Cover Sheet for Curriculum Action Request (CAR) and Course Outline
This is a routing procedure; the official signature section is on the CAR form.

Course alpha and number <u>ICS 275: Introduction to High Performance Computing Clusters</u> Proposal type <u>New Course</u>

Author _____<u>Sandra R. Swanson</u>_____ ext <u>388</u> e-mail <u>swansons@hawaii.edu</u>_____

Consulted with _____

_____✓ Written proposal reviewed by discipline representative to the Curriculum Committee Date *OCT 2003*

_____✓ Consulted with Articulation Coordinator (for General Education Core courses only) Date

_____✓ Written proposal discussed in unit Date *OCT 2003*

_____✓ Original CAR signed by Unit Chair Date *10 Feb 04*

_____✓ Banner Form attached (for courses not degrees, certificates, or programs) Date

_____✓ Original ~~and four copies of~~ complete proposal forwarded to Curriculum Committee Date

_____✓ Passed by Curriculum Committee, CAR signed by Chair, Academic Senate Chair notified Date *4 Feb 04*

_____✓ Approved by Academic Senate, CAR signed by Chair Date *13 Feb 04*

_____✓ Forwarded to and received by Chief Academic Officer Date *14 Feb 04*

_____✓ Reviewed and CAR signed by Chief Academic Officer Date *20 Feb 04*

_____✓ Forwarded to and received by Chancellor Date *26 Feb 04*

_____✓ Reviewed and CAR <u>and</u> Course Outline signed by Chancellor Date *2/27/04*

_____✓ Signed originals returned to Curriculum Chair Date

Distribution/Information Posting/Follow-up
_____✓ Copy of signed original Course Outline sent to author for his/her files Date

_____ Disc with WORD document identical to signed original Course Outline received by

  Curriculum Chair (two discs, if course is to be articulated) Date

_____✓ Banner input completed - *revised* Date *26 May 04*

_____✓ Catalog/Addendum input completed Date

_____ E-mail notice of approval to entire college Date

_____ Copy of original & disc forwarded to Articulation Coordinator, if necessary Date

_____ Effective date of proposal posted on Curriculum Committee website Date

_____ Databases: Curriculum Review Dates [Excel] and Yearly Curriculum Actions [Access] updated Date

_____ Other _____ Date

_____✓ Signed original and disc filed in master curriculum file in Dean of Instruction's Office Date *26 May 04*

Revised March 2003/AC

ORIGINAL

Curriculum proposal number _2003.26_

Curriculum Action Request (CAR) (Form 4-93) - Maui Community College

Data for Curriculum Committee and college catalog

1.   Author(s) __Sandra R. Swanson__

2.   Date submitted to Curriculum Committee __03 November 2003__

3. a. General type of action? _X_ course __program

   b. Specific type of action

Addition	Deletion	Modification	
X_regular	__course	__number/alpha	__prerequisites
__ experimental	__from program	__title	__corequisites
__ other (specify)	__program	__credits	__program
_____	__other (specify)	__description	__other (specify)
_____	_____	_____	

4. Reason for this curriculum action

   This course will be a requirement for the proposed High Performance Computing (HPC) certificate being phased in at MCC as part of the National Science Foundation HPC grant.

5. Existing course

   _____.

   alpha   number   title
   credits:

6. Proposed new/~~modified~~ course
   _ICS_____ _275___   _Introduction to High Performance Computing Clusters_____
   alpha   number   title
   credits: 4

7. New course description or page number in catalog of present course description, if unchanged.

   Introduces High Performance Computing (HPC) clusters. Covers the history, technology, and structure of computational clusters, with emphasis on Beowulf-style clusters. Includes design concepts, software and hardware implementations, enabling applications, and administration. Includes algorithmic considerations and structures conducive to the development and implementation of parallelized applications. Provides experience building, configuring, and utilizing the cluster.

8. Prerequisite(s): ICS/~~ETRO~~ 251 with at least a C, or consent

9. Corequisite(s): ICS 252

   ETRO 251 inactivated and equivalent to ICS 251

10. Recommended preparation:

11. Is this course cross-listed? ___yes _X_ no   If yes, list course:

12. Student contact hours per week

lecture___hours   lab___hours   lecture/lab_4_hours   other___hours, explain

13. Revise current MCC General Catalog page(s)_____34, 108_____

14. Course grading   ___letter grade only   ___credit/no credit   _X_either   _X_audit

15. Proposed semester and year of first offering?   _Fall_ semester   _2004_year

16. Maximum enrollment_18_   Rationale, if applicable: Limited by number of cluster computers.

17. Special scheduling considerations?   _X_yes   __no   If yes, explain. lab availability

18. Special fees required?   __yes   _X_no   If yes, explain.

19. Will this request require special resources (personnel, supplies, etc.?)   _X_yes   __no
    If yes, explain. Computer clusters in Ka`a`ike 217 & 219 classroom/laboratory, access to Linux
    operating system.

20. Is this course restricted to particular room type?   _X_yes   __no   If yes, explain. see #19

21. __Course fulfills requirement for _____program/~~degree~~

    _X_Course is an elective for _____Technical Elective for ECET_____program/degree

    _X_Course is elective for AS degree

22. This course   __increases   __decreases   _X_makes no change in number of credit required for
    the program(s) affected by this action

23. Is this course taught at another UH campus?   __ yes   _X_no
    a. If yes, specify campus, course, alpha and number

    b. If no, explain why this course is offered at MCC: To fulfill HPC certificate requirements.

24. a. Course is articulated at
    __UHCC   __UH Manoa   __UH Hilo   __UH WO   __Other/PCC

    b. Course is appropriate for articulation at
    __UHCC   __UH Manoa   __UH Hilo   __UH WO   __Other/PCC

    c. Course is not appropriate for articulation at
    __UHCC   __UH Manoa   __UH Hilo   __UH WO   __Other/PCC

    d. Course articulation information is attached?   __yes   _X_no
. . . .

Proposed by

Sandra R. Swanson   _03 Nov 03_
Author/Program Coordinator   Date

Requested by

Diane Meyer   _10 feb 04_
Division/Unit Chair   Date

Recommended by

Coopersmith   _4 Feb 04_
Curriculum Chair   Date

Approved by

    13 Feb 04
Academic Senate Chair   Date

    _2/20/04_
Chief Academic Officer   Date

    _2/27/07_
Chancellor   Date

Revised April 2003/AC

Maui Community College
Course Outline

ORIGINAL

1. Alpha and Number: ICS 275
                                 Information and Computer Science

    Course Title: Introduction to High Performance
                                 Computing Clusters

    Credits: Four (4)

    Date of Outline: October 25, 2003

2. Course Description: Introduces High Performance Computing
                                 (HPC) clusters. Covers the history,
                                 technology, and structure of computational
                                 clusters, with emphasis on Beowulf-style
                                 clusters. Includes design concepts, software
                                 and hardware implementations, enabling
                                 applications, and administration. Includes
                                 algorithmic considerations and structures
                                 conducive to the development and
                                 implementation of parallelized applications.
                                 Provides experience building, configuring,
                                 and utilizing the cluster.

3. Contact Hours/Type: Four(4): lecture/laboratory

4. Prerequisites: ICS/ETRO 251 with at least a C, or consent

    Co requisites: ICS 252

    Recommended Preparation:

Signed _____   Date 3/4/07

5. General Course Objectives:
   This course is an important component of the High Performance Computing Certificate of Completion Specialty in ECET AS. The course will build upon previously mastered knowledge to examine, design, build, configure, and operate a working Beowulf High Performance Computing cluster.

6. Specific Course Objectives, Competencies, and Student Learning Outcomes
   For assessment purposes, these are linked to #7. Recommended Course Content.
   Upon successful completion of this course the student shall demonstrate competence in the following:

   a) Explain the historical role of high performance computing;
   b) Compare, contrast, and explain the differences between the traditional vector supercomputers and clustered computing options;
   c) Evaluate, understand, and define existing hardware and software products and standards;
   d) Design a practical Beowulf computer cluster;
   e) Build and configure high performance cluster front end and compute nodes;
   f) Install and upgrade the Linux operating system configured for high performance computational clusters;
   g) Establish and construct necessary computational node network interfaces;
   h) Install and configure necessary security and control architectures;
   i) Design, install, configure, tune, and manage clustered applications; and
   j) Demonstrate the use of high performance computational clusters to solve practical problems;

7. Recommended Course Content and Approximate Time Spent on Each Topic
   Linked to #6. Specific Course Objectives, Competencies, and Student Learning Outcomes.

• 1-2 weeks	Overview and history of high performance computers: (a)
• 1-2 weeks	Study and review of vector, scalar, and parallel processing systems: (a, b)
• 2-3 weeks	Current hardware and software implementations and their suitability for HPC: (a, b, c)
• 1-2 weeks	The Beowulf computational model: (b, c, d, e)
• 2-3 weeks	Design and construction of a Beowulf cluster: (b, c, d, e, f)
• 1-3 weeks	Design, configure, and install the Linux operating system on a Beowulf cluster: (c, d, e, f, g)
• 2-3 weeks	Design, configure, and install necessary network and network security interfaces for a Beowulf cluster: (f, g, h)
• 2-3 weeks	Demonstrate a functional and productive Beowulf cluster performing solving realistic problems while achieving supercomputer performance standards: (d, e, g, h, i, j)

8. Text and Materials, Reference Materials, Auxiliary Materials and Content:
   Textbooks for all computer science courses are constantly being revised and updated. At this time, no textbooks exist specifically covering this topic. Course materials have been developed by the National Center for High Performance Computing. Much of that has been revised and adopted for use in a Community College environment by MCC faculty. As experience is gained and the field evolves, additional materials will be developed and/or revised.

9. Recommended Course Requirements and Evaluation
   Specific course requirements are at the discretion of the instructor at the time the course is being offered. Evaluation will be via testing and laboratory projects and will be graded as follows:

Laboratory exercises and workbook:	10-30 %
Unannounced quizzes:	10-25 %
Scheduled examinations:	10-40 %
Programming and reading assignments:	20-40 %
Class participation and attendance:	0 - 8 %

10. Methods of Instruction
    Instructional methods will vary with instructors. Specific methods may vary at the discretion of instructors and may include, but are not limited to:

    Lecture (PowerPoint, OpenOffice Impress, or similar)
    Classroom discussion
    Hands on laboratory exercises
    Design and implementation of scripting by example and evaluation
    Special projects
    Assignments
    Quizzes and examinations
    Guest lecturers
    Field trips