



# Frank Phillips College

1301 West Roosevelt POB 5118

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## 1. General Course Information

1.1. Course Number: MCHN1308 (48.0501)

1.2. Course Title: Basic Lathe

1.3. **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**

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

1.5. Co-requisites: none

1.6. Catalog Description: A introduction to the common types of lathes, Emphasis is placed on basic parts, nomenclature, lathe operation, safety, machine mathematics, blue print reading and theory.

1.7. **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 the manual traditional lathe, for the low-volume production or modification of items with minimal "attachments" or special tooling, that is traditional "craft" machining.

1.8. **Term and Year** Spring Semester 2003 [Jan - May]

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/4PM M-F however call as I am frequently out of the office for short periods of time
- 2.5. **Email:** gmcduffee@fpc.cc.tx.us

3. **Audience:**

**This class is intended for people wishing to learn how to safely and efficiently operate the traditional manual engine lathe.** Single unit production of prototypes, models, repair parts, etc. is stressed, with minimal reliance on special tooling, attachments or accessories. 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.***

4. **Objective of this class:**

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

- 4.1. 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.
- 4.2. Identify and name general and typical dangers in the industrial work environment.
- 4.3. Use personal protective equipment (PPE) when and where required.
- 4.4. Locate, identify, select and operate controls, switches, dials, levers, buttons, guards, stops and operating/controlling devices on typical manual lathes
- 4.5. Prepare manual engine lathes and related equipment and operate them in the correct, efficient and safe manner.
- 4.6. Select correct settings for the safe, efficient and proper set up, operation and shut down of engine lathes, and correct [safe] use of machine tool equipment commonly used with engine lathes such as: tool holders, gauge blocks, hand tools, thread fasteners and other mechanical hardware found in the machine shop.

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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.

- 4.7. 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.
- 4.8. Describe the 3 basic procedures to cut tapers using the engine lathe.
- 4.9. Describe basic metallurgical terms associated with machine tooling and the machine shop.
- 4.10. 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.
- 4.11. Demonstrate the ability to use a typical engine lathe to:
  - 4.11.1. face ends and center drill a work piece;
  - 4.11.2. turn a shaft between centers, ream, bore, tap and knurl;
  - 4.11.3. cut unified internal and external threads;
  - 4.11.4. perform set up operations;
  - 4.11.5. perform drilling operations;
  - 4.11.6. counter sinking.

## 5. Textbook and Other Required Materials

- 5.1. Safety glasses with side shields *meeting American National Standards Institute ANSI Z87 specifications*. or goggles, available FPC bookstore
- 5.2. 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.
- 5.3. Quad ruled (5 X 5) composition book, 10 X 7-7/8 AmPad#26-252 or similar. Available FPC bookstore.
- 5.4. Soft lead (#2 or softer) pencil with eraser or erasable ball point pen, Available FPC bookstore
- 5.5. 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.

## 6. Additional/Supplemental References

- 6.1. The instructor will distribute extensive handouts, taken mainly from the following references.
- 6.2. 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.*
  - 6.2.1. Milne, Lorus J., Machine Shop Methods, [reprint] Lindsay Publications, Bradley, IL
  - 6.2.2. Colvin, Fred H., Running an Engine Lathe, [reprint] Lindsay Publications, Bradley, IL
  - 6.2.3. 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.
  - 6.2.4. Barritt, J. W., Lathe Operations, [reprint] Lindsay Publications, Bradley, IL

- 6.2.5. South Bend Lathe, South Bend Lathe Machine Shop Projects, [reprint] Lindsay Publications, Bradley, IL
- 6.2.6. Horner, Joseph, Practical Metal Turning, [reprint] Lindsay Publications, Bradley, IL
- 6.2.7. Sheldon Machine Company, The Care and Operation of a Lathe, [reprint] Lindsay Publications, Bradley, IL
- 6.2.8. South Bend Lathe, How to Run a Metalworking Shaper and Drill Press, [reprint] Lindsay Publications, Bradley, IL
- 6.2.9. Hasluck, Paul N., Hasluck's Metalworking Tools, Materials & Processes, [reprint] Lindsay Publications, Bradley, IL
- 6.2.10. Smith, Robert H, Elements of Machine Work, [reprint] Lindsay Publications, Bradley, IL
- 6.2.11. Smith, Robert H., Advanced Machine Work [reprint] Lindsay Publications, Bradley, IL
- 6.2.12. Gingery, Dave, The Metal Lathe, Lindsay Publications, Bradley, IL
- 6.2.13. Henry Ford Trade School, Shop Theory, [reprint] Lindsay Publications, Bradley, IL
- 6.2.14. 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]
- 6.2.15. Lautard, Guy The Machinist' Bedside Reader, Guy B.E. Lautard; ISBN: 0969098030; (December 1988)
- 6.2.16. Lautard, Guy The Second Machinist' Bedside Reader and the Bull's Eye Mixture, Guy B.E. Lautard; ISBN: 0969098030; (December 1988)
- 6.2.17. Lautard, Guy The Third Machinist' Bedside Reader, Guy B.E. Lautard; ISBN: 096909809X; (June 1, 1993)
- 6.2.18. Moltrecht, Karl H., Machine Shop Practice, 2<sup>nd</sup> ed., Vol I, Industrial Press, New York ISBN: 0-8311-1126-7
- 6.2.19. Moltrecht, Karl H., Machine Shop Practice, 2<sup>nd</sup> ed., Vol II, Industrial Press, New York ISBN: 0-8311-1132-1
- 6.2.20. Jones, Franklin D., Machine Shop Training Course 5<sup>th</sup> Ed, Vol I. ISBN: 0-8311-1039-2 Industrial Press, New York (1964)
- 6.2.21. Jones, Franklin D., Machine Shop Training Course 5<sup>th</sup> Ed. Vol II Industrial Press ISBN: 0-8311-1040-6 (1964)
- 6.2.22. 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
- 6.2.23. Anderson, John G. Technical Shop Mathematics, 2<sup>nd</sup> ed. (1983) Industrial Press, New York ISBN 0-8311-1145-3

## 7. Classroom Policy and Instructor Expectations

- 7.1. The students and instructor will show mutual respect at all times. *Please see the S.C.A.N.S. section below for additional discussion on this point.*
- 7.2. Behavior inconsistent with a safe and student-friendly learning environment for all students is not acceptable. *Please see the S.C.A.N.S. section below for additional discussion on this point.*
- 7.3. Habits of neatness and safety are common workplace requirements. They are therefore required in this class. *Please see the S.C.A.N.S. section below for additional discussion on this point.*
- 7.4. 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.

## 8. 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**

- 8.1. (75%) Workmanship, form, fit, and finish of two assigned and at least one other project, approved by the instructor
- 8.2. (5%) Demonstrated ability to use an external inch micrometer to measure to the nearest 1/1000 of an inch.
- 8.3. (5%) Demonstrated ability to use a vernier caliper to measure to the nearest .005 inch the following characteristics:
  - 8.3.1. diameter
  - 8.3.2. length
  - 8.3.3. depth
- 8.4. (5%) Demonstrated ability to use a sine bar of arbitrary length to generate a given angle
- 8.5. (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.

## 9. Attendance Policy

- 9.1. 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. section below for additional discussion on this point.*
- 9.2. I do not waste my or the class's time by presenting unimportant or non-essential information, therefore every class is important.
- 9.3. Much of the material is cumulative, that is to understand material presented in class two it is essential that you attended class one.

- 9.4. Participation is an important part of life, and class participation is a significant element in student evaluation. If you do not attend, you can't participate. *Please see the S.C.A.N.S. section below for additional discussion on this point.*
- 9.5. 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.
- 9.6. 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.
- 9.7. 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.

## 10. SCANS<sup>2</sup> Workplace Competencies Addressed in this Class:

- 10.1. Resources: Identifies, organizes, plans, and allocates resources:
  - 10.1.1. Time--Selects goal-relevant activities, ranks them, allocates time, and prepares and follows schedules
  - 10.1.2. Money--Uses or prepares budgets, makes forecasts, keeps records, and makes adjustments to meet objectives
  - 10.1.3. Material and Facilities--Acquires, stores, allocates, and uses materials or space efficiently
  - 10.1.4. Human Resources--Assesses skills and distributes work accordingly, evaluates performance and provides feedback
- 10.2. Interpersonal: Works with others
  - 10.2.1. Participates as Member of a Team--contributes to group effort
  - 10.2.2. Teaches Others New Skills
  - 10.2.3. Serves Clients/Customers--works to satisfy customers' expectations
  - 10.2.4. Exercises Leadership--communicates ideas to justify position, persuades and convinces others
  - 10.2.5. Responsibly challenges existing procedures and policies
  - 10.2.6. Negotiates--works toward agreements involving exchange of resources, resolves divergent interests
  - 10.2.7. Works with Diversity--works well with men and women from diverse backgrounds

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<sup>2</sup> Secretary's Commission on Achieving Necessary Skills see <http://pueblo.pc.maricopa.edu/MariMUSE/SCANS/SCANS.html> for details.

- 10.3. Information: Acquires and uses information
  - 10.3.1. Acquires and Evaluates Information
  - 10.3.2. Organizes and Maintains Information
  - 10.3.3. Interprets and Communicates Information
  - 10.3.4. Uses Computers to Process Information
  
- 10.4. Systems: Understands complex inter-relationships
  - 10.4.1. Understands Systems--knows how social, organizational, and technological systems work and operates effectively with them
  - 10.4.2. Monitors and Corrects Performance--distinguishes trends, predicts impacts on systems operations, diagnoses deviations in systems' performance and corrects malfunctions
  - 10.4.3. Improves or Designs Systems--suggests modifications to existing systems and develops new or alternative systems to improve performance
  
- 10.5. Technology: Works with a variety of technologies
  - 10.5.1. Selects Technology--chooses procedures, tools or equipment including computers and related technologies
  - 10.5.2. Applies Technology to Task--Understands overall intent and proper procedures for setup and operation of equipment
  - 10.5.3. Maintains and Troubleshoots Equipment--Prevents, identifies, or solves problems with equipment, including computers and other technologies

## **11. Next Recommended Course(s) in Sequence [may be taken in any order]**

- 11.1.** MCHN1313-Basic Milling Operations (48.0501) An introduction to the common types of milling machines, basic parts, nomenclature, basic operations and procedures, machine operations, safety, machine mathematics, blueprint reading and theory.
  
- 11.2.** 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.
  
- 11.3.** 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.