Faculty
members who sign off on the talks are expected to provide constructive feedback to the student. The graduate advisor will monitor student compliance with the requirement.

General Examination

Candidates must pass a general oral examination in physics. The examination is given shortly before completion of other work for the degree. A master’s thesis is not required but may be submitted if the candidate and the director of the candidate’s research believe it to be appropriate.

M.S. Subspecialty in Computational Physics and Astronomy

This degree is a subspecialty program for students with a background in physics, astronomy, computer science, mathematics, or engineering who wish to become familiar with computer-based approaches to problems in these fields. Minimum preparation expected includes a year's course in general physics, mathematics through differential equations, and a knowledge of FORTRAN, C++, or another programming language.

A total of 30 hours of graduate credit is required. The 33 hours listed below under 2 and 3 may include certain undergraduate-level electrical engineering and computer science courses. (Only courses numbered 500 and above count as graduate credit.) Students entering the program may have satisfied several of these requirements, but a total of 30 hours of graduate credit is still required. No more than the required 6 hours of PHSX 899 Master’s Research/Thesis may be counted toward the degree. Degree requirements include

1. An undergraduate knowledge of physics. This must be certified by the department to be at an advanced undergraduate level (600-level KU courses). The certification must be achieved within 12 months (extension possible with recommendation of the graduate admission committee) of entering the program and may require additional coursework. Extension is possible with recommendation of the graduate admission committee.
   Certification can be achieved in several ways:
   1. A GRE physics score greater than or equal to 650; or
   2. The determination by the graduate director and graduate advisor, based on the diagnostic exam given on entering the program combined with the student's undergraduate record, that the student understands all major elements of undergraduate physics; or
   3. Successful completion with grade of B or better on all undergraduate courses that the graduate director and/or advisor recommends based on the results of part b above. The student who has not succeeded in certifying their undergraduate physics knowledge in one of the above three ways could, within 12 months of starting the program, petition the Graduate Committee for an oral exam on undergraduate physics. The oral exam will be administered by a committee of six faculty members assigned by the department.
   4. A candidate for a Master's or Ph.D. degree who has not had the equivalent of 6 credit hours of advanced undergraduate laboratory course work (junior/senior...
level) is required to take one of the three advanced laboratory courses offered in the Department:

- **PHSX 516**  Physical Measurements  4
- **PHSX 536**  Electronic Circuit Measurement and Design  4
- **PHSX 601**  Design of Physical and Electronic Systems  4

Again, this arrangement is pending CUSA/CAC approval in January 2014.

2. Required Courses (21 credit hours)

- **PHSX/ASTR 815**  Computational Methods in Physical Sciences  3
- **PHSX 718**  Mathematical Methods in Physical Sciences  3
- **MATH/EECS 781**  Numerical Analysis I  3

EECS – 1 course at the 300 level or above (in addition to EECS 781) (Note: courses below the 500 level will not count towards the required 30 hours of graduate credit.)

One additional PHSX/ASTR/ATMO lecture course at the level or above

- **PHSX 899**  Master's Research/Thesis  1-10

3. 12 or more credits from the following list of courses:

(Note: Double counting of courses is not allowed, e.g. a course used to fulfill a requirement under part 2. (e.g. **EECS 448**) may not also be counted under part 3.)

- **EECS 360**  Signal and System Analysis  4
- **EECS 368**  Programming Language Paradigms  3
- **EECS 388**  Embedded Systems  4
- **EECS 448**  Software Engineering I  4
- **EECS 560**  Data Structures  4
- **EECS 672**  Introduction to Computer Graphics  3

Select one of the following - Special Topics (Examples of recent topics: Mathematics of Wall Street Computer-aided, Study of Differential Geometry, Chaos and Fractals, Fractional Brownian Motion and Its Applications, Wavelet Analysis, Statistical Theory, Stochastic Differential Equations and Applications)

- **MATH 596**  Special Topics: _____
- **MATH 696**  Special Topics: _____
- **MATH 796**  Special Topics: _____
- **MATH 611**  Time Series Analysis  3
- **MATH 627**  Probability  3
- **MATH 647**  Applied Partial Differential Equations  3
- **MATH/EECS 782**  Numerical Analysis II  3
- **MATH 783**  Applied Numerical Methods for Partial Differential Equations  3
PHSX/ASTR/ATMO Courses Numbered 500 and above
Courses below the 500 level do not count towards the required 30 hours of graduate credit.

4. Communication Skills: All graduate students, after their first semester, will deliver at least one oral presentation per semester. The talk should be at least 20 minutes long. For students not yet associated with a research group, the Graduate Seminar can serve as a venue. For more advanced students the seminar of their research group would be a natural venue. The student does not need to be enrolled in the seminar to present a talk for this purpose. Off-campus venues such as collaboration meetings and physics conferences can also serve this purpose. When giving presentations, students should fill out a form available on the department web site and have it signed by two witnesses, one of which must be a Physics or Astronomy faculty and other a Ph.D. doing research in the department. The completed form must be handed to the office staff. Faculty members who sign off on the talks are expected to provide constructive feedback to the student. The graduate advisor will monitor student compliance with the requirement.

5. Thesis: An important component of this degree is the completion and documentation of a successful computer project. A thesis must be presented that describes the basic physics involved in the project, the method of implementing the project, and a discussion of the results. An oral defense of the thesis is required before a committee of at least three members of the graduate faculty.

Please go to this website to see the University's policy on time limits:
https://documents.ku.edu/policies/Graduate_Studies/maprogramtimeconstraints.htm

Physics, PhD

OLD (Current)

Ph.D. Degree Requirements

The departmental web page with some additional information, e.g., milestones, can be found at http://www.physics.ku.edu/~physics/graduate/about.shtml

Residence

To become a Ph.D. candidate, i.e. to take the comprehensive exam:

The student must spend at least 2 semesters, which may include 1 summer session, in resident study at the University of Kansas.

To earn a Ph.D.:

The student must spend at least the equivalent of 3 full academic years in graduate study at this or another approved institution or laboratory. During this period of residence, the student must be
involved full-time in academic or professional pursuits, which may include an appointment for teaching or research if the teaching/research is directed specifically toward the student's degree objectives.

Graduate students with half-time assistantships usually require at least 4 years to complete all requirements. Maximum enrollment for students with no other departmental obligations is 16 hours a semester. In addition to satisfying the residence requirement, a student with a half-time assistantship must be enrolled for at least 6 hours each semester. A maximum of 12 hours is permitted if the student’s duties consist of research that partially fulfills degree requirements. A fellowship holder or full-time student with private support must be enrolled for at least 9 hours.

**Time Limits**

Go to this website to see the University's policy on time limits:
https://documents.ku.edu/policies/Graduate_Studies/docprogramtimeconstraints.htm

**Graduate Teaching Assistantship Eligibility**

To be eligible for teaching assistantships, all graduate students who are not native speakers of English must achieve a minimum score of 50 on the SPEAK test. International students must pass an oral examination to demonstrate English fluency. Students who fail this examination should take courses from the Applied English Center.

Every student who receives a GTA appointment will be required to complete PHSX 702 Introductory Physics Pedagogy at the first offering of the course starting with the semester of the student’s initial GTA appointment. Failure to complete this class at the first opportunity may affect consideration for subsequent GTA appointments.

**Preliminary Candidacy**

To be admitted to preliminary candidacy, each graduate student must satisfy department requirements:

1. Undergraduate knowledge of physics must be certified at the department undergraduate level (600-level KU courses). The ways to achieve this certification are outlined above under Course Requirements. A candidate for a Master's or Ph.D. degree who has not had the equivalent of 6 credit hours of advanced undergraduate laboratory course work (Junior/Senior level) is required to take one of the three advanced laboratory courses offered in the department.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHSX 516</td>
<td>Physical Measurements</td>
<td>4</td>
</tr>
<tr>
<td>PHSX 536</td>
<td>Electronic Circuit Measurement and Design</td>
<td>4</td>
</tr>
<tr>
<td>PHSX 601</td>
<td>Design of Physical and Electronic Systems</td>
<td>4</td>
</tr>
</tbody>
</table>

This arrangement is pending CUSA/CAC approval in January 2014.
• Achieve a minimum core course grade point average of 3.2. The core course GPA is computed from the following five equally weighted elements:
  o Grade obtained in PHSX 711 Quantum Mechanics I
  o Grade obtained in PHSX 811 Quantum Mechanics II
  o Grade obtained in PHSX 821 Classical Mechanics
  o Grade obtained in PHSX 831 Electrodynamics I
  5. Average grade of two other PHSX lecture courses numbered 700 or higher, excluding PHSX 815 (computational physics) and PHSX 717 (graduate seminar).
     a. Students may repeat one of the four core courses (PHSX 711, PHSX 811, 
        PHSX 821, and PHSX 831) once for the purpose of improving the core GPA. In calculating the core GPA, the Department will use only the better of the two grades.
  6. The two "other PHSX lecture courses numbered 700 or higher" must be taken at KU, but students entering with graduate credit from other institutions may petition the Graduate Committee for transfer credit for any of the four named core courses. For the purposes of the core GPA, grades (of "B" or better) from the previous institution may be used for at most three of the four named courses. For the remaining course the student must obtain written certification of "B" performance or better from the instructor of the course at KU. Such certification may be obtained by taking the course, taking the final exam of the course (if there is one), or other means which the instructor may determine. An appropriate higher-level course may also be used to obtain certification in a core course (for example for PHSX 711 or PHSX 811, PHSX 931 for PHSX 831.)
  7. Graduate students are normally expected to complete all core courses by the end of their second year of enrollment. Students who are required to complete an undergraduate physics certificate have three years to finish their core courses. Extensive Applied English Center (AEC) courses, prolonged illness, or extended military service might provide exceptional circumstances.

**Decision on Preliminary Candidacy**

Once Undergraduate requirements have been certified and sufficient information has been received regarding the required courses, the Graduate Committee will decide whether or not to admit the student to preliminary candidacy. This decision will be based upon the certification and on their core course GPA. The Graduate Committee Chair will report their decision to the Graduate Faculty.

**Course Requirements**

What follows are the default set of requirements for all Ph.D. candidates.

1. An undergraduate knowledge of physics. This must be certified by the department to be at an advanced undergraduate level (600-level KU courses). The certification must be achieved within 12 months (extension possible with recommendation of the graduate admission committee) of entering the program and may require additional coursework.
Extension is possible with recommendation of the graduate admission committee. Certification can be achieved in several ways:

1. A GRE physics score greater than or equal to 650; or
2. THE DETERMINATION BY THE GRADUATE DIRECTOR AND GRADUATE ADVISOR, BASED ON the diagnostic exam given on entering the program combined with the student's undergraduate record, that the student understands all major elements of undergraduate physics; or
3. Successful completion with grade of B or better on all undergraduate courses that the graduate director and/or advisor recommends based on the results of (2). The student who has not succeeded in certifying their undergraduate physics knowledge in one of the above three ways could, within 12 months of starting the program, petition the Graduate Committee for an oral exam on undergraduate physics. The oral exam will be administered by a committee of six faculty members assigned by the department.
4. A candidate for a Master's or Ph.D. degree who has not had the equivalent of 6 credit hours of advanced undergraduate laboratory course work (Junior/Senior level) is required to take one of the three advanced laboratory courses offered in the Department.

   **PHSX 516** Physical Measurements 4
   **PHSX 536** Electronic Circuit Measurement and Design 4
   **PHSX 601** Design of Physical and Electronic Systems 4

Again, this arrangement is pending CUSA/CAC approval in January 2014.

2. A total of 11 advanced lecture courses (33 hours) is required. In addition, 1 hour of **PHSX 700** Colloquium, one hour of **PHSX 717** Graduate Seminar, and (for GTAs only) one hour of **PHSX 702** Introduction to Physics Pedagogy are required.

3. Core courses:

   **PHSX 711** Quantum Mechanics I 3
   **PHSX 811** Quantum Mechanics II 3
   **PHSX 821** Classical Mechanics 3
   **PHSX 831** Electrodynamics I 3

4. Other required courses:

   **PHSX 718** Mathematical Methods in Physical Sciences 3
   **PHSX 815** Computational Methods in Physical Sciences (satisfies Research Skills requirement) 3
   **PHSX 871** Statistical Physics I 3
   **PHSX 931** Electrodynamics II 3
5. Two additional PHSX lecture courses numbered 700 or above. This excludes PHSX 815 (computational physics) and PHSX 717 (graduate seminar). The two courses must be in different sub-fields of physics and they may not be used to simultaneously satisfy other degree requirements in force. (For example, if PHSX 911 is being used to satisfy the PHSX 811 core requirement, it may not also be used to satisfy the requirement for two lecture courses at the 700 level or above.)

6. 1 additional advanced PHSX lecture course (numbered 800 or above; excluding PHSX 815)

7. One credit hour of Colloquium is required (PHSX 700). See “Colloquium and Graduate Seminar for an explanation.”

8. All graduate students, after their first semester, will deliver at least one oral presentation per semester. See “Communication Skills” for an explanation.

The courses listed above comprise the Department course requirements common to all students except those pursuing a multi-disciplinary plan of study, which is described below. There is no foreign language requirement. Subsequent work, consisting of advanced courses in appropriate fields and seminars, will be selected by the student and the advisor on the basis of the student's need and intended field of specialization. There is no prescribed minimum number of hours for the Ph.D. degree. The student's dissertation committee will determine the adequacy of the student's courses and seminars and will specify the total course requirements. Neither the Graduate School nor the Department has a requirement for a minor.

Students who wish to pursue a more multidisciplinary plan of study may incorporate coursework from up to two other natural science, engineering, or mathematics (SEM) departments at KU by substituting non PHSX courses at the 600 level and above from these other disciplines for the three additional electives described in items c) and d) above. The research advisor, or in the absence of one, the Departmental Graduate Advisor (who is the default advisor for all students without a research advisor), shall approve all such outside course choices and provide documentation for the student file on the approved courses and their rationale.

Students who wish to take courses in the social sciences, humanities, or professional schools must submit a detailed plan of study that must be approved by the Physics and Astronomy Graduate Committee. Please note that while these unique plans involving non SEM fields will be considered, there is no guarantee that the plan of study will be approved.

**Suggested Course Schedule**

A sample academic schedule for a student who has a half-time teaching or research assistantship during the first four semesters is shown below. It includes the core courses for admission to preliminary candidacy (described in a subsequent section) and a set of lecture courses that meet the Ph.D. course requirements. It is the schedule for a full-time resident student with the normal preparation described above and who is working toward the Ph.D. degree. Students admitted with less preparation should begin with less advanced courses. Courses numbered 500 and above carry graduate credit.
The electives listed below, e.g. PHSX 741, PHSX 781, PHSX 795, PHSX 911, are purely an illustrative option. Students have the freedom to choose which non-required courses satisfy their elective requirements. Note that this sample schedule may also not apply for a student pursuing a more multidisciplinary plan of study.

### Year 1

<table>
<thead>
<tr>
<th></th>
<th>Fall Hours</th>
<th>Spring Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHSX 711</td>
<td>3</td>
<td>PHSX 811</td>
</tr>
<tr>
<td>PHSX 821</td>
<td>3</td>
<td>PHSX 815</td>
</tr>
<tr>
<td>PHSX 717</td>
<td>1</td>
<td>PHSX 831</td>
</tr>
<tr>
<td>PHSX 702</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>PHSX 718</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>9</td>
</tr>
</tbody>
</table>

### Year 2

<table>
<thead>
<tr>
<th></th>
<th>Fall Hours</th>
<th>Spring Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHSX 781</td>
<td>3</td>
<td>PHSX 741</td>
</tr>
<tr>
<td>PHSX 911</td>
<td>3</td>
<td>PHSX 795</td>
</tr>
<tr>
<td>PHSX 931</td>
<td>3</td>
<td>PHSX 871</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>9</td>
</tr>
</tbody>
</table>

Total Hours: 38

**Communication Skills**

All graduate students, after their first semester, will deliver at least one oral presentation per semester. The talk should be at least 20 minutes long. For students not yet associated with a research group, the Graduate Seminar can serve as a venue. For more advanced students the seminar of their research group would be a natural venue. The student does not need to be enrolled in the seminar to present a talk for this purpose. Off-campus venues such as collaboration meetings and physics conferences can also serve this purpose. When giving presentations, students should fill out a form available on the department web site and have it signed by two witnesses, one of which must be a Physics or Astronomy faculty and other a Ph.D. doing research in the department. The completed form must be handed to the office staff. Faculty members who sign off on the talks are expected to provide constructive feedback to the student. The graduate advisor will monitor student compliance with the requirement.

**Colloquium and Graduate Seminar**

All students must enroll in PHSX 700 Colloquium in the sixth semester. Students should have attended at least 75 percent of the regularly scheduled colloquia during the 6 semesters to achieve a passing grade. In Fall of the first year, each graduate student is required to enroll in and attend the graduate seminar (PHSX 717) in order to familiarize themselves with research programs in the Department and gain experience in oral presentations.
Research Skills and Responsible Scholarship

By the end of one year after being admitted to preliminary candidacy, the student must complete PHSX 815/ASTR 815, Computational Physics and Astronomy, with a grade of "B" or higher in order to satisfy the Research Skills requirement. Note that this course has significant prerequisites in undergraduate Computer Science. The Responsible Scholarship requirement is filled via completion of PHSX 717.

Computing Skill

Students must complete PHSX 815 Computational Methods in Physical Sciences/ASTR 815 Computational Physics and Astronomy with a grade of A or B, preferably within 1 year after admission to preliminary candidacy. This course has significant prerequisites in advanced undergraduate computer science and requires completion of a substantial computer program to solve a physical problem.

Note: Contact your department or program for more information about research skills and responsible scholarship, and the current requirements for doctoral students. Current policies on Doctoral Research Skills and Responsible Scholarship are listed in the KU Policy Library.

Comprehensive Examination

Graduate College requirements for the Comprehensive Examination can be found at https://documents.ku.edu/policies/Graduate_Studies/doccomprehensiveorals.htm.

After completing a major portion of the required course work and satisfying the computing skills requirement, the student must pass the comprehensive examination. The Department recommends at least five people for committee membership to the Graduate Division, which makes the final appointments. One committee member must come from outside of the Department to serve as a representative of the Graduate School. Requests to take the examination must be made to the Graduate Coordinator at least three weeks in advance of the date of the examination.

The student will write a 2000 to 4000 word paper on a topic in their chosen sub-field that is relevant to their thesis work. This paper must be presented to the committee at least one week in advance of the scheduled oral exam. The student will make a presentation at the oral examination based upon this paper, and will be examined on the contents of the talk, the paper, and works listed in the paper's bibliography. The bibliography must include at least one recent article from a peer-reviewed journal not authored by the student or the student's advisor. In addition, the committee may ask questions at the oral examination that cover the entire field of physics plus any related material (such as mathematics or chemistry) considered relevant by the examining committee.

In order to pass the comprehensive exam, the student must receive passing grades on both the written and oral components of the exam. The overall grade on this examination, determined by the examining committee, will be "Honors," "Satisfactory," or "Unsatisfactory."
**Post-Comprehensive Requirements**

Upon passing the comprehensive examination, the student becomes a candidate for the Ph.D. degree. The Graduate Division will then designate the candidate's dissertation committee based on the recommendation of the Department. Each candidate must complete a research project that has been approved by the committee. The committee establishes the candidate's course requirements and directs the research.

Unless granted a leave of absence, the candidate must be continuously enrolled full-time, including summer sessions, until all requirements for the degree are completed. During this time, the candidate must enroll in a minimum of 6 hours a semester and 3 hours a summer session until the completion of the degree or of 18 hours of post-comprehensive enrollment, whichever comes first. (Post-comprehensive enrollment may include the semester in which the comprehensive examination is passed.) After 18 hours of post-comprehensive enrollment, the candidate must continue to enroll each semester and each summer session until all requirements for the degree have been met. If the student petitions (at [https://documents.ku.edu/policies/Graduate_Studies/gta_gra_enroll_dr_fewer_6.pdf](https://documents.ku.edu/policies/Graduate_Studies/gta_gra_enroll_dr_fewer_6.pdf)) they can enroll for only one hour of credit in spring, summer, and fall and still maintain their GTA or GRA status.

At least once each year after passing the comprehensive examination, the student should schedule a meeting with his or her dissertation committee to discuss progress towards the completion of the dissertation and any other concerns. A report of the committee's consensus of the meeting should be prepared by a member of the committee other than the student's advisor and placed in the student's file. Copies are to be given to the Departmental Chairman, the Graduate Committee Chair, the Graduate Advisor, the Departmental Director of Graduate Studies, and the student.

**Final Oral Examination**

The final oral examination will proceed according to the regulations of Graduate studies. These can be found at [https://documents.ku.edu/policies/Graduate_Studies/docfinaloral.htm](https://documents.ku.edu/policies/Graduate_Studies/docfinaloral.htm).

We refer to these requirements below, as they appeared on September 24, 2010, and we have inserted some modified requirements for those students who wish to pursue a more multidisciplinary dissertation topic.

It is the responsibility of the student to make sure that they satisfy the current university requirements.

Completion of the dissertation is the culminating academic phase of a doctoral program, climaxed by the final oral examination and defense of the dissertation. In all but the rarest cases, tentative approval of the dissertation is followed promptly by the final oral examination. When the completed dissertation has been accepted by the committee in final draft form, and all other degree requirements have been satisfied, the chair of the committee requests the Graduate Division to schedule the final oral examination. This request must be made in advance of the
desired examination by at least the period specified by the Graduate Division (normally at least three weeks). The submission of the request must allow sufficient time to publicize the examination so that interested members of the university community may attend. At least five months must elapse between the successful completion of the comprehensive oral examination and the date of the final oral examination.

The committee for the final oral examination must consist of at least five members (the members of the dissertation committee plus other members of the Graduate Faculty recommended by the committee chair and the department and appointed by the Graduate Division). The Chair of the committee and three of the other four members must have appointments of some type within the Physics and Astronomy department. One member must be from a department other than the Physics and Astronomy department. The outside member represents Graduate Studies and must be a regular member of the Graduate Faculty. Before the examination, the Graduate Division provides a list of responsibilities to the Graduate Studies representative. The Graduate Studies representative is a voting member of the committee, has full right to participate in the examination, and provides a written report on any unsatisfactory or irregular aspects of the examination to the committee chair, department chair, Graduate Division, and Graduate Studies.

For students (and only those students) who are pursuing a multidisciplinary plan of study -- as defined by their substitution of courses from other departments for PHSX electives as described in the Course Requirements section -- up to two members of the committee, including the one required outside member, may be faculty from other SEM departments with regular, adjunct, or courtesy appointments at KU. The Chair must have an appointment of some type within the Physics and Astronomy department. (Exception: if the primary appointment of the Chair is outside the department, then only one additional committee member may be outside the Department of Physics and Astronomy.) NOTE: It is assumed that these research projects may involve interaction between physics and one or more other SEM disciplines; therefore, the external faculty members may come from up to two different departments. The Graduate Division ascertains whether all other degree requirements have been met and if reports of any previously scheduled final oral examinations have been submitted and recorded. Upon approval of the request, the final oral examination is scheduled at the time and place designated by the Graduate Division. This information must be published in a news medium as prescribed by the Graduate Faculty. Interested members of the university community are encouraged to attend these examinations. For every scheduled final oral examination, the department reports to the Graduate Division a grade of Honors, Satisfactory, or Unsatisfactory for the candidate's performance. If an Unsatisfactory grade is reported, the candidate may be allowed to repeat the examination on the recommendation of the department.
Ph.D. Degree Requirements

The departmental web page with some additional information, e.g., milestones, can be found at http://www.physics.ku.edu/~physics/graduate/about.shtml

Residence

To become a Ph.D. candidate, i.e. to take the comprehensive exam:

The student must spend at least 2 semesters, which may include 1 summer session, in resident study at the University of Kansas.

To earn a Ph.D.:

The student must spend at least the equivalent of 3 full academic years in graduate study at this or another approved institution or laboratory. During this period of residence, the student must be involved full-time in academic or professional pursuits, which may include an appointment for teaching or research if the teaching/research is directed specifically toward the student's degree objectives.

Graduate students with half-time assistantships usually require at least 4 years to complete all requirements. Maximum enrollment for students with no other departmental obligations is 16 hours a semester. In addition to satisfying the residence requirement, a student with a half-time assistantship must be enrolled for at least 6 hours each semester. A maximum of 12 hours is permitted if the student’s duties consist of research that partially fulfills degree requirements. A fellowship holder or full-time student with private support must be enrolled for at least 9 hours.

Time Limits

Go to this website to see the University's policy on time limits: https://documents.ku.edu/policies/Graduate_Studies/docprogramtimeconstraints.htm

Graduate Teaching Assistantship Eligibility

To be eligible for teaching assistantships, all graduate students who are not native speakers of English must achieve a minimum score of 50 on the SPEAK test. International students must pass an oral examination to demonstrate English fluency. Students who fail this examination should take courses from the Applied English Center.

Every student who receives a GTA appointment will be required to complete PHSX 702 Introductory Physics Pedagogy at the first offering of the course starting with the semester of the
student’s initial GTA appointment. Failure to complete this class at the first opportunity may affect consideration for subsequent GTA appointments.

**Preliminary Candidacy**

To be admitted to preliminary candidacy, each graduate student must satisfy department requirements:

1. Undergraduate knowledge of physics must be certified at the department undergraduate level (600-level KU courses). The ways to achieve this certification are outlined above under Course Requirements.

   A candidate for a Master’s or Ph.D. degree who has not had the equivalent of 6 credit hours of advanced undergraduate laboratory course work (Junior/Senior level) is required to take one of the three advanced laboratory courses offered in the department.

   - **PHSX 516**  
     Physical Measurements  
     4

   - **PHSX 536**  
     Electronic Circuit Measurement and Design  
     4

   - **PHSX 601**  
     Design of Physical and Electronic Systems  
     4

   This arrangement is pending CUSA/CAC approval in January 2014.

2. Achieve a minimum core course grade point average of 3.2. The core course GPA is computed from the following five equally weighted elements:
   - Grade obtained in **PHSX 711** Quantum Mechanics I
   - Grade obtained in **PHSX 811** Quantum Mechanics II
   - Grade obtained in **PHSX 821** Classical Mechanics
   - Grade obtained in **PHSX 831** Electrodynamics I

   5. Average grade of two other PHSX lecture courses numbered 700 or higher, excluding **PHSX 815** (computational physics) and **PHSX 717** (graduate seminar).

      a. Students may repeat one of the four core courses (**PHSX 711, PHSX 811, PHSX 821, and PHSX 831**) once for the purpose of improving the core GPA. In calculating the core GPA, the Department will use only the better of the two grades.

      6. The two "other PHSX lecture courses numbered 700 or higher" must be taken at KU, but students entering with graduate credit from other institutions may petition the Graduate Committee for transfer credit for any of the four named core courses. For the purposes of the core GPA, grades (of "B" or better) from the previous institution may be used for at most three of the four named courses. For the remaining course the student must obtain written certification of "B" performance or better from the instructor of the course at KU. Such certification may be obtained by taking the course, taking the final exam of the course (if there is one), or other means which the instructor may determine. An appropriate higher-level course may also be used to obtain certification in a core course (for example for **PHSX 711** or **PHSX 811, PHSX 931** for **PHSX 831**.)

   7. Graduate students are normally expected to complete all core courses by the end of their second year of enrollment. Students who are required to complete an
undergraduate physics certificate have three years to finish their core courses. Extensive Applied English Center (AEC) courses, prolonged illness, or extended military service might provide exceptional circumstances.

**Decision on Preliminary Candidacy**

Once Undergraduate requirements have been certified and sufficient information has been received regarding the required courses, the Graduate Committee will decide whether or not to admit the student to preliminary candidacy. This decision will be based upon the certification and on their core course GPA. The Graduate Committee Chair will report their decision to the Graduate Faculty.

**Course Requirements**

What follows are the default set of requirements for all Ph.D. candidates.

9. An undergraduate knowledge of physics. This must be certified by the department to be at an advanced undergraduate level (600-level KU courses). The certification must be achieved within 12 months (extension possible with recommendation of the graduate admission committee) of entering the program and may require additional coursework. Extension is possible with recommendation of the graduate admission committee. Certification can be achieved in several ways:

   1. A GRE physics score greater than or equal to 650; or
   2. THE DETERMINATION BY THE GRADUATE DIRECTOR AND GRADUATE ADVISOR, BASED ON the diagnostic exam given on entering the program combined with the student's undergraduate record, that the student understands all major elements of undergraduate physics; or
   3. Successful completion with grade of B or better on all undergraduate courses that the graduate director and/or advisor recommends based on the results of (2). The student who has not succeeded in certifying their undergraduate physics knowledge in one of the above three ways could, within 12 months of starting the program, petition the Graduate Committee for an oral exam on undergraduate physics. The oral exam will be administered by a committee of six faculty members assigned by the department.

4. A candidate for a Master's or Ph.D. degree who has not had the equivalent of 6 credit hours of advanced undergraduate laboratory course work (Junior/Senior level) is required to take one of the three advanced laboratory courses offered in the Department.

   **PHSX 516**       Physical Measurements
   **PHSX 536**       Electronic Circuit Measurement and Design
   **PHSX 601**       Design of Physical and Electronic Systems

Again, this arrangement is pending CUSA/CAC approval in January 2014.
10. A total of 11 advanced lecture courses (33 hours) is required. In addition, 1 hour of PHSX 700 Colloquium, one hour of PHSX 717 Graduate Seminar, and (for GTAs only) one hour of PHSX 702 Introduction to Physics Pedagogy are required.

11. Core courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHSX 711</td>
<td>Quantum Mechanics I</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 811</td>
<td>Quantum Mechanics II</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 821</td>
<td>Classical Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 831</td>
<td>Electrodynamics I</td>
<td>3</td>
</tr>
</tbody>
</table>

12. Other required courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHSX 718</td>
<td>Mathematical Methods in Physical Sciences</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 815</td>
<td>Computational Methods in Physical Sciences (satisfies Research Skills requirement)</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 871</td>
<td>Statistical Physics I</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 931</td>
<td>Electrodynamics II</td>
<td>3</td>
</tr>
</tbody>
</table>

13. Two additional PHSX lecture courses numbered 700 or above. This excludes PHSX 815 (computational physics) and PHSX 717 (graduate seminar). The two courses must be in different sub-fields of physics and they may not be used to simultaneously satisfy other degree requirements in force. (For example, if PHSX 911 is being used to satisfy the PHSX 811 core requirement, it may not also be used to satisfy the requirement for two lecture courses at the 700 level or above.)

14. 1 additional advanced PHSX lecture course (numbered 800 or above; excluding PHSX 815)

15. One credit hour of Colloquium is required (PHSX 700). See “Colloquium and Graduate Seminar for an explanation.”

16. All graduate students, after their first semester, will deliver at least one oral presentation per semester. See “Communication Skills” for an explanation.

The courses listed above comprise the Department course requirements common to all students except those pursuing a multi-disciplinary plan of study, which is described below. There is no foreign language requirement. Subsequent work, consisting of advanced courses in appropriate fields and seminars, will be selected by the student and the advisor on the basis of the student's need and intended field of specialization. There is no prescribed minimum number of hours for the Ph.D. degree. The student's dissertation committee will determine the adequacy of the student's courses and seminars and will specify the total course requirements. Neither the Graduate School nor the Department has a requirement for a minor.

Students who wish to pursue a more multidisciplinary plan of study may incorporate coursework from up to two other natural science, engineering, or mathematics (SEM) departments at KU by substituting non PHSX courses at the 600 level and above from these other disciplines for the three additional electives described in items c) and d) above. The research advisor, or in the
absence of one, the Departmental Graduate Advisor (who is the default advisor for all students without a research advisor), shall approve all such outside course choices and provide documentation for the student file on the approved courses and their rationale.

Students who wish to take courses in the social sciences, humanities, or professional schools must submit a detailed plan of study that must be approved by the Physics and Astronomy Graduate Committee. Please note that while these unique plans involving non SEM fields will be considered, there is no guarantee that the plan of study will be approved.

**Suggested Course Schedule**

A sample academic schedule for a student who has a half-time teaching or research assistantship during the first four semesters is shown below. It includes the core courses for admission to preliminary candidacy (described in a subsequent section) and a set of lecture courses that meet the Ph.D. course requirements. It is the schedule for a full-time resident student with the normal preparation described above and who is working toward the Ph.D. degree. Students admitted with less preparation should begin with less advanced courses. Courses numbered 500 and above carry graduate credit.

The electives listed below, e.g. PHSX 741, PHSX 781, PHSX 795, PHSX 911, are purely an illustrative option. Students have the freedom to choose which non-required courses satisfy their elective requirements. Note that this sample schedule may also not apply for a student pursuing a more multidisciplinary plan of study.

<table>
<thead>
<tr>
<th></th>
<th>Year 1</th>
<th></th>
<th>Year 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fall</td>
<td>Hours</td>
<td>Spring</td>
</tr>
<tr>
<td>PHSX 711</td>
<td>3</td>
<td>PHSX 811</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 821</td>
<td>3</td>
<td>PHSX 815</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 717</td>
<td>1</td>
<td>PHSX 831</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 702</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHSX 718</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>11</td>
<td></td>
<td>9</td>
</tr>
</tbody>
</table>

Total Hours: 38

**Communication Skills**
All graduate students, after their first semester, will deliver at least one oral presentation per semester. The talk should be at least 20 minutes long. For students not yet associated with a research group, the Graduate Seminar can serve as a venue. For more advanced students the seminar of their research group would be a natural venue. The student does not need to be enrolled in the seminar to present a talk for this purpose. Off-campus venues such as collaboration meetings and physics conferences can also serve this purpose. When giving presentations, students should fill out a form available on the department web site and have it signed by two witnesses, one of which must be a Physics or Astronomy faculty and other a Ph.D. doing research in the department. The completed form must be handed to the office staff. Faculty members who sign off on the talks are expected to provide constructive feedback to the student. The graduate advisor will monitor student compliance with the requirement.

**Colloquium and Graduate Seminar**

All students must enroll in **PHSX 700** Colloquium in the sixth semester. Students should have attended at least 75 percent of the regularly scheduled colloquia during the 6 semesters to achieve a passing grade. In Fall of the first year, each graduate student is required to enroll in and attend the graduate seminar (**PHSX 717**) in order to familiarize themselves with research programs in the Department and gain experience in oral presentations.

**Research Skills and Responsible Scholarship**

By the end of one year after being admitted to preliminary candidacy, the student must complete **PHSX 815/ASTR 815**, Computational Physics and Astronomy, with a grade of "B" or higher in order to satisfy the Research Skills requirement. Note that this course has significant prerequisites in undergraduate Computer Science. The Responsible Scholarship requirement is filled via completion of **PHSX 717**.

**Computing Skill**

Students must complete **PHSX 815** Computational Methods in Physical Sciences/**ASTR 815** Computational Physics and Astronomy with a grade of A or B, preferably within 1 year after admission to preliminary candidacy. This course has significant prerequisites in advanced undergraduate computer science and requires completion of a substantial computer program to solve a physical problem.

**Note:** Contact your department or program for more information about research skills and responsible scholarship, and the current requirements for doctoral students. Current policies on Doctoral Research Skills and Responsible Scholarship are listed in the KU Policy Library.

**Comprehensive Examination**

Graduate College requirements for the Comprehensive Examination can be found at [https://documents.ku.edu/policies/Graduate_Studies/doccomprehensiveorals.htm](https://documents.ku.edu/policies/Graduate_Studies/doccomprehensiveorals.htm).
After completing a major portion of the required course work and satisfying the computing skills requirement, the student must pass the comprehensive examination. The Department recommends at least five people for committee membership to the Graduate Division, which makes the final appointments. One committee member must come from outside of the Department to serve as a representative of the Graduate School. Requests to take the examination must be made to the Graduate Coordinator at least three weeks in advance of the date of the examination.

The student will write a 2000 to 4000 word paper on a topic in their chosen sub-field that is relevant to their thesis work. This paper must be presented to the committee at least one week in advance of the scheduled oral exam. The student will make a presentation at the oral examination based upon this paper, and will be examined on the contents of the talk, the paper, and works listed in the paper's bibliography. The bibliography must include at least one recent article from a peer-reviewed journal not authored by the student or the student's advisor. In addition, the committee may ask questions at the oral examination that cover the entire field of physics plus any related material (such as mathematics or chemistry) considered relevant by the examining committee.

In order to pass the comprehensive exam, the student must receive passing grades on both the written and oral components of the exam. The overall grade on this examination, determined by the examining committee, will be "Honors," "Satisfactory," or "Unsatisfactory."

**Post-Comprehensive Requirements**

Upon passing the comprehensive examination, the student becomes a candidate for the Ph.D. degree. The Graduate Division will then designate the candidate's dissertation committee based on the recommendation of the Department. Each candidate must complete a research project that has been approved by the committee. The committee establishes the candidate's course requirements and directs the research.

Unless granted a leave of absence, the candidate must be continuously enrolled full-time, including summer sessions, until all requirements for the degree are completed. During this time, the candidate must enroll in a minimum of 6 hours a semester and 3 hours a summer session until the completion of the degree or of 18 hours of post-comprehensive enrollment, whichever comes first. (Post-comprehensive enrollment may include the semester in which the comprehensive examination is passed.) After 18 hours of post-comprehensive enrollment, the candidate must continue to enroll each semester and each summer session until all requirements for the degree have been met. If the student petitions (at https://documents.ku.edu/policies/Graduate_Studies/gta_gra_enroll_dr_fewer_6.pdf) they can enroll for only one hour of credit in spring, summer, and fall and still maintain their GTA or GRA status.

At least once each year after passing the comprehensive examination, the student should schedule a meeting with his or her dissertation committee to discuss progress towards the completion of the dissertation and any other concerns. A report of the committee's consensus of the meeting should be prepared by a member of the committee other than the student's advisor.
and placed in the student's file. Copies are to be given to the Departmental Chairman, the Graduate Committee Chair, the Graduate Advisor, the Departmental Director of Graduate Studies, and the student.

**Final Oral Examination**

The final oral examination will proceed according to the regulations of Graduate studies. These can be found at [https://documents.ku.edu/policies/Graduate_Studies/docfinaloral.htm](https://documents.ku.edu/policies/Graduate_Studies/docfinaloral.htm).

We refer to these requirements below, as they appeared on September 24, 2010, and we have inserted some modified requirements for those students who wish to pursue a more multidisciplinary dissertation topic.

It is the responsibility of the student to make sure that they satisfy the current university requirements.

Completion of the dissertation is the culminating academic phase of a doctoral program, climaxed by the final oral examination and defense of the dissertation. In all but the rarest cases, tentative approval of the dissertation is followed promptly by the final oral examination. When the completed dissertation has been accepted by the committee in final draft form, and all other degree requirements have been satisfied, the chair of the committee requests the Graduate Division to schedule the final oral examination. This request must be made in advance of the desired examination by at least the period specified by the Graduate Division (normally at least three weeks). The submission of the request must allow sufficient time to publicize the examination so that interested members of the university community may attend. At least five months must elapse between the successful completion of the comprehensive oral examination and the date of the final oral examination.

The committee for the final oral examination must consist of at least five members (the members of the dissertation committee plus other members of the Graduate Faculty recommended by the committee chair and the department and appointed by the Graduate Division). The Chair of the committee and three of the other four members must have appointments of some type within the Physics and Astronomy department. One member must be from a department other than the Physics and Astronomy department. The outside member represents Graduate Studies and must be a regular member of the Graduate Faculty. Before the examination, the Graduate Division provides a list of responsibilities to the Graduate Studies representative. The Graduate Studies representative is a voting member of the committee, has full right to participate in the examination, and provides a written report on any unsatisfactory or irregular aspects of the examination to the committee chair, department chair, Graduate Division, and Graduate Studies.

For students (and only those students) who are pursuing a multidisciplinary plan of study -- as defined by their substitution of courses from other departments for PHSX electives as described in the Course Requirements section -- up to two members of the committee, including the one required outside member, may be faculty from other SEM departments with regular, adjunct, or courtesy appointments at KU. The Chair must have an appointment of some type within the Physics and Astronomy department. (Exception: if the primary appointment of the Chair is...
outside the department, then only one additional committee member may be outside the Department of Physics and Astronomy.) NOTE: It is assumed that these research projects may involve interaction between physics and one or more other SEM disciplines; therefore, the external faculty members may come from up to two different departments. The Graduate Division ascertains whether all other degree requirements have been met and if reports of any previously scheduled final oral examinations have been submitted and recorded. Upon approval of the request, the final oral examination is scheduled at the time and place designated by the Graduate Division. This information must be published in a news medium as prescribed by the Graduate Faculty. Interested members of the university community are encouraged to attend these examinations. For every scheduled final oral examination, the department reports to the Graduate Division a grade of Honors, Satisfactory, or Unsatisfactory for the candidate's performance. If an Unsatisfactory grade is reported, the candidate may be allowed to repeat the examination on the recommendation of the department.
JUSTIFICATION
The edits noted in yellow above are the proposed changes to the Ph.D. in Physics program. The old requirements were one of the four advanced laboratory courses offered by the department and included two courses that are no longer offered (PHSX 616 and PHSX 636). We therefore substituted PHSX 601, which is a class that satisfies the same learning goals. We want to offer PHSX 601 instead of just removing the PHSX 616/PHSX 636 requirement as it gives our students more flexibility to schedule the requirement, which must be completed in the first year of the program.

B. The PCC Subcommittee recommends the following new courses and course change to the CGS:

1. New Courses: CEAS 802

   **Center for East Asian Studies**

   **CEAS 802 Research Seminar (3)** Students will work with the instructor and, when appropriate, an additional faculty advisor to design, research and write up a research paper on an East Asian topic of their choosing. Students enrolling in this course are expected to have taken a social science research methods class prior to taking this course and to apply those methods to the research process. A core course for the MA in Contemporary East Asian Studies. Prerequisite: Permission of the instructor. SEM.

   Grading: A-F, W and I

   This course is not an elective
   This course is not a RSRS course
   This course is a degree requirement in the following way: This is one of the required courses for our new MA program in Contemporary East Asian Studies.

   This course impacts students in the following way: CEAS MA students must take this course.

   This new course will be first offered Summer 2014, and then Yearly thereafter.

   **JUSTIFICATION:**
   The Center for East Asian Studies (CEAS) is creating a new M.A. program in Contemporary East Asian Studies. The new M.A. program will be an interdisciplinary area studies program that emphasizes social science. This course will be one of the required courses for the new CEAS MA program.

2. Course changes: ISP 882, ISP 898
Indigenous Studies Program

(OLD) Current
ISP 882 Native American Natural Resources (2-3) This course provides a detailed examination of natural resource law as it applies to Indian Country. Among the topics to be discussed are water law, environmental protection, and subsurface property rights. While not a prerequisite, it is recommended that students take Federal Indian Law before enrolling in this course. (Same as LAW 967.) Prerequisite: Permission from the Instructor. LEC

Grading: A-F, W and I

This course is not an elective
This course is not a RSRS course

(NEW) Proposed
ISP 882 Native American Natural Resources (2-3) This course provides a detailed examination of natural resource law as it applies to Indian Country. Among the topics to be discussed are water law, environmental protection, and subsurface property rights. (Same as LAW 967.) LEC

Prerequisite: None

Grading: A-F, W and I

This course is not an elective
This course is not a RSRS course

The change to this course will first take effect Fall 2014 and the course will be offered every Spring semester thereafter.

JUSTIFICATION:
This course is cross listed with LAW 967. This course change has received approval from Law School governance. We are changing the course description to more accurately reflect the current professor's syllabus.

(OLD) Current
ISP 898 Master’s Non-Thesis (1-6) Course for Indigenous Nations Studies students completing non-thesis Master's projects. Graded on a satisfactory/unsatisfactory basis. Prerequisite: Permission from instructor. LEC

Grading: S/U, W and I
This course is an elective
This course is not a RSRS course

(NEW) Proposed
ISP 898 Master’s Portfolio Preparation (1-6) Course for Indigenous Studies students completing a portfolio Master’s exam. Graded on a satisfactory/unsatisfactory basis. Permission from instructor. IND

The change to this course will first take effect Fall 2014 and the course will be offered every semester thereafter.

JUSTIFICATION:
We are changing this course to align it with the program requirements for Indigenous Studies.

V. Old Business

VI. New Business