CERTIFICATE IN HIGH PERFORMANCE COMPUTING

Graduate Certificate in High Performance Computing

Please designate a responsible department and individual for this proposal:

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And

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Certificate in High Performance Computing

I. Overview and rationale

The primary objective of the High Performance Computing Certificate is to allow students to be introduced to the portfolio of knowledge and experiences that will enable them to tackle problems using High Performance Computing. Other objectives include providing:

- Obtain a fundamental understanding of the mathematical foundations and structure of numerical methods and parallel computing
- Become proficient in high-performance computing, by efficiently using hardware, algorithms, and programming
- Effectively apply high-performance computing in a variety of real-world problems, across multiple applications fields
- Knowledge and skills applicable to academia, industry, and government

The goal of the program is the successful placement of graduates into relevant jobs and to enable career advancement for scientists already employed.


The PSM in High Performance Computing degree program can be completed in 4 - 5 semesters which includes one summer semester. Among the working professionals who are seeking advancement and career mobility, a 4 - 5 semester training is often not feasible, and a shorter 1 - 2 semester certificate program has been developed for such candidates.

The Steering Committee agrees that a shorter, transcripted certificate program, which could be completed in 1-2 semesters would serve working professionals who need academic credentials for career advancement.

II. Relationship of Proposed Program to others in the College or University

The certificate will provide advanced academic credentials for the working professional seeking training beyond the baccalaureate degree. The certificate will be transcripted requiring the completion of up to and no more than 14 credits from the list of core classes in the current curriculum of the PSM in High Performance Computing. It will also be a means for training of students who are unable to complete the rigors of a 4 - 5 semester degree program, in 1 - 2 semesters.
The Certificate in High Performance Computing program will provide a mechanism to obtain a certificate in 1 - 2 semesters or for the part time student, the time required to complete 14 credits of core classes, with a GPA of 3.0. The classes will be taught by the same faculty as in the PSM in High Performance Computing program, as students will be taking the same core classes as the PSM in High Performance Computing students without committing to a capstone project or a graduate degree requiring 30 credits. The Certificate in High Performance Computing will credential future leaders in the field through a curriculum chosen according to the student's interest.

**III. Curriculum:**
Below is the list of core course which a student may take to complete the certificate in High Performance Computing. Student advising will be provided to meet the specific interests for each student.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 5061</td>
<td>Fundamentals of Computer Programming for Scientists and Engineers</td>
<td>4</td>
</tr>
<tr>
<td>MATH 5063</td>
<td>Introduction to High-Performance Computing Technology for Scientists</td>
<td>4</td>
</tr>
<tr>
<td>MATH 5062</td>
<td>High Performance Computer Programming for Scientific Modeling</td>
<td>3</td>
</tr>
<tr>
<td>MATH 5066</td>
<td>Mathematical Methods for High Performance Computing</td>
<td>3</td>
</tr>
</tbody>
</table>

_Students may replace any ONE of the courses with any level graduate course as recommended by Academic Advisor_

**IV Impact on Faculty and Students**
This will not impact faculty or require new faculty.

**V Impact on Resources**
This program is a tuition generating program and will contribute to the revenue stream already generated by the parent program.

**VII Assessment**
A formal assessment will be conducted after the certificate has run for one or two years.

**VIII Summary of Peer or Aspirant Programs**
A graduate certificate in High Performance Computing is offered in a few universities a link and summary of 3 such programs is provided in Appendix A.

**IX Implementation**
Pending approval, the certificate program is ready for a start date of Fall 2020.

**X Process for Proposal Development**
The certificate program was developed by the Steering Committee based on reflection of graduate outcomes, conversations with students and the Committee’s observations of student progress in other PSM programs. The focus of developing this program was to provide a mechanism for students to succeed who, for various reasons whether financial, academic or work related could not continue in the program.
APPENDIX A

3 Universities offering High Performance Computing Certificates

George Washington University
A graduate certificate in high performance computing tailored to provide students with knowledge in all aspects of high performance computing. The program requires 12 credits of courses, 6 credits being from core courses. Students can later use their credit hours to complete a master’s program or PhD program in the Department of Electrical and Computer Engineering.

Michigan State University
The Graduate Certificate in High Performance Computing is intended for graduate students in any discipline who have significant prior computational experience. To complete the certificate, students need to take 9 credits. All credits need to be at the 800 level or above.

University of Houston
The certificate requires the student to take 4 graduate courses (12 credits), to be chosen among already existing, 3-credit-hours regular courses offered by University of Houston departments, and 3 additional 1-credit-hour short courses chosen among those offered by the Hewlett Packard Enterprise Data Science Institute. Students must be enrolled in a graduate program at UH in order to qualify for application for the HPC Certificate program.