San José State University
Charles W. Davidson College of Engineering
Department of Mechanical Engineering
ME 30 Computer Applications
Section 01 Fall 2015

Instructor: Bryan Burlingame
Office Location: Engineering 348
Email: bryan.burlingame@me30.org
Office Hours: TBD

Class Meeting Information
Seminar 01: M 1200-1250 SH100
Lab 02: Tu 1330-1615 ENG394
Lab 03: Th 0900-1145 ENG407
Lab 04: F 0900-1145 ENG394
Lab 05: F 1330-1615 ENG394

Prerequisites: College Prep Mathematics and English
Course Fees: $60 lab kit

Web Pages and Messaging
Copies of the course materials such as the syllabus, informational handouts, etc., may be found on Dr. Furman’s website for this course: http://www.engr.sjsu.edu/bjfurman/courses/ME30/ or on the Canvas site: https://sjsu.instructure.com/. You are responsible for regularly checking these websites and the messaging system through MySJSU (or other communication system as indicated by the instructor) to stay on top of deadlines and announcements for the course.

Course Description
Using a computer to solve engineering problems through programming and the use of engineering application procedures. Use of procedural and informational problem solving methods and practices applied to software design, application, programming and testing. Lecture 1 hour/lab 3 hours. 2 units.

Course Goals and Learning Objectives
The goals of this course are to help you:
- Understand how mechanical and aerospace engineers can and do use computers to solve engineering problems
- Learn how to solve engineering problems using computational methods
- Get experience in developing algorithms for effectively solving problems using computers
- Gain familiarity with several software tools that are widely used by mechanical engineers to solve analytical and numerical problems
- Prepare for subsequent courses which involve computation to solve engineering problems

Learning Objectives
The student who successfully completes the course will be able to:

1. General
   1.1 Locate course materials using course management and web resources
   1.2 Explain what the course is about what will be covered
   1.3 Describe where and how computers are used by mechanical and aerospace engineers (MAEs)
   1.4 List some of the software commonly used by MAEs
   1.5 Describe what the major elements of a computer are and what they do conceptually
1.6 Explain the focus of the course

2. Problem Solving
   2.1 Describe and apply a general method for solving an engineering problem that leads to a computational solution
   2.2 Analyze a problem and devise an effective algorithm that can be implemented by a computer by applying specific techniques such as problem decomposition, defining diagrams, data dictionaries, pseudocode, desk checking, etc.

3. Programming Methodology
   3.1 Apply the basic concepts of sequence, selection, and repetition in the development of a computational solution to a specific problem
   3.2 Write programs that are sufficiently documented so that colleagues can understand their operation

4. Application of Software Tools
   4.1 Select and explain your choice of appropriate engineering software among potential candidates to use to solve a specific engineering problem
   4.2 Apply correct syntax, grammar, and design patterns to create a functional software program that solves a given problem
   4.3 Construct visual graphics using various software tools to effectively analyze and present data
   4.4 Write program code to interact with the physical world outside the computer

Texts

Required Textbook

Hardware

Spartronic Lab Kit ($60) from the ME office (available by week 4)

Software

Go to http://www.softintegration.com/download/register/, and register to download Ch 7.0 Student Edition (it is free). Install it on a computer that you will use for your homework.

References

C Programming
http://www.softintegration.com/products/chstudent/ (web page to download Ch Student Edition)
http://www.softintegration.com/download/software/release/docs/ (Documentation for Ch)
http://www.cs.grinnell.edu/~walker/c/examples/intro.pdf (Annotated C programming examples)
http://www.cplusplus.com/ (Excellent online language reference)
Arduino
http://www.arduino.cc/ (See the links for Reference and Getting Started on the ribbon bar especially)

Excel
http://www.vertex42.com/ExcelArticles/ (Many helpful articles for using Excel)

Matlab/Octave/FreeMat/Scilab
http://www.gnu.org/software/octave/
http://freemat.sourceforge.net/index.html
http://qtoctave.wordpress.com/download/
http://www.scilab.org/

Library Liaison
Our liaison to the University Library is Menxiong Liu <Mengxiong.Liu@jsu.edu >, 408-808-2020. Menxiong can help you make optimum use of information resources available to you through the University Library.

Classroom Protocol
I expect everyone to make their best effort to attend all class sessions and laboratory periods. Please arrive to the classroom or laboratory before the session begins, so that others are not disturbed by your entry after instruction has begun. If you normally keep a cell phone activated and with you, put your cell phone on 'vibrate' before you enter the classroom. Having your cell phone ring during class is disruptive, and will not be tolerated.

Dropping and Adding
Students are responsible for understanding the policies and procedures about add/drops, academic renewal, etc. Information on add/drops are available at http://info.jsu.edu/home/schedules.html. Information about late drop is available at http://www.jsu.edu/sac/policies/latedrops/. Students should be aware of the current deadlines and penalties for adding and dropping classes.

Assignments and Grading Policy
Assessment for the purposes of determining your course grade will consist of evaluating your performance on homework assignments, laboratory projects, quizzes and examinations, and a final examination. Quizzes may take place in lecture and/or lab and may be unannounced (so keep up on your reading and studying for this class). Check the ME 30 Course Schedule listed below for links to the homework and laboratory assignments. Unless otherwise specified, homework and lab reports will be due one week after they have been assigned. All of your work must be submitted in both hardcopy form AND in softcopy form (via the Canvas course management system) by the due date. You will not get credit for late assignments. Hardcopy of the homework must be submitted to Dr. Furman in lecture before the lecture begins. Hardcopy of your lab report must be submitted to your laboratory instructor during your lab period. IMPORTANT NOTE: Make it a point to turn in something for every assignment, whether you have completed it or not. The most common cause of failure in this class arises from not turning in assignments.

Weighting of Course Components
HW 20%, Laboratory Projects 40%, Quizzes and Exams 40%
Criteria for Assigning Letter Grades
The scores on your homework, laboratory projects, quizzes and exams, and final examination will be normalized, combined and totaled using the weighting scheme described above. A final letter grade will be determined from your overall performance (percentage) using the following criteria:
A+ Over 100%, A 100 - 93%; A- 92 - 90%; B+ 89 - 87%; B 86 - 83%; B- 82 - 80%; C+ 79 - 77%; C 76 - 72%; C- 71 - 69%; D+ 68 - 66%; D 65 - 62%; D- 61 - 59%; F <58%. Note: MAE must earn at least a grade of C- to pass the course.

The midterm examination will be given in the Laboratory sections during the week of October 20, 2014. You must attend your lab section that week in order to take the exam.

The final examination for the course will be Wednesday Dec 17, from 0945 - 1200 in E189.

University Policies
Academic Integrity
Your commitment as a student to learning is evidenced by your enrollment at San José State University. The University’s Academic Integrity policy, located at http://www.sjsu.edu/senate/S07-2.htm, requires you to be honest in all your academic course work. Faculty members are required to report all infractions to the office of Student Conduct and Ethical Development. The Student Conduct and Ethical Development website is available at http://www.sa.sjsu.edu/judicial_affairs/index.html.

Instances of academic dishonesty will not be tolerated. Cheating on exams or plagiarism will result in a failing grade and sanctions by the University. For this class, all assignments are to be completed by the individual student unless otherwise specified. If you would like to include your assignment or any material you have submitted, or plan to submit for another class, please note that SJSU’s Academic Policy S07-2 requires approval of instructors. Plagiarism is defined as, the use of another person’s original (not common-knowledge) work without acknowledging its source.¹ Thus plagiarism includes, but is not limited to²:
- copying in whole or in part, a picture, diagram, graph, figure, program code, algorithm, etc. and using it in your work without citing its source
- using exact words or unique phrases from somewhere without acknowledgement
- putting your name on a report, homework, or other assignment that was done by someone else

Students are expected to familiarize themselves with how to avoid plagiarism. Several helpful resources can be found at:
http://www.stanford.edu/dept/vpsa/judicialaffairs/students/plagiarism.sources.htm

I encourage students to collaborate on assignments, such as homework and lab reports, however what this means is that you can work together to decide on solution strategies, discuss what should be included in reports and how they should be organized, etc., but you may not copy answers in whole or in part (this includes program code), and you must put together your own lab reports. We will be using Turnitin.com to check the originality of your submissions, so do your own work.

Faculty members are required to report all infractions to the office of Student Conduct and Ethical Development. The website for Student Conduct and Ethical Development is available at http://www.sa.sjsu.edu/judicial_affairs/index.html.

SJSU Senate Policy S12-3 - Federal Regulation of the definition of the credit hour:

Success in this course is based on the expectation that a student will spend, for each unit of credit, a minimum of 45 hours over the length of the course (normally three hours per unit per week with one of the hours used for lecture) for instruction or preparation/studying or course-related activities including but not limited to internships, labs, clinical practica, etc. Other course structures will have equivalent workload expectations as described in the syllabus. [Thus, for this class, it is expected that you will spend at least two hours outside of class working on homework, lab work, test preparation, etc.]

**Campus Policy in Compliance with the American Disabilities Act**

If you need course adaptations or accommodations because of a disability, or if you need to make special arrangements in case the building must be evacuated, please make an appointment with me as soon as possible, or see me during office hours. Presidential Directive 97-03 requires that students with disabilities requesting accommodations must register with the DRC (Disability Resource Center) to establish a record of their disability.

**Student Technology Resources**

Computer labs for student use are available in the Academic Success Center located on the 1st floor of Clark Hall and on the 2nd floor of the Student Union. Additional computer labs are available in the Engineering Building in E390, and for MAE students, in E213 and E215. Computers are also available in the Martin Luther King Library (see: [http://www.sjlibrary.org/services/computers/index.htm](http://www.sjlibrary.org/services/computers/index.htm)).

**SJSU Writing Center**

The SJSU Writing Center is located in Room 126 in Clark Hall. It is staffed by professional instructors and upper-division or graduate-level writing specialists from each of the seven SJSU colleges. Our writing specialists have met a rigorous GPA requirement, and they are well trained to assist all students at all levels within all disciplines to become better writers. The Writing Center website is located at [http://www.sjsu.edu/writingcenter/](http://www.sjsu.edu/writingcenter/).

**ME 30 Course Schedule**

*The schedule below is a reasonable estimate of what will take place in the course and when. Check your email daily and the course website for alerts regarding changes to the schedule.*

**Legend:**

SK: **n-m** => **Programming in C** (Stephen G. Kochan), Chapter **n** through Chapter **m**

SK: **n-m (x-y)** => **Programming in C** (Stephen G. Kochan), Chapter **n** through Chapter **m**, pages **x-y**

**Notes:**

1. Each reading assignment shown in the table should be completed **prior to** the lecture for the week in which the assignment is listed. In other words, read the assigned chapters before the next lecture! Doing so will help prepare you for lecture and will help you maximize your learning efficiency. When you read, summarize the important points, and jot down any questions that you have. Bring your questions with you to the lecture, and please ask your instructor about them if they are not answered during the course of the lecture.

Make sure that you go over the Exercises at the end of every lesson in the text. These will help solidify your understanding of the concepts presented.

2. Following each lecture, I highly recommend that you **review** any notes you took in lecture along with the notes that you took from reading. Read back through your notes, and fill in any gaps that you may have missed or that became clearer from the lecture. Write down any questions you have in the margins of your notes. Be sure to come to office hours, or ask about your questions in class.

3. Note that hardcopy of the homework is generally due to the instructor at the **beginning** of the lecture one week after it is assigned. Unless otherwise specified, you will be expected to ALSO turn in a softcopy of your homework electronically using Canvas by the deadline indicated in the
associated Dropbox. **Both** hardcopy and softcopy must be submitted, or you will not get credit for the assignment. Pay careful attention to the deadlines for when your work must be submitted in D2L, because after the deadline passes, you will be **unable** to submit, and therefore you will not get credit assignments. **Do not** wait to the very last minute before the deadline, because slight differences between your clock setting and the server running the course management software may result in you not meeting the deadline. When you complete an assignment, I highly recommend that you **first** upload it to D2L, and then print out the hardcopy. Following this order will help you not forget to upload the softcopy version.

4. Bring some kind of data storage device with you to each laboratory session or plan to email a copy of your work to yourself, so that you will have a way to save your work. The hard drives on the computers are frequently refreshed, so do not rely on them to save your work from session to session.

**ME 30 Course Schedule** (may be subject to change, so check back throughout the semester!)

<table>
<thead>
<tr>
<th>Wk</th>
<th>Date</th>
<th>Subject</th>
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<tbody>
<tr>
<td>1</td>
<td>8/26</td>
<td><strong>Enrollment, course organization, overview of computers and programming</strong></td>
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<tr>
<td></td>
<td></td>
<td>Learning obj.</td>
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</table>
|    |      | Reading | SK: 2  
http://www.engr.jsu.edu/bjfurman/courses/ME30/ME30pdf/Notes_on_Data_Types.pdf |
|    |      | Lab | Project 1: Introduction to course tools |
|    |      | Assignment | Homework 1 and Questionnaire (don’t forget to include a picture of yourself in the Questionnaire)  
Enroll in the Piazza shell for ME 30. (Visit https://piazza.com/jsu/spring2014/me30/home)  
Homework 1 and Questionnaire due on 02/10. Hardcopy in lecture, and softcopy via Canvas. |
| 2  | 9/2  | **Operators** |
|    |      | Learning obj. | 2, 3, 4 |
|    |      | Reading | http://www.mathworks.com/access/helpdesk/help/techdoc/learn_matlab/bqr_2pl.html; Ch: 23 |
|    |      | Lab | Project 2: MatLab 1 – Bring Headphones |
|    |      | Assignment | Check Canvas |
|    |      | Due | In laboratory: Report for the previous week’s Lab Project (hard copy). Softcopy via Canvas. |
| 3  | 9/9  | **Matlab for Engineering Computation – Part 2** |
|    |      | Learning obj. | 2, 3, 4 |
|    |      | Reading | http://www.mathworks.net/MATLAB/Academic_Curricula/General_Interest/MATLAB_Tutorials/index.html |
|    |      | Lab | Project 3: MatLab 2 |
|    |      | Assignment | Check Canvas |
|    |      | Due | In lecture: Homework (hard copy). Softcopy via Canvas.  
In laboratory: Report for the previous week’s Lab Project (hard copy). Softcopy via Canvas. |
<p>| 4  | 9/16 | <strong>Data Visualization using Matlab and Excel</strong> |
|    |      | Learning obj. | 2, 3, 4 |
|    |      | Reading | <a href="http://www.egr.msu.edu/~lira/spreadsheets.pdf">http://www.egr.msu.edu/~lira/spreadsheets.pdf</a> |
|    |      | Lab | Project 4: Graphics |
|    |      | Assignment | Check Canvas |
|    |      | Due | In laboratory: Report for the previous week’s Lab Project (hard copy). Softcopy via Canvas. |</p>
<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Assignment</th>
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<tbody>
<tr>
<td>5</td>
<td>9/23</td>
<td><strong>Introduction to Algorithms</strong></td>
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<td>Learning obj. 2, 3, 4</td>
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<td></td>
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<td>Lab Project 5: Matlab &amp; Algorithm Development 2</td>
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<td>Assignment Check Canvas</td>
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<tr>
<td>6</td>
<td>9/30</td>
<td><strong>The General Form Of A C Program &amp; Introduction to Data Types</strong></td>
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<td>Learning obj. 2, 3, 4</td>
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<td>Reading SK: 1, 2</td>
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<td>Lab Project 7: Introduction to C</td>
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<td>Assignment Check Canvas</td>
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<td>Due In laboratory: Report for the previous week’s Lab Project (hard copy). Softcopy via Canvas.</td>
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<tr>
<td>7</td>
<td>10/7</td>
<td><strong>Introduction to Microcontrollers &amp; Input</strong></td>
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<td>Learning obj. 2, 3, 4, 2</td>
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<td>Reading SK: 3, 4 <a href="http://www.framingham.edu/~dkeil/keil-johnson.pdf">Problem Solving And Program Design</a> Pay special attention to the form of the control structures and how they are represented in pseudocode. <a href="http://www.engr.sjsu.edu/bjfurman/courses/ME30/ME30pdf/Notes_on_Algorithms.pdf">http://www.engr.sjsu.edu/bjfurman/courses/ME30/ME30pdf/Notes_on_Algorithms.pdf</a> <a href="http://www.engr.sjsu.edu/bjfurman/courses/ME30/ME30pdf/Notes_on_var_names.pdf">http://www.engr.sjsu.edu/bjfurman/courses/ME30/ME30pdf/Notes_on_var_names.pdf</a> <a href="http://www.engr.sjsu.edu/bjfurman/courses/ME30/ME30pdf/Notes_on_Data_Types.pdf">http://www.engr.sjsu.edu/bjfurman/courses/ME30/ME30pdf/Notes_on_Data_Types.pdf</a></td>
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<td>Lab Project 8: Algorithm development</td>
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<td>Assignment Check Canvas</td>
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<tr>
<td>8</td>
<td>10/14</td>
<td><strong>Input/Output: Interacting with the world &amp; Decisions (if/else)</strong></td>
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<td>Learning obj. 2, 3, 4, 2</td>
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<td>Lab Project 9: I/O 1</td>
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<td>Assignment Check Canvas</td>
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<td>Due In laboratory: Report for the previous week’s Lab Project (hard copy). Softcopy via Canvas.</td>
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<tr>
<td>9</td>
<td>10/21</td>
<td><strong>Decisions (case) – Midterm in Lab</strong></td>
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<td>Learning obj. 2, 3, 4, 2, 4, 4</td>
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<tr>
<td></td>
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<td>Reading SK: 5, 6, 12(280 – 292) <a href="http://www.tigoee.net/blog/category/physicalcomputing/176/">http://www.tigoee.net/blog/category/physicalcomputing/176/ EXPLORE a few themes that look interesting</a> Optional <a href="http://ahmedriaiz.com/mind/esketching4designers/">http://ahmedriaiz.com/mind/esketching4designers/</a> Lots of links to Arduino-related and other embedded-related sites</td>
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<td>Lab MIDTERM</td>
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<td>Assignment Check Canvas</td>
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<tr>
<td>Date</td>
<td>Date of Assignment</td>
<td>Description</td>
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</tbody>
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| 10/28 | Selection Structures and Repetition (for loops) – *Take home lab*  
Learning obj.  
Reading  
Lab  
Assignment  
Due  |
| 2, 3, 4.2, 4.4  
SK: 5, 6  
Project 11: Selection  
Check Canvas  
|  
In laboratory: Report for the previous week's Lab Project (hard copy). Softcopy via Canvas.  |
| 11/4 | Repetition Structures (while loops) & Files  
Learning obj.  
Reading  
Lab  
Assignment  
Due  |
| 2, 3, 4.2  
SK: 5,6, 16 (363 – 371)  
http://www engr sjtu edu/bjfurman/courses/ME30/ME30pdf/Notes_on_Algorithms.pdf (Note the forms for how to express a selection structure in pseudocode)  
Project 12: Repetition structures  
Check Canvas  
|  
In lecture: Homework 2 hard copy. Softcopy via Canvas.  
In laboratory: Report for the previous week's Lab Project (hard copy). Softcopy via Canvas.  |
| 11/11 | Veteran's Day  
Learning obj.  
Reading  
Lab  
Assignment  
Due  |
| 2, 3, 4.2, 4.4  
SK: 5, 6  
Open Labs  
Check Canvas  
|  |
| 11/18 | Modular Programming using Functions  
Learning obj.  
Reading  
Lab  
Assignment  
Due  |
| 2, 3, 4.2  
SK: 8 (119 – 135)  
http://www engr sjtu edu/bjfurman/courses/ME30/ME30pdf/Notes_on_Algorithms.pdf (Note the forms for how to express a repetition structure in pseudocode.)  
Project 13: Modular programming using functions  
Check Canvas  
|  
In laboratory: Report for the previous week's Lab Project (hard copy). Softcopy via Canvas.  |
| 11/25 | Pointers and Arrays  
Learning obj.  
Reading  
Lab  
Assignment  
Due  |
| 2, 3, 4.2  
SK: 7, 8 (136 – 156), 10 (195 – 217)  
No Labs  
Check Canvas  
|  
In lecture: Homework (hard copy). Softcopy via Canvas.  
In laboratory: Report for the previous week's Lab Project (hard copy). Softcopy via Canvas.  |
<table>
<thead>
<tr>
<th>14</th>
<th>12/3</th>
<th><strong>Final Review</strong></th>
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<tbody>
<tr>
<td></td>
<td><strong>Learning obj.</strong></td>
<td>2, 3, 4.2</td>
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<td></td>
<td><strong>Reading</strong></td>
<td>SK: 11</td>
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<td><strong>Lab</strong></td>
<td>Project 14: Final Lab</td>
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<td><strong>Assignment</strong></td>
<td>Check Canvas</td>
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<td>Due</td>
<td><strong>Due</strong></td>
<td>In laboratory: Report for the previous week’s Lab Project (hard copy). Softcopy via Canvas.</td>
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<tr>
<td>Due</td>
<td><strong>Due</strong></td>
<td>In lecture: Report for the previous week’s Lab Project (hard copy). Softcopy via Canvas.</td>
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</tbody>
</table>

**FINAL EXAM on December 10th**