



**Frank Phillips College**  
1301 West Roosevelt POB 5118  
Borger, TX 79008-5118



(voice) 806.274.5311

(fax) 806.274.6835

## 1. General Course Information

1.1. Course Number: MCHN1338 (48.0501)

1.2. Course Title: Machining I

1.3. Term and Year: Fall Semester 2004 [Aug. – Dec.]

1.4. SCH [Semester Credit Hours]: 3 OR CEU\* [Continuing Education Units] 4.8

**NB: \*C.E.U. CLASSES DO NOT COUNT FOR ACADEMIC CREDIT**

**YOU CAN NOT CONCURRENTLY TAKE THIS CLASS FOR BOTH SCH AND CEU CREDIT**

1.5. Pre-requisites: none, although a drafting class and some mechanical experience will be very helpful

1.6. Co-requisites: none

1.7. Catalog Description: Operation of drills, milling machines, lathes, and power saws. Introduction to precision measuring techniques.

1.8. WECM Description: **Learning Outcomes:** The student will identify machine parts and their functions; select layout tools and techniques; define machine shop terminology; perform basic machine setups; calculate common shop formulas; perform semi-precision layout; execute grinding techniques; demonstrate basic machine operations; and apply proper measuring tools.

1.9. **Instructor's Description:** While the use of trig formulas, gear ratio calculation and conversion of between/among decimal inch, fractional inch and metric dimensions are an integral part of the trade, in this class these concepts are embedded and contextualized by extensive application in many “hands on” activities which stress both safety and the production of useful traditional apprentice machinist’s projects such as parallel jaw clamps, prick and center punches, and pump shafts or “wrigglers.” Supporting activities such as print reading, lay-out, tool grinding, and precision “set-up” are stressed. This class emphasizes the safe and efficient operation of traditional manual machines, for the low-volume production or modification/repair of items with minimal “attachments” or special tooling, that is traditional “craft” machining.

### 1.10. Audience:

**This class is intended for people wishing to learn how to safely and efficiently operate the traditional manual machine tools.** Single unit production of prototypes, models, repair parts, etc. is stressed, with minimal reliance on special tooling, attachments or accessories and maximum reliance on personal ingenuity and innovation. This course will be of particular interest to individuals employed in maintenance or repair activities where replacement parts may not be easily obtainable, and persons interested in home shop or hobby machining. ***This course stresses traditional “craft” machining and is not intended to produce “tool and die makers” or experts in high volume factory production, although this course will provide a good introduction to the basic metal working processes and activities underlying these trades/professions***

### 2. Instructor:

- 2.1. **Name:** Dr. F. George McDuffee<sup>1</sup>
- 2.2. **Office:** Library Building Room 10 on the Borger Campus
- 2.3. **Extension:** 791
- 2.4. **Hours:** 9AM-11:30 AM, 1:30PM-4PM M-F however call first as I am frequently out of the office for short periods. Generally the best way to contact me is by Email.
- 2.5. **Email:** gmcduffee@fpc.cc.tx.us

### 3. Objective of this class:

**After successful completion of this class the student will be able to:**

- 3.1. Demonstrate safety at all times by following all safety rules and procedures when using machine tools such as, shears, hydraulic presses, saws gauges, milling machines, lathes, abrasive machines, cut off saws and tools, drill presses and when handling materials.
- 3.2. Identify and name general and typical dangers in the industrial work environment.
- 3.3. Use personal protective equipment (PPE) when and where required.
- 3.4. Locate, identify, select and operate controls, switches, dials, levers, buttons, guards, stops and operating/controlling devices on typical manual machine tools
- 3.5. Prepare traditional manual machine tools and related equipment and operate them in the correct, efficient and safe manner.

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<sup>1</sup> AS Coffeyville Junior College 1960, BS [Applied Mathematics and Statistics] Southern Illinois University at Edwardsville, 1969, MS [Manufacturing Technology] Pittsburg State University 1993, EdS [Industrial Education] Pittsburg State University 1995, EdD [Occupational and Adult Education] Oklahoma State University 1999. With some overlap, 30 years manufacturing, 15 years consulting [technology transfer] and 15 years teaching.

- 3.6. Select correct settings for the safe, efficient and proper set up, operation and shut down of traditional manual machine tools, and correct [safe] use of machine tool equipment commonly used such as: tool holders, gauge blocks, hand tools, thread fasteners and other mechanical hardware found in the machine shop.
- 3.7. Identify and/or interpret mechanical hardware found in the machine shop, common detail drawings, various steel rules, and a variety of gauging devices such as micrometers, dial and test indicators, dial and vernier calipers and height gages, space or gauge blocks, surface plates, angle blocks, protractors and sine bars.
- 3.8. Demonstrate the ability to accurately “lay out” material for processing in the engine lathe using common tools such as scribes, surface gauges, height gauges, scales, planer gauges, sine bars, protractors, prick punches, center punches and dividers.
- 3.9. Demonstrate the ability to use a typical engine lathe to:
  - 3.9.1. face ends and center drill a work piece;
  - 3.9.2. turn a shaft between centers, ream, bore, tap and knurl;
  - 3.9.3. cut external threads;
  - 3.9.4. perform set up operations;
  - 3.9.5. perform drilling operations;
  - 3.9.6. counter sinking.
- 3.10. Demonstrate the ability to use a typical milling machine to:
  - 3.10.1. square a work piece on all six sides;
  - 3.10.2. locate a work piece using edge finders and wigglers;
  - 3.10.3. drill, tap, chamfer and counter-bore holes
  - 3.10.4. power-feed mill surfaces and slots

#### 4. **Textbook and Other REQUIRED Materials**

- 4.1. Safety glasses with side shields *meeting American National Standards Institute ANSI Z87 specifications* or goggles, available FPC bookstore
- 4.2. Machinist’s Apron, available on line from <http://www.harborfreight.com> [has store in Amarillo] or <http://www.wearguard.com>. Also available locally in Borger.
- 4.3. Quad ruled (5 X 5) composition book, 10 X 7-7/8 AmPad#26-252 or similar. Available FPC bookstore.
- 4.4. Soft lead (#2 or softer) pencil with eraser or erasable ball point pen, Available FPC bookstore
- 4.5. Required materials and supplies for the basic class projects are included in the fee for this course. Supplementary projects or production of multiple project items may incur additional material charges at the discretion of the instructor.
- 4.6. While students may bring any precision measurement or other tools they desire to class, it is suggested that students NOT purchase any tools until they have had a chance to use samples in class.

## 5. Additional/Supplemental References

- 5.1. The instructor will distribute extensive handouts, taken mainly from the following references. The student is encouraged but not required to read and possibly purchase the following texts. *Many of these items are available in the FPC library in the Mac and Betty McDuffee Foundation collection.*
  - 5.1.1. Milne, Lorus J., Machine Shop Methods, [reprint] Lindsay Publications, Bradley, IL
  - 5.1.2. Colvin, Fred H., Running an Engine Lathe, [reprint] Lindsay Publications, Bradley, IL
  - 5.1.3. Kibbe, Neely, et al, Machine tool Practices, 7<sup>th</sup> Edition, Prentice Hall, Upper Saddle River, NJ, Available FPC bookstore. Note: This text is expensive but is used in several technology classes and is a good reference.
  - 5.1.4. Barritt, J. W., Lathe Operations, [reprint] Lindsay Publications, Bradley, IL
  - 5.1.5. South Bend Lathe, South Bend Lathe Machine Shop Projects, [reprint] Lindsay Publications, Bradley, IL
  - 5.1.6. Horner, Joseph, Practical Metal Turning, [reprint] Lindsay Publications, Bradley, IL
  - 5.1.7. Sheldon Machine Company, The Care and Operation of a Lathe, [reprint] Lindsay Publications, Bradley, IL
  - 5.1.8. South Bend Lathe, How to Run a Metalworking Shaper and Drill Press, [reprint] Lindsay Publications, Bradley, IL
  - 5.1.9. Hasluck, Paul N., Hasluck's Metalworking Tools, Materials & Processes, [reprint] Lindsay Publications, Bradley, IL
  - 5.1.10. Smith, Robert H, Elements of Machine Work, [reprint] Lindsay Publications, Bradley, IL
  - 5.1.11. Smith, Robert H., Advanced Machine Work [reprint] Lindsay Publications, Bradley, IL
  - 5.1.12. Gingery, Dave, The Metal Lathe, Lindsay Publications, Bradley, IL
  - 5.1.13. Henry Ford Trade School, Shop Theory, [reprint] Lindsay Publications, Bradley, IL
  - 5.1.14. Oberg, Jones, Horton, et al. Machinery's Handbook 26<sup>th</sup> edition, Industrial Press, New York [note earlier editions may be more suitable as these emphasize manual machining techniques, older manual machines, materials, techniques and processes]
  - 5.1.15. Lautard, Guy The Machinist' Bedside Reader, Guy B.E. Lautard; ISBN: 0969098030; (December 1988)
  - 5.1.16. Lautard, Guy The Second Machinist' Bedside Reader and the Bull's Eye Mixture, Guy B. E. Lautard; ISBN: 0969098030; (December 1988)
  - 5.1.17. Lautard, Guy The Third Machinist' Bedside Reader, Guy B. E. Lautard; ISBN: 096909809X; (June 1, 1993)
  - 5.1.18. Moltrecht, Karl H., Machine Shop Practice, 2<sup>nd</sup> ed., Vol I, Industrial Press, New York ISBN: 0-8311-1126-7
  - 5.1.19. Moltrecht, Karl H., Machine Shop Practice, 2<sup>nd</sup> ed., Vol II, Industrial Press, New York ISBN: 0-8311-1132-1

- 5.1.20. Jones, Franklin D., Machine Shop Training Course 5<sup>th</sup> Ed, Vol I. ISBN: 0-8311-1039-2 Industrial Press, New York (1964)
- 5.1.21. Jones, Franklin D., Machine Shop Training Course 5<sup>th</sup> Ed. Vol II Industrial Press ISBN: 0-8311-1040-6 (1964)
- 5.1.22. Hoffman, Edward G. and McCauley, Christopher, J. Shop Reference for Students and Apprentices, 2<sup>nd</sup> ed. Industrial Press, New York (2001) ISBN 0-8311-3079-2
- 5.1.23. Anderson, John G. Technical Shop Mathematics, 2<sup>nd</sup> ed. (1983) Industrial Press, New York ISBN 0-8311-1145-3

## 6. Classroom Policy and Instructor Expectations

- 6.1. The students and instructor will show mutual respect at all times. *Please see the S.C.A.N.S. URL<sup>2</sup> for additional information on this point.*
- 6.2. Behavior inconsistent with a safe and student-friendly learning environment for all students is not acceptable. *Please see the S.C.A.N.S. URL for additional information on this point.*
- 6.3. Habits of neatness and safety are common workplace requirements. They are therefore required in this class. *Please see the S.C.A.N.S. URL for additional information on this point.*
- 6.4. Honesty is expected of all students. Cheating and plagiarism are violations of honesty. **Cheating occurs whenever one uses deceitful means**, for example crib notes or copying assignments. Plagiarism is presenting the language and ideas **OR PRODUCTS** of another as ones own work such as coping papers, themes, abstracts, sections of books, magazine articles, etc. *Please see the S.C.A.N.S. URL for additional information on this point.*

## 7. Methods of Evaluation

**Machining is a “hands on” activity, supported by certain mathematical skills. Therefore, evaluation will be based principally on the workmanship, form, fit and finish of their projects. The final grade will be determined by**

- 7.1. (75%) Workmanship, form, fit, and finish of two assigned and at least one other project, approved by the instructor
- 7.2. (5%) Demonstrated ability to use an external inch micrometer to measure to the nearest 1/1000 of an inch.
- 7.3. (5%) Demonstrated ability to use a vernier caliper to measure to the nearest .005 inch the following characteristics:
- 7.3.1. Diameter
- 7.3.2. Length
- 7.3.3. Depth
- 7.4. (5%) Demonstrated ability to use a sine bar of arbitrary length to generate a given angle

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<sup>2</sup> Secretary's Commission on Achieving Necessary Skills <http://wdr.doleta.gov/SCANS/>

- 7.5. (10%) Define and demonstrate the ability to correctly grind top and side rake and top and side clearance on a high speed steel lathe tool bit for left hand and right hand cutting and threading.

## 8. Attendance Policy

- 8.1. While attendance in many college classes is optional, attendance in life and at work is not, therefore all participants are expected to attend all sessions. *Please see the S.C.A.N.S. URL for additional information on this point.*
- 8.2. I do not waste my or the class's time by presenting unimportant or non-essential information, therefore every class is important.
- 8.3. Much of the material is cumulative, that is to understand material presented in class two it is essential that you attended class one.
- 8.4. Participation is an important part of life, and class participation is a significant element in student evaluation. If you do not attend, you cannot participate. *Please see the S.C.A.N.S. URL for additional information on this point.*
- 8.5. It is assumed that you are participating in this class to obtain skills and knowledge. It is obvious that if you do not attend, you cannot obtain these skills and knowledge.
- 8.6. FPC has excellent relations and high credibility with the area employers. Our graduates have traditionally exhibited "on-the-job" performance consistent with the skills and knowledge described in the course syllabi. The only way to maintain this high standard is to insure that every student is presented with the opportunity to obtain these skills and knowledge, which obviously requires class attendance.
- 8.7. One of the most valuable and enjoyable aspects of adult education is the sharing of knowledge and experiences among the participants. If you do not attend, you cannot contribute your unique experiences and observations. Thus, your absences not only affect your learning opportunities but also the learning opportunities of all the other participants.

## 9. Next Recommended Course(s) in Sequence [may be taken in any order except for MCHN1352]

- 9.1. MCHN1352 INTERMEDIATE MACHINE SHOP I – Operation of drills, milling machines, lathes, and power saws. Introduction to precision measuring techniques.
- 9.2. MCHN1320 – Precision Tools and Measurement (48.0501) An introduction to the modern science of dimensional metrology. Emphasis on the identification, selection, and application of various types of precision instruments associated with the machining trade. Practice of basic layout and piece part measurements while using standard measuring tools is also included.
- 9.3. MCHN1352 – Bench Work and Layout An introduction to bench work and layout. Application of the use and theory of tools such as: hand tools, height gauges, pedestal grinders, and layouts.