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12 April 2024

MEMORANDUM TO THE VMI BOARD OF VISITORS THROUGH THE ACADEMIC AFFAIRS COMMITTEE

SUBJECT: Approval of Curricular Changes

Background

The Board of Visitors is charged with the responsibility of ensuring the academic quality and integrity of the Institute. The following changes to the Institute curriculum have been approved by the Academic Board and are submitted for the approval of the Board of Visitors:

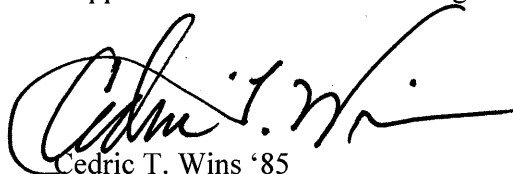
- Programmatic Changes:
 - International Studies Major Curricular Changes – Enclosure (1)
 - Replace Biology Concentrations with a Biology Minor – Enclosure (2)
 - Physics Major Curricular Changes – Enclosure (3)
 - Mechanical Engineering Major Curricular/Course Changes – Enclosure (4)
 - Economics and Business Major Curricular Change – Enclosure (5)

- Name Changes:
 - The Civil and Environmental Engineering Department proposed changing the name of CE 409 from “Hazardous Waste Treatment and Site Remediation” to “Environmental Site Remediation.”
 - The Chemistry department proposed changing the name of its “Chemistry, B.S. - Pre-Medical Track” to “Chemistry, B.S. - Biochemistry/Pre-Medical Track.”

- New Courses – Enclosure (6):
 - GR 333 – In the Shadow of the Berlin Wall: Germany from the Cold War to Reunification, 1961-1990 (3-0-3)
 - EE 461 – RF Circuit Design-I (2-2-3)
 - EE 462 – RF Circuit Design-II (2-2-3)
 - MA 339 – Introduction to Python (1-0-1)
 - MA 340 – Introduction to R Programming for Data Science and Statistics (1-0-1)
 - MA 349 – Introduction to VBA Programming (1-0-1)
 - IS 333 – Politics in the Middle East (3-0-3)
 - PY 101 – Fundamentals of Physics (3-0-3)
 - ME 426 – Mechatronics (3-0-3)
 - BU 212 – Principles of Accounting (3-0-3)

Recommended Motion

“The Academic Affairs Committee has considered the recommended Curricular Changes dated 12 April 2024. I move that the Board of Visitors approve these Curricular Changes and that they be made part of the minutes.”

A handwritten signature in black ink, appearing to read "Cedric T. Wins '85". The signature is fluid and cursive, with a long horizontal stroke extending to the right.

Cedric T. Wins '85
Major General, U.S. Army (Retired)
Superintendent

International Studies Curricular Changes

The International Studies and Political Science (ISPS) Department proposed the following, changes to the International Studies (IS) major curriculum:

1. **Replace the requirement for IS majors to complete IS 210 – American Government with HI 300 – Constitutional History.** IS 210 has been a required course in the IS curriculum since the major's inception, and it has been something of an outlier as no other courses in the IS curriculum focus on the domestic political aspects of the American system. For nearly ten years, IS 210 has been taught exclusively by adjuncts while the full-time ISPS faculty have focused on instruction of the IS curriculum's core, substantive topics of international relations/security studies and cross-national comparative politics. As the Institute and the History Department move towards implementing HI 300 as a Core Curriculum requirement, HI 300 would fulfil the role filled by IS 210 in the current IS curriculum while enabling IS majors to be the first major to incorporate HI 300 as a curricular requirement.
2. **Course Prerequisites.** The ISPS Department proposed the introduction of a small number of prerequisites to ensure the timely, sequential completion of core, required courses at the 200, 300, and 400 levels. Following are the proposed changes:
 - a. Set the (aggregate) completion of IS 201 (Introduction to International Studies), IS 220 (International Politics), and IS 230 (Comparative Politics) with grades of C or better as prerequisite for enrollment in IS 301 (Techniques of Computer Analysis) for all IS majors.
 - b. Set the completion of IS 301 with a grade of C or better as prerequisite for enrollment in IS 401W (Capstone) for all IS majors.

Replace Biology Concentrations with a Biology Minor

The Biology Department proposed to eliminate its two concentrations, in Biochemistry and Molecular Biology (BMB) and Ecology, Conservation, and Organismal Sciences (ECOS), and replace them with a Biology minor, which would be available to all majors. The Department feels these concentrations have become poorly used and do not offer much added value for the Biology program or for the Institute. For example, Biology majors with interest in chemistry have typically pursued a Chemistry minor as opposed to the BMB concentration. Biology currently offers a wide variety of courses in the major, many of which are beneficial to students in other majors. By transitioning to a Biology minor, the Department would be able to serve more students from other majors.

Biology minors would complete the introductory sequence currently taken by many first-year students as part of the Core Curriculum science requirement, or the introductory sequence taken by Biology majors. Biology minors would also take upper-level courses as described below, for a total of 20 credits of Biology courses. Following are the proposed requirements:

- Complete one of the two introductory sequences:
 - BI 101, General Biology I and BI 102, General Biology II; or,
 - BI 111, Fundamentals of Biology I, BI 112, Fundamentals of Biology II, and BI 113, Fundamentals of Biology III.

- Complete additional, upper-level Biology courses for a total of 20-credits hours in Biology. At least one course must be completed from at least two of the following groups of courses:
 - Organismal Biology
BI 216, Animal Behavior BI 217, General Botany BI 301, Nematology
BI 304, Comparative Vertebrate Morphology BI 307, Vertebrate Biology
BI 313, Microbiology
BI 321, Invertebrate Zoology BI 326, Parasitology

 - Cell and Molecular Biology
BI 204, Physiology
BI 210, Comparative Animal Nutrition
BI 303, Developmental Biology
BI 335, Neurobiology
BI 346, Genetics
BI 404, Cell Biology
BI 406, Virology
BI 411, Immunology
BI 430, Molecular Biology

- Ecology, Evolution, and Environmental Biology

- BI 219, Conservation Biology

- BI 250, Analysis of Environmental Issues

- BI 310, Evolution

- BI 311, Aquatic Ecosystems

- BI 312, Ecology

- BI 325, Ecological Biochemistry

- In addition to meeting the course and credit requirements, a minimum GPA of 2.0 for Biology coursework will be required to successfully complete the minor.

Physics Major Curricular Changes

The Physics and Astronomy Department proposed the following changes to the Physics major curriculum:

- Fall of fourth-class year, drop CH 137 and CH 117 replace it with new, 3-credit course PY 101 – Fundamentals of Physics (submitted in a separate proposal);
- Spring of fourth-class year, drop CH 138 and CH 118, replace it with a 3-credit free elective;
- Fall of second-class year, add a 1-credit free elective;
- Reduce the total hours in the curriculum from 137 to 136.

Currently, fourth-class Physics majors are required to take 18.5 credits hours each semester. Many cadets struggle with the course load, which includes both the general physics and the chemistry introductory sequence with labs. The combination of 18.5 credit hours with the two lab sciences, while in the Ratline, is challenging even for Rats that enter VMI well prepared for college. As a result, many fourth class Physics majors have very low GPAs or drop courses because they are failing. Recovering from either scenario is complicated and often leads to cadets changing majors, being placed on academic probation, or leaving VMI. In addition, the 2022 external review team recommended the Department reduce the number of required courses and increase the number of electives in the Physics curriculum. Therefore, to facilitate greater academic success in the fourth-class year, and to implement recommendations from the external reviewers, the Department proposed removing the chemistry requirement from the Physics curriculum. Instead, fourth-class Physics majors would take the new PY 101 course in the fall semester, which is designed to teach these cadets the necessary skills to succeed in the major. In the spring semester, fourth-class Physics majors would take a three-credit free elective. The proposed changes to the curriculum would offer a more manageable workload for fourth-class Physics majors. In addition, the changes would add four credits of free electives to the curriculum: three in the fourth-class year and one in the second-class year.

Mechanical Engineering Curricular/Course Changes

The Mechanical Engineering (ME) Department proposed the following changes to its major curriculum:

- **Elective Requirements.** The Department proposed the following changes to its major elective requirements:
 - Change 3 hours of Math/Science electives to 3 hours of ME electives;
 - Change 3 hours of Technical electives to 3 hours of ME electives.

Changes in ABET standards regarding curriculum have reduced the number of total required college-level mathematics and basic science credit hours from 32 hours to 30 hours. ME currently requires 33 college-level mathematics and basic science credit hours as a part of the major curriculum, with 3 hours being reserved as a Math/Science Elective. Additionally, during the last two ABET accreditation visits (2012, 2018), reviewers verbally expressed concerns about the limited number of ME elective course offerings. Therefore, the proposal would align the major curriculum with the current ABET accreditation standards, and it would implement recommended changes from the last two accreditation visits.

- **Course Sequencing.** The Department proposed the following changes to the sequencing in which courses are taken in the major curriculum:
 - Move ME 314 (Fluid Mechanics) from spring of the second-class year to fall of the second-class year;
 - Move EC 322 (Engineering Economics) from fall of the second-class year to fall of the first-class year;
 - Move the Civilizations and Cultures elective from fall of the second-class year to spring of the second-class year;
 - Move a Human Performance and Wellness elective from fall of the first-class year to fall of the second-class year.

The reason for these changes is to move ME-314 (Fluid Mechanics) which is typically taught to ME second-classman during spring semester, to the 2nd class year fall semester.

Currently, teaching ME 314 (Fluid Mechanics) in spring of the second-class year places it out of sequence compared to other mechanical engineering programs. Typically, this course is taught prior to students taking ME 336 (Heat and Mass Transfer) as students learn fundamental concepts needed for ME 336 in ME 314. Changing the sequencing of ME 314 necessitates the other proposed sequencing changes in order to keep credit hours balanced within the major curriculum.

- **Course Credit Changes.** The Department proposed the increases to the credit hours associated with the following design courses:
 - ME 243 – ME Design Competition Participation (0-1-0.5) to (0-2-1);
 - ME 244 – ME Design Competition Participation (0-1-0.5) to (0-2-1);

- ME 343 – ME Design Competition Participation (0-1-0.5) to (0-2-1);
- ME 344 – ME Design Competition Participation (0-1-0.5) to (0-2-1).

These four courses are offered to ME majors participating on a design competition team (e.g., Baja SAE team). Cadets have begun taking these courses to learn more about automotive engineering as opposed to simply working on the design/fabrication of a competition project; the original intent of these courses. The proposed changes would enable the Department to cover additional automotive engineering information in addition to the hands-on experience of designing, building, and analyzing projects. In addition, the increased credit hours would enable cadets who participate in at least three semesters of design competition to use those credits to satisfy a 3-hour elective requirement.

Economics and Business Major Curricular Change

The Economics and Business (ECBU) Department proposed replacing BU 210 – Financial Accounting and BU 211 – Managerial Accounting with the new BU 212 – Principles of Accounting (contingent upon its approval) as the only required accounting course in the ECBU curriculum.

Following is the basis for this proposal:

- AACSB, our accrediting body, AACSB, does not prescribe a minimum number of accounting hours required in a general, undergraduate business degree;
- It is common in business schools to require general business majors to complete only one combined accounting class, because they do not require the depth of accounting knowledge provided by taking both BU 210 and BU 211;
- Some topics currently covered in Managerial Accounting are covered in other required courses, such as Business Finance;
- The ECBU Department has only one full-time accounting faculty position, and qualified, accounting adjunct faculty are extremely hard to find;
- The typical matriculating class requires three sections of both BU 210 and BU 211 to meet student demand, which is difficult to staff without adjunct support.

Therefore, the proposed change would more closely align VMI's ECBU program with accreditation standards and other business programs while simultaneously easing the pressure on the Department to staff six required sections of accounting with one full-time accounting faculty.

New Course Descriptions

GR 333 – In the Shadow of the Berlin Wall: Germany from the Cold War to Reunification, 1961-1990 (3-0-3)

Course Description: This course will address the issues that weighed on the minds of Germans during the 1960s, 1970s and 1980s. Themes will include coming to terms with the Nazi past, tensions of the Cold War (including Western integration and Ostpolitik), the economic and social integration of guest workers and the images that the two Germanies projected to the world. Readings (in English) will be taken from journalists and artists who lived during this time, including Heinrich Böll, Fritz Stern ("Five Germanies I Have Known"), Rudolf Augstein, editor-in-chief of Spiegel magazine and Marion Gräfin Dönhoff, managing editor of the weekly "Die Zeit". We will also examine eyewitness accounts of important events. This course does not include a foreign language component and cannot be used toward a language requirement for language credit.

EE 461 – RF Circuit Design-I (2-2-3)

Course Description: This RF circuit design course introduces cadets to high-frequency passive circuit analysis and design, focusing on transmission lines, microwave network analysis (s-parameters, impedance matching with the Smith chart), and key microwave passive components (e.g., power dividers, couplers). The concurrent hands-on lab sessions emphasize proficiency with Advanced Design System (ADS), a leading industry-standard software for high-frequency circuit and system design, covering linear and non-linear electrical schematic analysis, electromagnetic (EM) simulation, and co-simulation. The course features comprehensive projects involving the design and PCB fabrication of microstrip versions of these components. Cadets also gain practical experience in component measurement using a vector network analyzer (VNA).

EE 462 – RF Circuit Design-II (2-2-3)

Course Description: This second course on radio-frequency (RF) circuit design aims to introduce cadets to the fundamentals of high-frequency active circuit analysis and design. Specifically, in this course, cadets will learn basic concepts of RF transistor amplifiers, low-noise amplifiers (LNAs), broadband amplifiers, and power amplifiers. Power gain equations, conjugate match, stability considerations, gain and noise circles, DC bias networks, and balanced amplifiers will be the main focus of this course. In the accompanying lab sessions, cadets will learn the Advanced Design System (ADS)-a leading industry-standard software for high-frequency circuits and systems design. Both linear and non-linear electrical (schematic) analyses, as well as electromagnetic (EM) and EM co-simulation, will be introduced in the context of amplifier design. Furthermore, cadets will complete a hands-on project on the design and PCB fabrication of a microstrip RF amplifier, and they will measure its performance using a vector network analyzer (VNA), signal generator, and power meter.

MA 339 – Introduction to Python (1-0-1)

Course Description: This course is an introduction to the Python programming language. In this course, you will learn the basic syntax required to write programs in Python. The course assumes you have learned at least one programming language and are comfortable with basic flow control (if-statements, for-loops, etc.).

MA 340 – Introduction to R Programming for Data Science and Statistics (1-0-1)

Course Description: This 300-level course is an introduction to programming with R, a language for statistical computing and graphics. The topics covered include basic operations on vectors, matrices, and data frames. Students also learn how to use R functions for data analysis, like data manipulation, obtaining summary of data, data visualization, data cleansing, and fitting models. Prerequisite: MA-220 or EC-303 or PS-205.

MA 349 – Introduction to VBA Programming (1-0-1)

Course Description: This course is an introduction to Visual Basic for Applications (VBA). We will create VBA code to solve problems with automated solutions in Excel. Topics include, but are not limited to, basic syntax, macros, subroutines, loop structures, logic, I/O, and general data management. This is intended for those who have had some programming experience and at least a basic understanding of Excel.

IS 333 – Politics in the Middle East (3-0-3)

Course Description: The Middle East and North Africa (MENA) countries continue to occupy a substantive role in World Politics. What is the region that we call MENA, and how do we study it? Why do some MENA countries struggle with implementing democracy and advancing their economy? Could their shortcomings be explained through institutional, structural factors or foreign influence? How can we explain the rise of terrorist groups originating from the region? In this introductory course we seek answers to such questions. The first part of the course is thematic, focusing on broad trends in the region. In the second part we analyze specific country-cases. Following the completion of this course, cadets will gain in-depth knowledge of the region to produce their own research.

PY 101 – Fundamentals of Physics (3-0-3)

Course Description: This is a one-semester courses designed to introduce physics students to fundamental skills and techniques commonly used by practicing physicists. Topics include logical reasoning and application of physics and mathematics to problem solving, introduction to Excel and other programming tools, exploration of various fields of physics, with emphasis on common practices and professionalism in the field.

ME 426 – Mechatronics (3-0-3)

Course Description: Design of electromechanical systems. Passive and active electrical components will be covered, in addition to practical driver circuitry and amplification circuits. Sensors, actuators, and microcontrollers introduced via project-based instruction. (3-0-3).
Prerequisite: EE-351.

BU 212 – Principles of Accounting (3-0-3)

Course Description: This course is designed to teach students the fundamental principles of accounting, including foundational concepts from financial and managerial accounting.