MEMORANDUM

TO: Charles Caramello,
   Associate Provost and Dean, Graduate School

   Stephen Halperin
   Dean, College of Computer, Mathematical and Physical Sciences

FROM: Phyllis Perez
   Associate Provost for Academic Planning and Programs

SUBJECT: Proposal to offer a new iteration of the Master of Professional Studies and three new iterations of the Graduate Certificate in Professional Studies (PCC log nos. 08051-08054)

On April 23, Chancellor Kirwan gave final approval to your proposal to offer a new iteration of the Master of Professional Studies in Atmospheric and Oceanic Science and Technology, and three new iterations of the Graduate Certificate in Professional Studies, in (1) General Atmospheric and Oceanic Science, (2) Air Quality Science and Technology, and (3) Computational Methods in Atmospheric and Oceanic Science. A copy of the approved proposal is attached.

The changes are effective Fall 2009.

CWR/

Enclosure

cc: Carmen Balthrop, Chair, Senate PCC Committee
Sarah Bauder, Office of Student Financial Aid
Reka Montfort, University Senate
Barbara Hope, Data Administration
Eric Spear, Institutional Research & Planning
Anne Turkos, Archives
Linda Yokoi, Office of the Registrar
Thomas Castonguay, Graduate School
James Purtilo, College of Computer, Mathematical and Physical Sciences
James Carton, Atmospheric and Oceanic Science
April 23, 2009

Dr. C. D. Mote, Jr.
President
University of Maryland, College Park
1101 Main Administration Building
College Park, MD 20742

Dear Dan:

Thank you for forwarding the request of the University of Maryland, College Park to offer a new iteration of the Professional Studies degree focusing on Atmospheric and Oceanic Science and Technology. Further, you have mentioned that the university would like to offer three new iterations of the Graduate Certificate in Professional Studies in General Atmospheric and Oceanic Science, Computational Methods in Atmospheric and Oceanic Science, and Air Quality Science and Technology, respectively.

I am pleased to approve this recommendation. Please express my appreciation to departmental faculty and administrative committees for their careful work in planning for this program.

Sincerely yours,

William E. Kirwan
Chancellor

cc: Irwin Goldstein
Theresa Hollander
Nariman Farvardin, Senior Vice President for Academic Affairs and Provost

OFFICE OF THE PRESIDENT

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THE UNIVERSITY OF MARYLAND, COLLEGE PARK
PROGRAM/CURRICULUM PROPOSAL

DIRECTIONS:

- Provide one form with original approval signatures in lines 1 - 4 for each proposed action. Keep this form to one page in length.
- Early consultation with the Office of the Associate Provost for Academic Planning & Programs is strongly recommended if there are questions or concerns, particularly with new programs.
- Please submit the signed form to Claudia Rector, Office of the Associate Provost for Academic Planning and Programs, 1119 Main Administration Building, Campus.
- Please email the rest of the proposal as an MSWord attachment to pcc-submissions@umd.edu.

DATE SUBMITTED_ 1-14-09

PCC LOG NO. 08051

COLLEGE/SCHOOL_CMPS

DEPARTMENT/PROGRAM__AOSC: Master of Professional Studies in
Atmospheric and Oceanic Science and Technology

PROPOSED ACTION (A separate form for each) ADD x DELETE_______ CHANGE______

DESCRIPTION (Provide a succinct account of the proposed action. Details should be provided in an attachment. Provide old and new sample programs for curriculum changes.)

This is a proposal by the Department of Atmospheric and Oceanic Science to create a Master of Professional Studies in Atmospheric and Oceanic Science and Technology. The goal of the proposed program is to provide professionals in the Washington, DC area with the background they will need for employment as researchers in the environmental fields of meteorology and physical oceanography.

JUSTIFICATION/REASONS/RESOURCES (Briefly explain the reason for the proposed action. Identify the source of new resources that may be required. Details should be provided in an attachment.)

Two factors provide motivation for this proposal. The first is our location in the Washington area – next to the new home of the NOAA/National Centers for Environmental Prediction (NCEP) and the National Environmental Data and Information Service at MSquare, close to the NASA Goddard Space Flight Center in Greenbelt, a variety of other NOAA facilities in Silver Spring, NASA headquarters downtown, the Office of Naval Research headquarters in Arlington, etc. Each of these facilities hires new employees who are in need of additional education and training as well as employees who may be interested in further education for career advancement. NCEP alone hires 40 new junior atmosphere/ocean scientists each year. Corresponding projections for NASA Goddard are more difficult to make due to the diversity of contractor companies, but the potential is large. Indeed, the American Meteorological Society in the Washington area shares with Boulder Colorado the distinction of having the highest number of scientists working in the areas of atmospheric and oceanic science. The government laboratories also may provide additional instructional help from active or retired scientists who would enjoy becoming involved in education. For example, a key department course will be taught this fall by an NCEP retiree, Dr. Vern Kousky.

The second factor that motivates this proposal is the critical mass of expertise already in place at the University. The Department of Atmospheric and Oceanic Science has an outstanding research program in Atmospheric and Oceanic Science. The presence of over 50 graduate students ensures many potential teaching assistants, opportunities that will benefit both the students and the teaching assistants who would be supplied by current graduate students. The Department is surrounded by superb science departments which can provide additional help on relevant topics such as high performance computing.

The program will be self-funding and so no new resources will be required.
APPROVAL SIGNATURES - Please print name, sign, and date

1. Department Committee Chair  James A. Carton

2. Department Chair  James A. Carton

3. College/School PCC Chair  JAMES CARTON

4. Dean  JAMES CARTON

5. Dean of the Graduate School (if required)  [Signature]

6. Chair, Senate PCC  [Signature]  4/3/09

7. Chair of Senate  [Signature]  5/15/09

8. Vice President for Academic Affairs & Provost  Phyllis Reyes  5/15/09

VPAAP 8-05
PROPOSAL FOR

NEW INSTRUCTIONAL PROGRAM

UNIVERSITY OF MARYLAND AT COLLEGE PARK, MARYLAND

Master of Professional Studies in

Atmospheric and Oceanic Science and Technology

PROPOSED INITIATION DATE: Fall 2009
I. OVERVIEW and RATIONALE

A. Briefly describe the nature of the proposed program and explain why the institution should offer it.

This is a proposal by the Department of Atmospheric and Oceanic Science to create a Master of Professional Studies in Atmospheric and Oceanic Science and Technology, associated with proposals for three Certificates of Professional Studies in Computational Methods in Atmospheric and Oceanic Science, Atmospheric and Oceanic Science, and in Air Quality Science and Technology. The goal of the proposed program is to provide professionals in the Washington, DC area with the background they will need for employment as researchers in the environmental fields of meteorology and physical oceanography.

Two factors provide motivation for this proposal. The first is our location in the Washington area – next to the new home of the NOAA/National Centers for Environmental Prediction (NCEP) and the National Environmental Data and Information Service at MSquare, close to the NASA Goddard Space Flight Center in Greenbelt, a variety of other NOAA facilities in Silver Spring, NASA headquarters downtown, the Office of Naval Research headquarters in Arlington, etc. Each of these facilities hires new employees who are in need of additional education and training as well as employees who may be interested in further education for career advancement. NCEP alone hires 40 new junior atmosphere/ocean scientists each year. Corresponding projections for NASA Goddard are more difficult to make due to the diversity of contractor companies, but the potential is large. Indeed, the American Meteorological Society in the Washington area shares with Boulder, Colorado the distinction of having the highest number of scientists working in the areas of atmospheric and oceanic science. The government laboratories also may provide additional instructional help from active or retired scientists who would enjoy becoming involved in education. For example, a key department course will be taught this fall by an NCEP retiree, Dr. Vern Kousky.

The second factor that motivates this proposal is the critical mass of expertise already in place at the University. The Department of Atmospheric and Oceanic Science has an outstanding academic and research program in Atmospheric and Oceanic Science. The presence of over 60 graduate students ensures many potential teaching assistants. The Department is surrounded by superb science departments which can provide additional help on relevant topics such as high performance computing.

The University of Maryland is committed to providing educational programs that meet the needs of a variety of audiences. Our new graduate offerings, the Master of Professional Studies and the Graduate Certificate in Professional Studies, differ from our current Master of Science in Atmospheric and Oceanic Science in that they are career-focused degrees designed for students who wish to increase their subject-matter knowledge as well as prepare themselves for new challenges related to their professional areas. These programs will be administered by the Program Oversight Committee, with academic oversight provided by the Graduate School.
B. How big is the program expected to be? From what other programs serving current students, or from what new populations of potential students, onsite or offsite, are you expecting to draw?

The program will draw a professional audience. Initial enrollment is anticipated at 7 – 10 students in the Year 1 cohort. We expect to reach a maximum of 15 – 25 students in the Year 3 cohort and expect the number of students to continue to increase for at least several years beyond that.

II. CURRICULUM

A. Provide a full catalog description of the proposed program, including educational objectives and any areas of concentration.

The Master of Professional Studies in Atmospheric and Oceanic Science and Technology is a 30-credit (10 course) graduate program that provides training for working individuals who want to enhance their contributions in a wide range of industries by improved understanding of the chemistry and physics of weather and climate, and weather prediction technologies.

With the advice of the Program Director, the student chooses two among three areas of concentration: Atmospheric and Oceanic Science, Air Quality Science and Technology, and Computational Methods; to best address his/her professional needs. The concentration in Atmospheric and Oceanic Science begins with a phenomenological description of the time mean circulation as well as extreme events such as hurricanes. The student is introduced to the governing equations and important chemical and dynamical balances and progresses to understand the process by which weather and climate predictions are produced. The concentration in Air Quality Science and Technology concerns the dynamics, physical, and chemical aspects of atmospheric circulation which affect concentration of pollutants such as sulfur and nitrogen oxides and particulate aerosols. Important processes include the dynamics of the atmospheric boundary layer, as well as local convection. The concentration in Computational Methods covers the technical methods by which weather and climate analysis and prediction is carried out. This concentration covers common statistical and graphical techniques as well as remote sensing. Emphasis will be on those technologies in current use at laboratories in the Washington, DC area.
B. List the courses (number, title, semester credit hours) that would constitute the requirements and other components of the proposed program. Provide a catalog description for any courses that will be newly developed or substantially modified for the program.

The program will consist of completing two of the following three required certificate course sequences with two additional courses chosen from the courses associated with the third certificate in consultation with the academic advisor (Program Coordinator). The requirements the MS degree will be a combination of the requirements of the two main certificate course sequences.

Please see the last page of this proposal for details on the three courses which must be approved in order to support this program. In the interests of clarity, we explicitly identify in the course list below those prerequisites which would be needed in order to proceed with the respective plan of study.

Certificate #1  **Computational Methods in Atmospheric and Oceanic Science**
AOSC630 (3 Credits) Statistical Methods in Meteorology and Oceanography
*AOSC650 (3 Credits) Numerical Methods in Atmospheric and Oceanic Science
AOSC684 (3 Credits) Climate System Modeling
Elective (chosen from AOSC614, AOSC615). This list may be expanded to include an additional GIS course.
Prerequisites: MATH141, STAT 400 or permission of department.

Certificate #2  **General Atmospheric and Oceanic Science**
AOSC431 (3 Credits) Atmospheric thermodynamics and physics
*AOSC632 (3 Credits) Atmospheric Dynamics
AOSC617 (3 Credits) Atmospheric and Oceanic Climate
AOSC670 (3 Credits) Physical Oceanography
Prerequisites: MATH240 or 461, PHYS270, PHYS271 (Formerly: 263), and CHEM135 or permission of Department.

Certificate #3  **Air Quality Science and Technology**
AOSC600 (3 Credits) Synoptic Meteorology I
AOSC637 (3 Credits) Air Chemistry
*AOSC424 (3 Credits) Remote Sensing of the Atmosphere and Oceans
Elective (chosen from AOSC624, AOSC625)
Prerequisites: CHEM135 and MATH241 or permission of department.

*Courses not yet approved by VPAC

C. Describe any selective admissions policy or special criteria for students selecting this field of study.
The admissions policy will reflect current standards established by the Graduate School, including the requisite bachelor’s degree and a minimum cumulative 3.0 GPA. Official undergraduate transcripts from all colleges attended must be provided. A current resume is required.

III. STUDENT LEARNING OUTCOMES AND ASSESSMENT

The purpose of this assessment plan is to set clear guidelines, identify articulated outcomes, and ensure avenues for continuous improvement for each graduate certificate and Master’s degree program managed by the Program Oversight Committee and housed in the Graduate School. It is our mission to provide programs that meet UMD’s institutional goals and objectives for educational activities.
<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
<th>Assessment Measures and Criteria</th>
<th>Assessment Schedule</th>
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| 1. Students will illustrate comprehension of issues related to atmospheric and oceanic science. | Measurement A: Successful completion of a class project focusing on issues related to Atmospheric and Oceanic Science.  
Criterion A: 80% of students will attain a 2 or better on Comprehension Scale  
Measurement B: Pre and Post-Test Assessment.  
Criterion B: 80% of students will show gains between Pre and Post-Test questions #2, #3, #4, #5, and #6. | Comprehension Scale will be scored by faculty, and data collected annually by the Oversight Committee.  
All Pre-Test data will be collected by the Oversight Committee prior to first class attendance by annual cohort.  
All Post-Test data will be collected after conclusion of last class by annual cohort. |
| 2. Students will assess the relevance of program content as it applies to their professional and educational needs | Measurement A: An exit interview will be conducted with a random sample of graduates (minimum of 20% depending on class size) to assess their overall satisfaction with the certificate.  
Criterion A: 80% of respondents will correlate academic program offerings to needs  
Measurement B: Pre and Post-Test Assessment.  
Criterion B: 80% of students will show gains between Pre and Post-Test questions #7, #8, #9, and #10. | Responses will be collected and discussed with the Academic Oversight committee for retention purposes.  
All Pre-Test data will be collected by the Oversight Committee prior to first class attendance by annual cohort.  
All Post-Test data will be collected after conclusion of last class by annual cohort. |

IV. FACULTY AND ORGANIZATION

A. Who will provide academic direction and oversight for the program?

The degree will be housed in the Graduate School. Continuing academic and program direction will be provided by the Program Oversight Committee. Members of the Program Oversight Committee consist of:

Graduate Director (academic chair):
Professor Dan Kirk-Davidoff  
Faculty, Department of Atmospheric and Oceanic Science  
College of CMPS

Second Faculty Member:  
Professor Dalin Zhang  
Faculty, Department of Atmospheric and Oceanic Science  
College of CMPS

Administrative Manager:  
June Sherer  
Department of Atmospheric and Oceanic Science  
College of CMPS

Graduate School Representative:  
Charles Caramello  
Dean, Graduate School

B. If the program is not to be housed and administered within a single academic unit, provide details of its administrative structure.

The Master of Professional Studies and the Graduate Certificate in Professional Studies will be housed in the Graduate School and administered by the Program Oversight Committee (described above). A faculty member from the college providing the foundation courses, CMPS, will serve as Graduate Director and will provide the academic leadership for the team.

Faculty selection and appointments are made by the Department of Atmospheric and Oceanic Science. All faculty will be members of the Graduate Faculty and approved by the Dean of the Graduate School to teach.

V. OFF-CAMPUS PROGRAMS (if necessary)

A. If at Shady Grove – indicate how students will access student services

Not applicable

B. If on-line – describe the concerns in “Principles and Guidelines for Online Programs” are to be addressed.

Not applicable
VI. OTHER ISSUES

A. Describe any cooperative arrangements with other institutions or organizations that will be important for the success of this program.

   Not applicable

B. Will the program require or seek accreditation? Is it intended to provide certification or licensure for its graduates? Are there academic or administrative constraints as a consequence?

   No

VII. COMMITMENT TO DIVERSITY

The University of Maryland is an equal opportunity institution with respect to both education and employment. The University does not discriminate on the basis of race, color, national origin, sex, age, or handicap in admission or access to, or treatment or employment in, its programs and activities as required by federal (Title VI, Title IX, Section 504) and state laws and regulations.

Through its actions and statements of policy the University of Maryland has demonstrated a commitment to diversity by creating programs of study which explore the experiences, perspectives, and contributions of a wide variety of cultures, groups, and individuals; and has sought to create a campus environment which encourages tolerance and respect for individuals regardless of differences in age, race, ethnicity, sex, religion, disability, sexual orientation, class, political affiliation, and national origin.

VIII. REQUIRED PHYSICAL RESOURCES

A. Additional library and other information resources required to support the proposed program. You must include a formal evaluation by Library staff.

   This program uses existing courses and therefore additional library resources are not required.

B. Additional facilities, facility modifications, and equipment that will be required. This is to include faculty and staff office space, laboratories, special classrooms, computers, etc.

   This program will require the purchase of a small portable turntable equipped with a water tank and a coaxially rotating camera, for classroom demonstrations of geophysical fluid dynamics (see http://paoc.mit.edu/labguide/apparatus.html ). The cost will be less than $500 (cost borne by AOSC).
C. Impact, if any, on the use of existing facilities and equipment. Examples are laboratories, computer labs, specially equipped classrooms, and access to computer servers.

This program does not require additional resources.

IX. RESOURCE NEEDS AND SOURCES

A. List new courses to be taught and needed additional sections of existing courses. Describe the anticipated advising and administrative loads. Indicate the personnel resources (faculty, staff, and teaching assistants) that will be needed to cover all these responsibilities.

The following courses will need to be approved by VPAC:

- AOSC650 (3 Credits) Numerical Methods in Atmospheric and Oceanic Science
- AOSC424 (3 Credits) Remote Sensing of the Atmosphere and Oceans
- AOSC632 (3 Credits) Atmospheric Dynamics

The program will require coordination and oversight of educational quality. In addition outreach to the professional meteorology and oceanography communities will be required to ensure that the program is meeting the needs of major employers for up-to-date training. There will be no impact on existing resources. This program is self-supporting. Courses may be cancelled due to low enrollment.

B. List new faculty, staff, and teaching assistants needed for the responsibilities in A, and indicate the source of the resources for hiring them

A Coordinator for the program will be required to allocate teaching responsibilities, recruit teaching staff from the professional meteorology community, develop continuing curriculum improvement, maintain a collaborative relationship with major government and private meteorological organizations and provide career counseling for students. University of Maryland faculty who teach in the program will be compensated using overloads. Other faculty may include research faculty, retired faculty and professionals in the field.

C. Some of these teaching, advising, and administrative duties may be covered by existing faculty and staff. Describe your expectations for this, and indicate how the current duties of these individuals will be covered, and the source of any needed resources.

Approval of all faculty overloads for teaching and advising will be in accordance with University of Maryland policy and procedures. The Oversight Committee is responsible for the overall administrative management of the program.
D. Identify the source to pay for the required physical resources identified in Section VIII. above.

   Tuition revenue will be used to cover the program expenses (see separate budget page).

E. List any other required resources and the anticipated source for them

   Not applicable

F. Complete the additional proposal and financial tables as required by MHEC.

   Not applicable
New Courses requiring VPAC Approval

**AOSC650 (3 Credits)** Numerical Methods in Atmospheric and Oceanic Science
Introduction to numerical methods widely used in the atmospheric and oceanic sciences. A variety of the numerical tools often used by atmospheric and oceanic scientists, will be applied to observational data sets such as the Vostok ice core and sun spot records. This is a hands-on programming course, taught in a computer laboratory setting, exposing the students to Fortran, IDL, and Matlab, as well as geographic information systems and modern data formats. No prior programming experience required.

**AOSC424 (3 Credits)** Remote Sensing of the Atmosphere and Oceans
Fundamentals of radiative transfer; extinction and scattering-based passive remote sensing; emission-based passive remote sensing; principles of active remote sensing; multi-sensor and multi-wave-length approaches to satellite remote sensing with examples drawn from current satellites; future satellite systems.

**AOSC632 (3 Credits)** Atmospheric Dynamics
The general character of the atmosphere and its weather and climate systems, phenomena, and distributions of variables (winds, temperature, pressure, moisture). The formal framework of the science; the application of basic classical physics, chemistry, mathematics, and computational sciences to the atmosphere. The course requirements include an extended project.