

MEMORANDUM TO: Ogden College of Science and Engineering Curriculum Committee

Dr. Jack Rudolph	Dr. James Gary	Dr. Greg Arbuckle
Dr. Martin Stone	Dr. Rong Yang	Dr. John Khouryieh
Dr. Bruce Schulte	Dr. Julie Ellis	Dr. Bruce Kessler
Dr. Phil Lienesch	Dr. Warren Campbell	Dr. Richard Schugart
Dr. Cathleen Webb	Dr. David Keeling	Dr. Keith Andrew
Dr. Hemali Rathnayake	Dr. Xingang Fan	Dr. Elizabeth Lemerise
Dr. Les Pesterfield		Dr. Matthew Shake

FROM: Kenneth Crawford, Chair

SUBJECT: Agenda for Thursday, May 1, 2014 4:00 p.m. in COHH 4123

A. OLD BUSINESS:

I. Consideration of the minutes of the April 3, 2014 meeting.

B. NEW BUSINESS:

Consent Items

Department of Physics & Astronomy

I. Proposal to Revise Course Prerequisites/Corequisites
a. PHYS 321, Introductory Modern Physics II, 3 hrs.

Action Items

Department of Architectural and Manufacturing Science

I. Proposal to Make Multiple Revisions to a Course
a. AMS 210, Introduction to Technology, 3 hrs.
b. AMS 368, Problem Solving/Research, 3 hrs.

Department of Physics & Astronomy

I. Proposal to Create a New Course
a. PHYS 425 (/PHYS 425G), Physics of Materials Science, 3 hrs.

C. OTHER BUSINESS

MEMBERS PRESENT:

Dr. Martin Stone
Dr. Les Pesterfield
Dr. Cathleen Webb
Dr. Phil Lienesch
Dr. Hemali Rathnayake
Dr. James Gary
Dr. Rong Yang
Dr. Warren Campbell
Dr. Greg Arbuckle

Dr. David Keeling
Dr. John Khouryieh
Dr. Bruce Kessler
Dr. Richard Schugart
Dr. Keith Andrew
Dr. Elizabeth Lemerise
Dr. Matthew Shake
Dr. Xingang Fan

FROM: Ken Crawford, Chair

OLD BUSINESS:

Keeling/Lemerise moved approval of the minutes from the March 6, 2014 meeting & special electronic March 7, 2014 meeting. Motion passed.

NEW BUSINESS:

Action Agenda

Department of Agriculture

Arbuckle/Keeling moved to approve proposal to create a new course, AGRI 323. Motion passed.

Department of Engineering

Keeling/Arbuckle moved approve proposal to revise a program, Ref. 534P, Civil Engineering-Prep. Motion passed.

Lemerise/Campbell moved to approve proposal to revise a program, Ref. 534, Civil Engineering. Motion passed with friendly amendment to update the program with the new colonnade requirements, strike through dropped courses, and change the total hours from 136 to 67.

OTHER BUSINESS:

No other business. Meeting was adjourned at 4:16 p.m.

Proposal Date:

College Name
Department Name
Proposal to Revise Course Prerequisites/Corequisites
(Consent Item)

Contact Person: Keith Andrew, keith.andrew@wku.edu, 270-745-4357

- 1. Identification of course:**
 - 1.1 Course prefix (subject area) and number: PHYS 321
 - 1.2 Course title: Introductory Modern Physics II
- 2. Current prerequisites/corequisites/special requirements:** PHYS 180/181, PHYS 265
- 3. Proposed prerequisites/corequisites/special requirements:** Prerequisites CHM 120/121 and MATH 237
- 4. Rationale for the revision of prerequisites/corequisites/special requirements:** This material is required for the topics covered in the class, the chemistry is needed for the quantum mechanical molecular bonding and calculus is needed for the treatment of the Schrödinger equation in three spatial dimensions.
- 5. Effect on completion of major/minor sequence:** no change, these courses have always been required for the major and are taken early in the program.
- 6. Proposed term for implementation:** SP 2015
- 7. Dates of prior committee approvals:**

Department/ Unit	__Physics and Astronomy__	<u>April 2, 2014</u>
__OCSE__	College Curriculum Committee	_____
Professional Education Council (if applicable)		_____
General Education Committee (if applicable)		_____
Undergraduate Curriculum Committee		_____
University Senate		_____

Proposal Date:

Ogden College of Science and Engineering
Architectural and Manufacturing Science Department
Proposal to Make Multiple Revisions to a Course
(Action Item)

Contact Person: Bryan Reaka, AMS Department, bryan.reaka@wku.edu, 270-745- 7032

1. Identification of course:

- 1.1 Current course prefix (subject area) and number: AMS 210
- 1.2 Course title: Introduction to Technology

2. Revise course title:

- 2.1 Current course title: Introduction to Technology
- 2.2 Proposed course title: Technology and Societal Impact
- 2.3 Proposed abbreviated title: Technology and Societal Impact
- 2.4 Rationale for revision of course title: AMS 210 has been a General Education course, designed to present a survey of technology and ethics to undergraduates in various disciplines. With the creation of the Colonnade Program, the AMS Faculty now seeks to modify the title and emphasis of the course to qualify it for inclusion as a colonnade offering.

3. Revise course number:

- 3.1 Current course number: N/A
- 3.2 Proposed course number: N/A
- 3.3 Rationale for revision of course number: N/A

4. Revise course prerequisites/corequisites/special requirements:

- 4.1 Current prerequisites/corequisites/special requirements: N/A
- 4.2 Proposed prerequisites/corequisites/special requirements: None
- 4.3 Rationale for revision of course prerequisites/corequisites/special requirements: N/A
- 4.4 Effect on completion of major/minor sequence: None

5. Revise course catalog listing:

- 5.1 Current course catalog listing: Prerequisite: A study of technology and ethics in technology with laboratory activities in manufacturing, construction, communication, power and transportation. Lecture and laboratory.
- 5.2 Proposed course catalog listing: A study of technology and the west through Great Britain's Industrial Revolution (c. 1850) and the expansion and diffusion of Western Industrial Technology (c. 1850 to present).
- 5.3 Rationale for revision of course catalog listing: To modify the emphasis of the course to include all colonnade requirements.

6. Revise course credit hours:

- 6.1 Current course credit hours: N/A
- 6.2 Proposed course credit hours: N/A
- 6.3 Rationale for revision of course credit hours: N/A

7. Revise grade type:

- 7.1 Current grade type: N/A
- 7.2 Proposed grade type: N/A
- 7.3 Rationale for revision of grade type: N/A

8. Proposed term for implementation: Fall 2014

9. Dates of prior committee approvals:

Department of Architectural and Manufacturing Sciences	4-4-2014
OCSE Curriculum Committee	_____
Undergraduate Curriculum Committee	_____
University Senate	_____

Proposal Date: April 18, 2014

Ogden College of Science and Engineering
Architectural and Manufacturing Science Department
Proposal to Make Multiple Revisions to a Course
(Action Item)

Contact Person: Dr. Mark Doggett, AMS Department, mark.doggett@wku.edu, 270-745- 6951

1. Identification of course:

- 1.1 Current course prefix (subject area) and number: AMS 368
- 1.2 Course title: Problem Solving/Research

2. Revise course title:

- 2.1 Current course title: Problem Solving/Research
- 2.2 Proposed course title: Problem Solving
- 2.3 Proposed abbreviated title: Problem Solving
- 2.4 Rationale for revision of course title: AMS 368 has been offered as a course to present research and problem-solving techniques to students in various disciplines. With the creation of the Colonnade Program, the AMS faculty now seeks to modify the title and emphasis of the course to qualify it for inclusion as a colonnade offering.

3. Revise course number:

- 3.1 Current course number: N/A
- 3.2 Proposed course number: N/A
- 3.3 Rationale for revision of course number: N/A

4. Revise course prerequisites/corequisites/special requirements:

- 4.1 Current prerequisites/corequisites/special requirements: AMS 271
- 4.2 Proposed prerequisites/corequisites/special requirements: None
- 4.3 Rationale for revision of course prerequisites/corequisites/special requirements: The course will be slightly modified to ensure the goals outlined in the Colonnade program are met, but not to change the overall content. Those changes will ensure that AMS 271 will not be needed to successfully complete the class.
- 4.4 Effect on completion of major/minor sequence: None

5. Revise course catalog listing:

- 5.1 Current course catalog listing: Prerequisite: AMS 271. An application oriented introduction to basic analytical tools for the solution of practical industrial problems. Focusing on developing qualitative and quantitative literacy and analytic skills, the emphasis will be on data analysis, graphics and simple experiments applied to typical problems encountered in architectural and manufacturing practice. Course Fee
- 5.2 Proposed course catalog listing: An application oriented introduction to basic analytical tools for the solution of practical problems. Focusing on developing qualitative and quantitative literacy and analytic skills, the emphasis will be on data analysis, graphic communication and simple experiments applied to real problems.
- 5.3 Rationale for revision of course catalog listing: To modify the emphasis of the course to include all Colonnade requirements and remove the need for a prerequisite course.

6. Revise course credit hours:

- 6.1 Current course credit hours: N/A
- 6.2 Proposed course credit hours: N/A
- 6.3 Rationale for revision of course credit hours: N/A

7. Revise grade type:

- 7.1 Current grade type: N/A
- 7.2 Proposed grade type: N/A
- 7.3 Rationale for revision of grade type: N/A

8. Proposed term for implementation: Spring 2015

9. Dates of prior committee approvals:

Department of Architectural and Manufacturing Sciences
OCSE Curriculum Committee
Undergraduate Curriculum Committee
University Senate

April 18, 2014

Proposal Date: February 03, 2014

Ogden College of Science and Engineering
Department of Physics & Astronomy
Proposal to Create a New Course
(Action Item)

Contact Person: Sanju Gupta, sanju.gupta@wku.edu, (270) 745-5940

1. Identification of proposed course:

- 1.1 Course prefix and number: **PHYS425 (/ PHYS425G)**
- 1.2 Course title: **Physics of Materials Science**
- 1.3 Abbreviated course title: **Phys Mat Sci**
- 1.4 Credit hours and contact hours: **3**
- 1.5 Type of course: **C**
- 1.6 Prerequisite(s): **PHYS321, MATH 237**
- 1.7 Corequisite(s): **PHYS440, MATH 331**
- 1.8 **Course catalog listing:** This course investigates the fundamental quantum physics of bonding, energetics and structure that underpins the foundation of the physics of materials. The physical properties of nanomaterials and their corresponding applications will be explored using the principles of quantum physics. Materials examined include engineered metal alloys, electronic and magnetic materials, ionic and network solids, ceramics, polymers, and biomaterials at all length scales.

2. Rationale:

- 2.1 **Reason for developing the proposed course:** Students will benefit from a course on novel materials complemented with nanotechnology applications. They will obtain the knowledge and skills necessary for work at academic research laboratories, national laboratories and industrial facilities using state-of-the art procedures to produce: synthetic nanomaterials, electro-ceramics, multiferroics, stronger composites with polymers, and energy harvesting structures. This course will allow students to be exposed to and become knowledgeable about the rapidly growing area of the quantum properties of materials, especially students who are interested in pursuing graduate studies in physics and materials science and students who are in the M. Phil program, currently being developed at WKU.
- 2.2 **Projected enrollment in the proposed course:** 6-8 students per offering based on previous enrollment in Solid-State Physics course.
- 2.3 **Relationship of the proposed course to courses now offered by the department:** The proposed course builds on the basic concepts discussed in PHYS 321 and PHYS 440. However, there is only a minimal overlap between the content of PHYS 425 and that of any other physics course currently offered by the department. This course will be offered on a rotating basis *i.e.* every other Fall or Spring semester. The course PHYS 425G is intended for students in the Masters in Homeland Security Sciences Program, for these students there will be an extra component in the course requiring reading and presenting of current research papers.

2.4 **Relationship of the proposed course to courses offered in other departments:**
This course in the physics of materials science focuses on the detailed quantum structural and physical properties of technologically significant materials at all length scales: from bulk solids to low-dimension or nanoscale materials. It complements the chemistry course, CHEM 490 Materials Chemistry in the Department of Chemistry, by providing a quantum physics approach to materials formation and function using MATH 237 tools. Since the proposed course will be offered on alternative Spring odd years, it will be considered as an equivalent elective to CHEM 490 for students in the physics major.

2.5 **Relationship of the proposed course to courses offered in other institutions:** A course on the physics of materials is offered in the Department of Physics and/or Department of Materials Science & Engineering at several universities in the United States, MIT and Cornell offer a physics of materials and a solid state course for undergraduate physics majors. MTSU specializes in digital electronic material devices and solid state materials, UK has a series of courses on materials in engineering, chemistry and physics. Students who are interested in research experience through the summer NSF-REU programs at other institutions will be better prepared through this course.

3. **Discussion of proposed course:**

3.1 **Course objectives:** This course is designed to study the quantitative aspects of novel materials and their applications. Upon completion of this course, the students will acquire a calculus based quantitative understanding of the structural and physical properties of both the traditional and technologically important advanced functional materials at the nanoscale to help meet the demands of our modern digital age and the wide range of high-tech applications.

3.2 **Content outline:** A general framework from the abovementioned textbook is as follows:

- ❖ **Atomic Structure and Interatomic Bonding**
- ❖ **The Structure of Crystalline and Non-crystalline Solids**
- ❖ **Solidification, Crystalline imperfections/defects, and Diffusion in Solids**
- ❖ **Phase Diagrams and Phase Equilibrium** (of unary and multi-component systems and Gibbs phase rule)
- ❖ **Types of Nanomaterials and Applications** 0D (quantum dots), 1D (nanotubes), 2D (planar sheets), 3D (mesoscopic), hybrid systems, Energy and biological-related applications
- ❖ **Electrical and Thermal Properties of Bulk Solids and Nanomaterials**
- ❖ **Semiconductor Materials** (Electronic Properties)
- ❖ **Ceramic Materials** (traditional and advanced electro-ceramics, silicate structures) their processing and physical properties
- ❖ **Polymeric Materials** (types of polymers, polymerization reactions and deformation, advanced polymers, soft- and bio-materials)

- ❖ **Magnetic Materials** (dia-, para-, ferro-, antiferro-, ferri-), soft and hard magnets, magnetic storage, superconductivity and topological insulators
 - ❖ **Optical Properties** (basics include electromagnetic radiation and light interaction with solids – absorption, reflection, refraction, and transmission, applications of optical phenomena – photoluminescence and stimulated emission of radiation *i.e.* lasers, metamaterials)
 - ❖ **Composite Materials** (particulate- and fiber-reinforcements forming bulk and nanoscale composites) and **Mechanical Properties**
 - ❖ **Modification of Physical Properties Through Changes in Environment and Microstructure** thus establishing *Property-Microscopic structure-Processing-Functionality* relationship
- 3.3 **Student expectations and requirements:**
Performance will be evaluated based upon examinations, classroom discussion, field trips, and term paper presentation.
- 3.4 *Materials Science and Engineering: An Introduction* by William D. Callister Jr. and David G. Rethwisch, 9th Ed. John Wiley & Sons, Inc. New York, 2013. ISBN-10: 1118324579 | ISBN-13: 978-1118324578.

Bibliography:

Introduction to Materials Science for Engineers, James F. Shackelford, 7th Ed. Prentice-Hall, Upper Saddle River, New Jersey, 2008.
Principles of Materials Science and Engineering, William F. Smith, McGraw-Hill, Inc. 3rd Ed. New York, 1999.

4. Resources:

- 4.1 Library resources: See attached library resource form and bibliography.
- 4.2 Computer resources: No new additional resources required.

5. Budget implications:

- 5.1 Proposed method of staffing: Existing faculty will teach this course.
- 5.2 Special equipment needed: None
- 5.3 Expendable materials needed: None
- 5.4 Laboratory materials needed: None

6. Proposed term for implementation: Spring 2015

7. Dates of prior committee approvals:

Department of Physics & Astronomy _____ March 31, 2014 _____

OCSE College Curriculum Committee _____

Undergraduate Curriculum Committee _____

Senate _____

Attachment: Bibliography

Bibliography:

Materials Science and Engineering: An Introduction by William D. Callister Jr. and David G. Rethwisch, 9th Ed. John Wiley & Sons, Inc. New York, 2013. ISBN-10: 1118324579 | ISBN-13: 978-1118324578

Introduction to Materials Science for Engineers, James F. Shackelford, 7th Ed. Prentice-Hall, Upper Saddle River, New Jersey, 2008.

Principles of Materials Science and Engineering, William F. Smith, McGraw-Hill, Inc. 3rd Ed. New York, 1999.