Department of Mechanical Engineering
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Uttyler.edu/engineering

# MSEL 5330– System Engineering & Process Control/ MENG 5330 – Process Control
# Course Syllabus

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| **Semester / Year** | Summer 2025 |
| **Catalog Description** | The course focuses on the use of controls in the process industry. The development of process models will involve measurement of variables, controller types, and final elements. Design and evaluation of controllers in processes including thermal systems will be carried out. General instrumentation design and practice will be conducted. |
| **Prerequisites** | MENG 4312 or EENG 4308 (or Equivalent Controls course) |
| **Section Number** | MSEL 5330.RP02/ MENG 5330.461 |
| **Instructor Name** | Dr. M. A. Rafe Biswas |
| **Contact Information** | Email: mbiswas@uttyler.edu , Zoom ID: 9035666115 - https://uttyler.zoom.us/j/9035666115 , Office: HEC A214 |
| **Class Type / Instruction Mode / Location** | Online |
| **Class Time** | N/A |
| **Office Hours** | By appointment |
| **No. of Credits** | 3 |
| **Required Textbook** | None |
| **Optional References** | Recommended textbooks (some available via library using patriots account) –<br>- Agachi, Paul Serban, and Mircea Vasile Cristea. *Basic Process Engineering Control*, Walter de Gruyter GmbH, 2014. *ProQuest Ebook Central*, https://ebookcentral.proquest.com/lib/uttyler/detail.action?docID=4190803<br>- Agachi, Paul Serban, et al. *Advanced Process Engineering Control*, Walter de Gruyter GmbH, 2016. *ProQuest Ebook Central*, https://ebookcentral.proquest.com/lib/uttyler/detail.action?docID=4793896<br>- Chandra, Rames Panda, and T. Thyagarajan. *Introduction to Process Modelling Identification and Control for Engineers, An*, Alpha Science International, 2017. *ProQuest Ebook Central*, https://ebookcentral.proquest.com/lib/uttyler/detail.action?docID=5426842<br>- Chapter 8 Process control from Green, Don W., and Robert H. Perry. "Perry's chemical engineers' handbook." 8th Ed., McGraw-Hill Education (2007).<br><br>Additional Material on Canvas: Websites, Class Handouts, Tutorials on MATLAB and Simulink by Mathworks, Inc. |
| **Additional Rules and Requirements** | MATLAB, Simulink & Simscape by MathWorks, Inc. (available through virtual desktop – one.uttyler.edu and IT support)<br><br>I encourage you to explore using artificial intelligence (AI) tools, such as |

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| | Copilot and ChatGPT, for all assignments and assessments. Any such use must be appropriately acknowledged and cited, following the guidelines established by the IEEE Style Guide, including the specific version of the tool used. The submitted work should include the exact prompt you used to generate the content and the AI's complete response as an appendix. Because AI-generate content is not necessarily accurate or appropriate, you must assess the validity and applicability of any submitted AI output. You will not earn full credit if inaccurate, invalid, or inappropriate information is found in your work.<br>http://journals.ieeeauthorcenter.ieee.org/wp-content/uploads/sites/7/IEEE_Reference_Guide.pdf<br><br>The use of cellular phones during the lectures is prohibited. If a student uses the cellular phone (call, text, internet), he/she will be asked to leave the classroom and penalties of missing the class will apply. It is highly recommended to keep your cellular phone off. |
| **Evaluation Method** | **Project 30%**<br>**Exam & Quiz 30%**<br>**Assignments & Course Participation 40%** |
| **Grading Policy / Scale** | Letter grades, scale:<br>A: 90 – 100; B: 80 – 89; C: 70 – 79; D: 60 – 69; F: < 60 |
| **Important Events / Dates** | Census date: June 27<br>Last date to withdraw from one or more 7-week courses: July 24<br>Final project report due: August 6<br>Final Exams due, end of Second 7-week session - August 9 |
| **Attendance / Makeup policy / other rules** | Attendance is expected per university policy. Attendance of lectures may be regularly checked using Canvas.<br>Make-up exams or assignments if approved will be administered during finals week.<br>No email submission of assignment(s). All assignments MUST be submitted to Canvas for grading.<br>Student with SAR status should contact the UT Tyler Office of Student Accessibility and Resources for exam arrangements.<br>Any minor violation of the Student Behavior by a student will result in a full letter grade reduction for each incident and any single major violation such as cheating and plagiarism by a student will result in automatic failing grading in the course.<br><br>Late submissions of assignments, reports (e.g., if due at 11:59:00 pm, then any time after such as 11:59:30 pm is late) will result in 10 % deduction per day from the graded score until down to 10% remaining. Late or no submission for any exam results in automatic grade of zero.<br><br>Questions involving knowledge covered in class will be answered if the student proves that they have tried to come up with the answer. Solution to homework and quizzes will not be given. However, students can work on the right solution by checking their work with the instructor. |

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| | Grade appeal: grades can be appealed by sending a Canvas message in written or typed format and then meeting the instructor during office hours, but no later than a week after the grade has been posted. Moreover, students may appeal any grade reduction to the instructor if valid excuse with documentation is provided.<br><br>Note: your final semester grade is based on the 10-point scale. No curving or scaling will be applied even if you receive borderline grade such as 79.99. |
| **Course Learning Objectives / ABET & PEOs Relation** | By the end of this course, students will be able to:<br>1. Ability to develop mathematical models and transfer functions of processes.<br>2. Analyze and model dynamic processes in time domain.<br>3. Utilize computational tools to design and analyze different types of control systems.<br>4. Able to read and interpret block diagrams, and process and instrumentation diagrams.<br>5. Relate the use of control systems to real-world problems. |
| **Tentative Topics / Course Plans** | • Mathematical modeling of different processes includes thermal fluid systems<br>• Process Dynamic modeling and Analysis including empirical modeling<br>• Advanced Control architectures including Feedback and Feedforward control<br>• Control System Design, Tuning and Analysis<br>• Process and instrumentation diagram<br>• Machine Learning |
| **University Policies** | https://www.uttyler.edu/offices/academic-affairs/files/syllabus-information.pdf |

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**Course Schedule for 7 week session - https://www.uttyler.edu/academics/academic-calendar.php**

| Week of | | Chapter /Class Activity | Major Assignments due |
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| June | 23 | Intro to Process Control<br>Laplace Transform & Transfer Functions | Welcome and Intro<br>Module 1 Discussion and Assignments |
| | 30 | Process Dynamic modeling and Analysis | Module 2 Discussion and Assignments |
| July | 7 | Empirical Modeling/System Identification/Machine Learning | Module 3 Discussion and Assignments |
| | 14 | Intro to Feedback Control/ Control System Instrumentation | Module 4 Discussion and Assignments including Scope Report |
| | 21 | Control System Design, Tuning and Analysis | Module 5 Discussion and Assignments |
| | 28 | Advanced Control architectures | Module 6 Discussion and Assignments |
| Aug | 4 | Project & Basics of Systems Engineering | Final Project Report due on Aug 6<br>Final Exam due on Aug 9 |

Evaluation activities

- Exam & Quiz: There will be an exam and multiple quizzes during the semester. Final exam is comprehensive covering all modules and related to the project. Quiz will cover topics from each module except for module 1, which will not have any quizzes. No late submission will be accepted and will result in automatic grade of zero. Make-up exam if approved by instructor will be administered during finals week.
- Project: There will be 2 reports during the semester. Each student will choose a complex thermal fluid energy system to model and control which they will present as Scope Report. Each student analyzes the system and simulate the system to and develops the control architecture for given system and provide results for different operating (input/disturbance) conditions to then submit Final Report. Instructions on the report format/style, grading rubric form and checklist will be posted separately. No late submission will be accepted and will result in automatic grade of zero.
- Assignments & Course Participation and Conduct: Participation are expected per university policy. Check class and Canvas regularly for any announced assignments according to the topics covered in lectures. Questions involving knowledge covered in class can be checked if your work is shown to the instructor, but no solutions will be posted on Canvas. Be prepared for the course by reviewing relevant material, taking notes, solving problems and participating in discussions, which are all expected. Late submissions of assignments will result in 10% deduction from the graded score after each 24-hour period.

Instructions on the report format/style, checklist and grading rubric form will be posted separately on Canvas. Figure 1 shows approximate amount time that should be invested into the course weekly.

NOTE: The syllabus is subject to change during the course of semester as deemed necessary.