SAULT COLLEGE OF APPLIED ARTS & TECHNOLOGY

SAULT STE. MARIE, ONTARIO

COURSE OUTLINE

Course Title:	Tooling - Carbide and Ceramic
Code No.:	MCH 129
Program:	Machine Shop
Semester:	Two
Date:	1987 01 09
Author:	Greg White

New: XX Revision:

APPROVED: L.P. Arazietti
Chairperson Date

Tooling-Carbide and Ceramic MCH 129

Course Name **Course Number**

PHILOSOPHY/GOALS; There are no new processes in the metal removal industry, chips are produced using lathes, mills and other equipment much the same as they were thirty years ago. Some of them are now controlled by computers for accuracy and out of cut time improvements but basically the method is identical. The most rapid technical advances have been in the tooling; the material, the holding of it, the coating of it, the geometry of it, all to overcome the basic physics of metal cutting and the problems associated with it.

METHODS OF ASSESSMENT (GRADING METHOD):

It should be noted that attendance is **compulsory** and you will lose approximately 1% for every hour that you are either absent of late.

Your final grade will be based on the following assessment:

3 tests worth 10% each (week 5, 10 & 15)	=	30%
1 major project assignment(draft due Feb. 27)	=	15%
4 weekly assignments 5% each	=	20%
- attendance, attitude and initiative	=	20%
- final exam	=	15%
		100%

MATERIALS AND OTHER REQUIREMENTS:

Due to the nature of this course, its rapid changes and developments, there will be a considerable amount of self-directed research and learning required on your part. Our library carries a few texts, current magazines and some other basic resources. Upstairs there is considerable information, but **you** have to dig for it. I can supply a list of some of the tooling companies. Unlike a traditional theory course the information is not straight forward, not always current. With this in mind I expect you to devote approximately 5 hours per week outside of the classroom on research. Anything you find that you question or feel is valuable to share please bring it to the attention of your instructor.

COURSE CONTENT

- History of tooling.
- The basic theory of metal cutting.
- Terms associated with the physics of metal cutting.
- Types of chips generated - chip flow and chip control.
- Types of cutting tool angles.
- Machinability ratings.
- Angles on tools and tool bits, brazed tools.
- Cutting forces present.
- Machining economics.
- Theory of cutting fluid action.
- Affect of metal composition.
- Affect of temperature - Whitaker Ring Theory.
- Affect of lead angle, radius, rigidity.

TEST ONE

- Method of manufacture high speed, carbide.
- Conditions required for use.
- Identification system for carbide.
- Applications of shapes, tolerances, size, relief angles.
- Negative-positive inserts.
- Insert grades.
- Grade selection.
- Types and effects of coatings.
- Tool holders - styles and types.
- Effect of shims, wedges, etc.

TEST TWO

- Tooling catalogues and selection.
- Application of technical data.
- Troubleshooting methods and corrections.
- Ceramic vs carbide.
- Conditions necessary for ceramic.
- Hot and cold press ceramic.
- Identification of ceramic.
- Feed and speed selection with ceramic.
- Jig and fixture purpose, basic design and cost justification.

TEST THREE

Distribution and lecture notes on the following discussion papers:

1) Profiling inserts
   - companies
   - costs
   - applications
   - tool holder considerations
   - advantages/disadvantages

2) Top-notch and topping inserts - companies
- costs
- applications
- tool holder considerations
- advantages/disadvantages

3) Trepan, grooving and parting inserts - companies
- costs
- applications
- considerations
- advantages/disadvantages

4) Drilling with inserts, deep holes, short holes, gun drills - types
- costs
- applications
- costs
- considerations
- advantages/disadvantages

5) Specialized rail and wheel finishing - types
- costs
- applications
- considerations

6) Specialized threading inserts - types
- costs
- applications
- considerations

7) Specialized "oil field" threading inserts - (A.P.I.)
- costs
- types
- applications
- considerations

8) High-productivity insert and holder applications - samples
- costs
- applications
- considerations

9) Insert blanks and other applications of carbide (i.e. burnishing) - examples
- applications
- types
- costs
- considerations

10) Rating performance and testing of carbide - methods used
- samples of examples
- interpretation of results

11) Interchangeable heads, cartridges and other tooling systems - types
- applications
- considerations
- costs

12) Tool life and metal removal rates - formulae examples
- applications
- interpretation of data

13) Insert edge preparation - methods
- applications
- implications
- costs

14) Chip removal - methods
- how to overcome - flow away from cutting area
- be convenient size and shape
- fall away from workpiece tool and turret

15) Other inserts (industrial diamond, boron nitride) - costs
- advantages/ disadvantage
- applications

16) Mathematical formulae applicable to study of tooling - application - examples
- i.e. horsepower, estimating weight

17) Spraywelding - how
- when, where, why

18) Automatic tool wear compensation systems - costs
- applications
- types of sensing

19) Machining economics - machining costs
- improved return on investment
- tool rationalization

20) The future of tooling - what to expect
- changes in materials

EXAM