<p style="text-align:center">**New Course**
Department of Mechanical Engineering
ENG M 670: Advanced Topics in Engineering Management -

Advanced Product Modeling and Production Engineering
Winter Term of Academic Year 2011/2012
Tuesday and Thursdays, 9:30 – 10:50 AM</p>

Current

<p style="text-align:center">**Proposed**</p>

* None *

ENG M 6xx, Computer-Aided Product Modeling and Production Engineering; *3 (*fi* 6) (Either winter or fall term, 3 – 0 - 0) Computer-aided engineering software modeling and implementation methodology; Feature-based product modeling development; Feature-based manufacturing process modeling; Engineering data integration; Production system engineering; System integration in production engineering; Advanced product and process engineering informatics with networked collaboration.

Detailed New Course Outline
This course will be organized around the following 39 units. There are 37 units of 50 minutes lectures given in parentheses, and 2 more units for the midterm exam, total 39 units.

1. Introduction about object-oriented software engineering methodology and technology; abstraction of information; Generic representation; Software lifecycle, reusability, portability and interoperability

   (3)
2. Engineering information modeling and implementation methodology; Overview of collaborative product development processes; Product and process planning, development and implementation

   (3)
3. Multi-view product feature definitions, modeling, and implementation; Product knowledge representation; Feature representation and new extensions; Principles of Concurrent Engineering (CE)

   (3)
4. Feature-based product information modeling; Standard Data Exchange Protocols (STEP) standards and data schemas for solid modeling, features, process planning and CNC machining; EXPRESS data model

   (4)
5. Associative product modeling data integration; Product structure and configuration

management; Change management; Product Data Management (PDM) systems

(3)

6. Midterm Exam

(2)

7. Process feature definitions, modeling, and implementation; Process feature definitions, integration of design and manufacturing; Computer Aided Process Planning (CAPP)

(3)

8. Production process modeling; Quantitative analysis for manufacturability, including machine scheduling, manual and automatic assembly, quality, reliability

(3)

9. Process modeling data integration; Shop Floor Control (SFC) functions, architecture and reference models; Communication networks for equipment, cell, and workshops; Workflow Management; Simulation of shop floor material flow

(3)

10. Manufacturing system engineering; SFC design and implementation; Flexible manufacturing systems; Capacity modeling; Planning and schedule; Job management; ERP systems

(3)

11. System integration in production; Tools for production system integration; Organizational strategy for collaborative engineering over the network; Information management

(3)

12. Fundamentals of collaborative engineering; Associative feature identification, representation, design, implementation in concurrent engineering; advanced database technologies.

(3)

13. Advanced informatics in engineering with networked collaboration; Data sharing in heterogeneous and distributed computer environments; Knowledge centralization vs. distribution; Social and organizational impacts of the advanced technologies; Research issues and future trends

(3)

Total: 39

Justification

The syllabus will be tailored to suit Western of Canada, especially Albertan industrial requirement for the qualified manpower in the field of computer-aided product and process engineering. The production and manufacturing sector is a fundamental part of the western Canada industry with large employment, although the majority of the companies are small and medium enterprises. Many of these companies in the region are struggling to upgrade their technologies to achieve long term sustainability. Advanced product and process modeling, manufacturing system engineering and integration are more and more demanded. At present the Faculty of Engineering at the U of A does not offer a graduate course in this area. This proposed Eng M 6xx course would be of great interest to students who would like to develop their career

in the product development and manufacturing sector. This course would enrich the student's knowledge and skills in advanced technology specification, selection and implementation.

Additional Information about course implementation
For this proposed course, it is expected that it will be offered once per calendar year. This course is proposed as a research oriented survey course with strong practical system modeling and software design exercises in the form of student assignments and projects. Some computer based tools are to be used by students as technology examples and project tools, including MS Office, Matlab, Siemens NX PLM system, Arena simulation.

Text and References

The course will draw on a number of sources for reference materials.
1. E.A. Nasr, A.K. Kamrani, *Computer-Based Design and Manufacturing: An Information-based Approach*, Springer, 2007.
2. G. Chryssolouris, *Manufacturing Systems: Theory and Practice*, Springer, 2006.
3. W.D. Li, S.K. Ong, A.Y.C. Nee, and C. McMahon, *Collaborative Product Design and Manufacturing Methodologies and Applications*, Springer, 2007.
4. X. Xu and A.Y.C. Nee, *Advanced Design and Manufacturing Based on STEP*, Springer, 2009.