UNIVERSITY OF SASKATCHEWAN

Academic Programs Committee of Council

University Course Challenge

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Next scheduled posting:
The next scheduled Challenge document posting will be in November 2013, with a submission deadline of November 13, 2013. Urgent items can be posted on request.

COLLEGE OF GRADUATE STUDIES & RESEARCH

PHYSICS

Program Modification: Master of Science in Physics
Change to Required Courses

Rationale:
Several factors motivate the proposed changes. The current course requirements in the department have been established over 20 years ago. Since then, there have been dramatic changes and developments in physics as a discipline as well as changes in student demographics, background and expected training outcomes. Developments in physics are reflected in new research areas that have emerged in our and cognate departments. Research groups in new areas of condensed matter physics, spintronics, high temperature superconductivity, material science, synchrotron science, and theoretical and high energy physics have been created. As a result, the range of physics sub-fields became more diverse both in the discipline as a whole and, in particular, in the department. Most newly emerging research areas draw heavily on Quantum Mechanics and graduate students are required to have good preparation in Quantum Mechanics to successfully proceed with specialized projects. Diverse arrays of specialized areas also pose a challenge of combining student training in wide physics fundamentals, such as quantum mechanics and electrodynamics, with in-depth training in particular specializations, such as synchrotron science.

Removal of PHYS 812, and PHYS 883 or PHYS 811, as required classes for M.Sc. program, is justified by following reasons:

1. Classical mechanics (PHYS 811) has become less relevant to graduate training and this class has been eliminated from the revised program as a mandatory class. It will remain available to students who may need its elements in their research.

2. Modern requirements and expectations to Physics graduates stipulate that it is imperative that all students in M.Sc. program have broad foundational training in Quantum Mechanics and Electrodynamics. Departmental procedures now ensure that students who did not have sufficient previous background in Quantum Mechanics and Electrodynamics will have to take broadly oriented PHYS 883 (Advanced Quantum Mechanics) and recently introduced PHYS 816 (Electrodynamics) courses included in their program of studies. As a result, every student in M.Sc. program will have the training in Quantum Mechanics and Electrodynamics.

3. Proposed changes address the diversity of our M.Sc. students and diversity of specializations in Canadian and International universities. Some of our M.Sc. students come with M.Sc. degrees from foreign universities and have had the course equivalent to PHYS 816 and PHYS 883 taken at the graduate level. A number of Canadian universities also offer advanced undergraduate courses equivalent to PHYS 816 and PHYS 883 (usually taken as electives within specific specializations) and students coming from such programs will have required background in Quantum Mechanics and Electrodynamics. Our own department, also offer advanced level classes in Quantum Mechanics and Electrodynamics that satisfy (and in some cases, e.g, as in PHYS 482, Quantum Mechanics, exceed the minimum background level provided by PHYS 816

and PHYS 883). To reflect this diversity of students coming into our M.Sc. program, we propose to remove explicit requirements for titles of the required courses in Quantum Mechanics and Electrodynamics.

Our requirements for Program of Studies stipulate that all M.Sc. students should have fundamental preparation in Quantum Mechanics and Electrodynamics at the level equivalent to PHYS 816 and PHYS 883. This will be achieved in various ways depending on the previous background: students coming with an undergraduate degrees from Physics and Engineering Physics at U of S or students coming from other Canadian universities may have taken courses equivalent to PHYS 816 and PHYS 883 at the undergraduate level, international students may have taken courses equivalent to PHYS 816 and PHYS 883 as part of their previous graduate degrees.

In all such cases, student's background preparation will be evaluated by the advisory committee (AC) at a special Program of Studies meeting (early in the program). At such meeting, the AC will evaluate the course information (outline, format, textbook, instructor, etc.) to establish whether the course(s) can be deemed to be equivalent to our PHYS 816/PHYS 883. Student's background knowledge in topics covered by the course(s) in question will also be assessed by the AC in oral questioning. Based on these assessments the AC will recommend whether PHYS 816 and PHYS 883 should be included in program of studies. Students who do not require these courses will have to take other graduate courses (12 cu in total).

Current Physics MSc Requirements	**Proposed Physics MSc Requirements**

• GSR 960.0
• GSR 961.0 if research involves human subjects
• GSR 962.0 if research involves animal subjects
• Minimum 12 credits, including the following:
  o PHYS 811.3 or PHYS 883.3
  o PHYS 812.3
• PHYS 990.0
• PHYS 994.0
• Thesis defence
	• GSR 960.0
	• GSR 961.0 if research involves human subjects
	• GSR 962.0 if research involves animal subjects
	• Minimum 12 credits~~, including the following:~~
	  ~~o PHYS 811.3 or PHYS 883.3~~
	  ~~o PHYS 812.3~~
	• PHYS 990.0
	• PHYS 994.0
	• Thesis defence

Program Modification: Doctor of Philosophy in Physics
Change to Required Courses

Rationale:
Several factors motivate the proposed changes. The current course requirements in the department have been established over 20 years ago. Since then there have been dramatic changes and developments in physics as a discipline as well as changes in student demographics, background and expected training outcomes. Development in physics are reflected in new research areas that have emerged in our and cognate departments. Research groups in new areas of condensed matter physics, spintronics, high temperature superconductivity, material science,

synchrotron science, and theoretical and high energy physics have been created. As a result, the range of physics sub-fields became more diverse both in the discipline as a whole and, in particular, in the department. The proposed modifications address the challenge of combining good preparation in broad physics fundamentals, such as quantum mechanics and electrodynamics, with in-depth training in particular specializations, such as synchrotron science, material science, theoretical physic etc.

New requirements for MSc degrees in the department, new evaluation and admission process for PhD students in the department, and new MSc to PhD transfer process in the department will ensure that all students entering PhD program (independently of the research field) will have broadly oriented foundational training in Quantum Mechanics and Electrodynamics at the level of PHYS 883 (Advanced Quantum Mechanics) and PHYS 816 (Electrodynamics) taken before beginning of PhD program. In addition to background training provided at the MSc level by PHYS 883 (Advanced Quantum Mechanics) and PHYS 816 (Electrodynamics), PhD students need additional foundational training to prepare them to work successfully in newly emerging research areas in physics that have been expanding in the department.
New PHYS 873 (Statistical Mechanics) and PHYS 886 (Relativistic Quantum Mechanics) have been created for students specializing in related areas. Current PHYS 812 class will continue to serve needs of PhD students from research groups dealing with electromagnetics. Students in PhD program will be required to take at least one advanced foundational course PHYS 812 or PHYS 873 or PHYS 886 which will serve as a foundation to the specific area of PhD research. The proposed changes eliminate Classical Mechanics (PHYS 811) which became less relevant to graduate training and this class has been eliminated from the revised program as a mandatory class. It will remain available to students who may need its elements in their research.

Current Physics PhD Requirements	**Proposed Physics PhD Requirements**

• GSR 960.0
• GSR 961.0 if research involves human subjects
• GSR 962.0 if research involves animal subjects
• Minimum 9 credits, including the following:
  o PHYS 811.3 or PHYS 883.3
  o PHYS 812.3
• PHYS 990.0
• PHYS 996.0
• Qualifying examination
• Comprehensive examination
• Thesis defence
	• GSR 960.0
	• GSR 961.0 if research involves human subjects
	• GSR 962.0 if research involves animal subjects
	• Minimum 12 credits, including the following:
	  o ~~PHYS 811.3 or PHYS 883.3~~
	  o ~~PHYS 812.3~~
	  o PHYS 812.3 or PHYS 873.3 or PHYS 886.3
	• PHYS 990.0
	• PHYS 996.0
	• Qualifying examination
	• Comprehensive examination
	• Thesis defence

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Approval:
October 1st, 2013, by CGSR

PUBLIC HEALTH

New Graduate Course
PUBH 812.3 – Emergency Management for Public Safety
Prerequisites/ Restrictions:
None
Catalogue Description:
This course takes a One Health/ All Hazards approach to health emergency management (encompassing risk analysis, preparedness, detection, response, and recovery). We will explore special considerations for disease outbreaks, natural disasters, and bioterrorism through scenario-based exercises. Students will have the opportunity to become certified in the Incident Command System (ICS 100).
Rationale:
Increased globalization, climate change, and altered interfaces between animals and people are leading to increased frequency and severity of natural disasters and outbreaks of emerging disease. Public and animal health professionals require formal training in risk analysis (assessment, management, and communication) as well as health emergency management to be competitive in the job market, and to pursue academic research in the fields of public health and policy. This is a unique course offered at the University of Saskatchewan, targeted for future public and animal health professionals who will be responsible for preparedness and response of their clinic, agency, or region.
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VETERINARY BIOMEDICAL SCIENCES

New Graduate Course
VBMS 880.3 – Experimental Design and Statistical Analysis for the Natural Sciences
Prerequisites/ Restrictions:
Any undergraduate stats course
Catalogue Description:
This course is designed to provide students with a working knowledge of experimental design, data analysis and data reporting. The course will cover major univariate parametric and non-parametric tools, including more complex ANOVA designs (nested, repeated-measures, ANCOVAs), as well as a few multivariate ones (MANOVA, PCA).
Rationale:
The Department of Vet Biomedical Science is the most research intensive department in the College, yet the graduate students do not have access to a yearly statistic course in their department. Whether graduate students are working on molecular, cell, physiology or other behavioural endpoints, they will need to strong quantitative skills to perform high quality research and publish in high-quality journals. This course will go beyond what other courses may offer. First, the students will be exposed to the basic rules of good science, and will learn experimental design. This is what is usually lacking in other stats courses - to teach students how to design a scientifically sound experiment, to be aware of potential confounds and to remove those confounds. In addition, they will learn the most common univariate parametric and non-

parametric statistical tools. Emphasis will be given to complex ANOVA designs and mixed models designs. They will be introduced to some simple statistical modelling. The students will also be introduced to 2 common multivariate tools, widely used but rarely understood by researchers: PCA and MANOVAs. The lectures will aim to teach the students about the strengths and weaknesses of each statistical approach. The lab component of the course will ensure that the students not only understand the tools, but can use them properly and apply them directly to their research. Assignments will be given bi-weekly. One of the required outputs is scientific writing. The students will be asked to perform statistical analyses and provide a result section, similar to what would be required for publications. This course will provide graduate students with tools to design, analyze and write their results at peer-reviewed standards. In addition, there are three reasons this course should be offered:

(1)While other stats courses on campus might provide statistical tools pertaining to one's particular area, I find a common lack of understanding of the scientific method (how to state clear and testable hypotheses) and experimental design (how to lay out the experiment to minimize biases and avoid confounds). These are the basis of good science. Most of the scientific work has to be done before the first data point is collected. If students understand these concepts, they will be able to design better, higher-quality experiments. They should also know how to analyse their data before collecting them. Most graduate students I interact with do not realize that.

(2) Most statistical courses offer either univariate or multivariate statistical methods. I often find that students may need to use some simple multivariate techniques, without the need to take comprehensive classes on how the world of multivariate stats works. My course would be informative, as it would focus mainly on univariate methods (most common) but would also introduce the students to some simple multivariate techniques to handle simple multivariate data sets. In addition, statistics are more than just getting a p-value. The ability of students to draw meaningful conclusions (what level of inference do they have?) and know how to interpret their results (for instance, what does it mean to have an interaction?) is crucial, but often overlooked in classical stats courses.

(3) The endpoint of the analysis is to present, either in a thesis or in a publication, the essence of the results. This part is often skipped in classical statistical courses. Throughout the course, the students will learn to report data summary, plot appropriate figures, and write the equivalent of the "Result Section" of a paper. This will prepare the students for what is to come in their scientific career. I want the students to focus on the statistics and not programming. I believe programming should be an entire course in itself. Thus, the software for the course will be SPSS (U of S has a site-licence for it and have made it available in some computer labs). It is easy to work with, but can accommodate more complex inputs. The students will be able to continue using SPSS for their research. Other stats courses only offer statistical analysis based on the R-platform, which is a programming platform. For this reason, a number of students may not want to learn programming in order to perform their statistical tests

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Item for Information

Student and Enrolment Services Division
List of the Arts and Science Social Science, Humanities and Fine Arts courses

In order to keep the Catalogue as accurate and up-to-date as possible, SESD will use the following officially-approved Arts and Science Humanities, Social Science, and Fine Arts course lists in programs that require these courses, regardless of the college of ownership.

We currently have unique Humanities, Social Science, and Fine Arts lists for each college's programs in the database and this has proven to create inconsistencies. If we maintain one list for each of these areas, rather than several, they will always be correct and consistent.

These lists will be used for the relevant programs in Agriculture & Bioresources, Edwards School of Business, Kinesiology, Nursing, and Pharmacy & Nutrition.

AR Social Science, Humanities, and Fine Arts lists:

Social Science:

- ANTH 111.3
- ARCH 112.3
- ARCH 116.3
- ECON 111.3
- ECON 114.3
- GEOG 130.3
- LING 111.3
- LING 112.3
- NS 107.3
- POLS 111.3
- POLS 112.3
- PSY 100.3
- PSY 120.3 and PSY 121.3 (formerly PSY 110)
- SOC 111.3
- SOC 112.3
- WGST 112.3
- Any senior-level social science course provided that the prerequisite is met and not more than 6 credit units in one subject are used for the Social Science Requirement.
- Statistics courses in social sciences are not accepted for credit toward the Social Science Requirement (eg. ECON 204.6, PSY 233.3, PSY 234.3, SOC 225.3 and SOC 325.3).
- Certain WGST courses may be considered a Humanities and/or Social Science. Refer to the course descriptions.
- NRTH 101.3 may not be used to fulfill the Social Science Requirement.

Humanities:

- CHIN 111.6
- CHIN 130.6
- CLAS 110.3
- CLAS 111.3
- CMRS 110.3
- CMRS 111.3
- CREE 101.6
- CREE 120.6
- ENG 110.6
- ENG 111.3
- ENG 112.3
- ENG 113.3
- ENG 114.3
- FREN 103.3
- FREN 106.3
- FREN 122.3
- FREN 125.3
- FREN 128.3
- FREN 218.3
- GERM 114.3
- GERM 117.3
- GRK 112.3
- GRK 113.3
- HEB 111.6
- HIST 110.3
- HIST 111.3
- HIST 114.6
- HIST 120.6
- HIST 121.3
- HIST 122.3
- HIST 151.3
- HIST 152.3
- HIST 170.6
- INTS 101.12
- LATN 112.3
- LATN 113.3
- LING 110.3
- LIT 100.6
- PHIL 110.6
- PHIL 120.3
- PHIL 133.3
- PHIL 140.3
- RLST 110.6
- RUSS 114.3
- RUSS 117.3
- SNSK 101.6
- SPAN 114.3

- SPAN 117.3
- UKR 114.3
- UKR 117.3
- WGST 112.3
- any senior-level humanities course provided that the prerequisite is met and not more than 6 credit units in one subject are used for the Humanities or Languages Requirements.
- Certain WGST courses may be considered a Humanities and/or Social Science. Refer to the course descriptions.
- CLAS 103.3, CLAS 104.3, CLAS 105.3, and CLAS 106.3 may not be used to fulfill the Humanities requirement.

Fine Arts:

- ☐ ART 111.6
- ☐ ART 112.6
- ☐ ART 113.6
- ☐ ART 136.3
- ☐ ART 141.3
- ☐ ART 161.3
- ☐ ARTH 120.3
- ☐ ARTH 121.3
- ☐ DRAM 101.3
- ☐ DRAM 104.6
- ☐ DRAM 110.3
- ☐ DRAM 113.3
- ☐ DRAM 118.3 (formerly DRAM 116)
- ☐ DRAM 119.3 (formerly DRAM 117)
- ☐ MUS 101.3
- ☐ MUS 105.3
- ☐ MUS 111.3
- ☐ MUS 120.2
- ☐ MUS 121.2
- ☐ MUS 133.3
- ☐ MUS 134.3
- ☐ MUS 150.3
- ☐ MUS 151.3
- ☐ MUS 184.3

Any senior-level fine arts course provided that the prerequisite is met.