

COURSE SYLLABUS

LAST REVIEW	Fall 2022
COURSE TITLE	CAD/CAM I
COURSE NUMBER	MACH 0204
DIVISION	Career and Technical Education
DEPARTMENT	MACH
CIP CODE	48.0501
CREDIT HOURS	4
CONTACT HOURS/WEEK	Class: 1 Lab: 6
PREREQUISITES	KBOR approved Core Curriculum or documentation of NIMS, or successfully passing a machining credentialing testing method per instructor.

COURSE DESCRIPTION

The learner will be introduced to computer aided machining (CAM) fundamentals by creating part files, and interpreting part-starting procedures.

PROGRAM ALIGNMENT

This course is part of a program aligned through the Kansas Board of Regents and Technical Education Authority. For more information, please visit:

https://kansasregents.org/workforce_development/program-alignment

PROGRAM LEARNING OUTCOMES

1. Students will be able to create 2D and 3D CNC mill programs using Mastercam software.
2. Students will be able to create 4th and 5th axis CNC mill programs using Mastercam and Solidworks software.
3. Students will be able to program a CNC Lathe using CAM Software

TEXTBOOKS

<http://kckccbookstore.com/>

METHODS OF INSTRUCTION

A variety of instructional methods may be used depending on content area. These include but are not limited to: lecture, multimedia, cooperative/collaborative learning, labs and demonstrations, projects and presentations, speeches, debates, panels, conferencing, performances, and learning experiences outside the classroom. Methodology will be selected to best meet student needs.

COURSE OUTLINE

- I. General Applications
 - A. Introduction
 - B. Part set-up
 - C. Tool Creation

- D. General machining information
- E. Plans sequence of operations
- F. Process information
- G. Operations
- H. Rotary machining
- I. Cut part rendering
- J. Post processing
- K. Communications
- L. Equipment safety
- II. Introduction
 - A. The system requirements
 - B. Prompting
 - C. Text
 - D. Technical support
- III. Part set-up
 - A. Documents and controls
 - B. Top sections of the document controls
 - C. Bottom sections of the document controls
 - D. Custom stock
 - E. Custom stock with a hole
- IV. Tool creation
 - A. Tool creation overview
 - B. Tool creation dialog
 - C. Tool types
 - D. Tool list summary
 - E. Tool offsets cutter comp
- V. General marching information
 - A. Machining overview
 - B. Creating an operation
 - C. Multiple process programming
 - D. Modifying an operation
 - E. Machining palette
 - F. Material data base
- VI. Processes information
 - A. Process dialogs
 - B. Hole process
 - C. Hole bore tab
 - D. Hole process pre mill turn tab
 - E. Holes process rotate tab
 - F. Roughing process- offset
 - G. Zig zag roughing process
 - H. Roughing process surface tabs
 - I. Contouring process
 - J. Threading
 - K. Material only

- L. Rotate tab
- M. Machining markers
- N. Pre-defined process groups
- VII. Operations
 - A. Clearance markers
 - B. Entry exit moves
 - C. Entry exit moves at tool change
 - D. Intra-operation moves
 - E. Boss top machining
 - F. Machining air
 - G. 2 ½ axis surfacing
 - H. Patterns
 - I. Engraving
 - J. Operation titles
 - K. Operation summaries
 - L. Printing tool paths
- VIII. Rotary machining
 - A. Rotary milling wrapping
 - B. Flat vs. radial geometry
- IX. Cut part rendering
 - A. Cut part rendering overview
 - B. Cut part rendering palette
 - C. Printing the cut part rendering image
- X. Post processing
 - A. Post processing overview
 - B. Post processor dialog
 - C. Mill post labeling definitions
- XI. Communications
 - A. Protocols
 - B. Communicating with a CNC machine

COURSE LEARNING OUTCOMES AND COMPETENCIES

Upon successful completion of this course, the student will:

- A. Set up part stock.
 1. Create part stock set-ups.
 2. Understand tool selection.
 3. Have concepts of general machining operations.
 4. Plan sequence of operations.
 5. Set up software to create rotary programs.
 6. Operate equipment safely.
- B. Create tools lists.
 7. Select tools by size shape.
 8. Create tool lists.

9. Give an overview of tools used.
- C. Understand general machining set-ups.
10. Create a safe set-up for machining.
 11. Create multiple operation lists.
 12. Modify an operation.
 13. Understand a machining palette.
 14. Access the material data base.
- D. Plan sequence of operations.
15. Determine machining order of operations.
- E. Create operations lists.
16. Create hole operations.
 17. Create bore operations.
 18. Offset roughing process.
 19. Create zigzag face milling operations.
 20. Create contour machining methods.
 21. Create pocketing methods.
 22. Create threads.
 23. Create rotating tabs.
 24. Take affirmative action to correct cutting conditions.
- F. Render parts.
25. Cut part render parts.
 26. Modify rendered order of sequence.
- G. Locate posts for equipment.
27. Identify post processors.
- H. Set-up communication with equipment.
28. Identify communication links to equipment.
 29. Send program to equipment.
 30. Receive programs from equipment.
- I. Operate equipment safely.
31. Adhere to safety operations of equipment.
- J. Understand system requirements.
32. Locate the system requirements to run software.
 33. Check systems configuration.
- K. Create text.
34. Locate shapes in software.
 35. Engrave their name with selected text for machining.

- L. Create custom stock sizes.
 - 36. Create odd-shaped stock sizes.
 - 37. Establish part zero on odd-shaped stock sizes.
 - 38. Create no machining boundaries on stock.

- M. Create tools.
 - 39. Draw special tool configurations.
 - 40. Import special tools in to the tool bank.

- N. Understand tool cutter comp.
 - 41. Describe the effects of cutter comp vs. no cutter comp.

- O. Relate to machining overviews.
 - 42. Analyze machining times.
 - 43. Determine pre defined process groups.

- P. Create operations.
 - 44. Establish machining control markers.
 - 45. Create entry exit moves.
 - 46. Create exit moves at tool changes.
 - 47. Introduce operation moves.
 - 48. Optimizing air movements.
 - 49. Machine 2 ½ axis parts.
 - 50. Create patterns.

- Q. Locate material data base.
 - 51. Access the material feed and speed data base.

- R. Create process to machine parts
 - 52. Create sub routines.
 - 53. Identify special machining boundaries.
 - 54. Establish multiple part zeros.
 - 55. Change sequence of operations.

- S. Identify tool types.
 - 56. Select tools to optimize cutting effects.
 - 57. Select correct tool holders.

- T. Create tool list summary.
 - 58. List tooling for part production.
 - 59. Create cost list per part for production.

- U. Create an operation for machining.
 - 60. Produce parts from prints.

- 61. Plan optimization for multiple part producing.
- V. Create process to machine parts.
 - 62. Analyze parts for accuracy.
 - 63. Determine cycle times for part production.
- W. Understand machining markers.
 - 64. Create start stop points for tool paths.
 - 65. Select features for matching markers.
- X. Create clearance in machining process.
 - 66. Create clearance planes for tool clearance.
 - 67. Create tool clearance for rapid tool movements and tool changes.
- Y. Create patterns.
 - 68. Create off set hole patterns.
 - 69. Create aligned hole patterning.
 - 70. Duplicated and mirror patterns.
- Z. Locate operation summaries.
 - 71. Print summary time management reports.
- AA. Print information.
 - 72. Access local printer's plotters to produce prints.
- BB. Create rotary moves.
 - 73. Create programs using A axis routines.
 - 74. Establish machine setup for A axis.
- CC. View parts prior to machining.
 - 75. Cut part render parts prior to machining.
 - 76. Determine if part program is clean.
- DD. Post process parts to be machine.
 - 77. Send communication links to equipment.
 - 78. Format programs to machine language.
- EE. Communicate with equipment.
 - 79. Send clean program to equipment.

ASSESSMENT OF COURSE LEARNING OUTCOMES AND COMPETENCIES

Student progress is evaluated through both formative and summative assessment methods. Specific details may be found in the instructor's course information document.

COLLEGE POLICIES AND PROCEDURES

Student Handbook

<https://www.kckcc.edu/files/docs/student-resources/student-handbook-and-code-of-conduct.pdf>

College Catalog

<https://www.kckcc.edu/academics/catalog/index.html>

College Policies and Statements

<https://www.kckcc.edu/about/policies-statements/index.html>

Accessibility and Accommodations

<https://www.kckcc.edu/academics/resources/student-accessibility-support-services/index.html>.