

ME 311: Microprocessors and Automatic Control: Introduction



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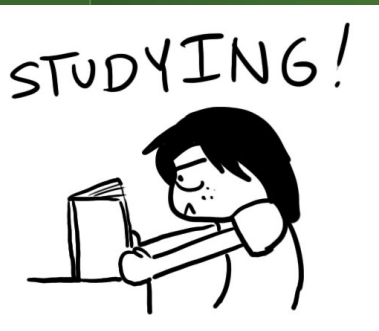
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Why are you studying what you are?



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- Getting grade
- Parents are forcing me to do, I am helpless
- Nothing else to do
- Don't know
- Everybody is doing
- For the sake of participating in competitions!!
- Any other reason
- ***Gain knowledge***

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Why I am here?

- Would like to see that you develop in every aspect in theoretical understanding with practical perspective of microprocessor, automatic control and have a rich learning experience
- Anything else you are expecting me to do??

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What is expected of you?

- BE ETHICAL: the most important. Do not copy/ be truthful/ help others to clear fundes ← You are helping yourself by this
- Be in class physically as well mentally: then you would have to spend less time studying in room
- If you have doubt questions, feel free to ask. It may be common for many
- Participate
- Give me feedback anytime →

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EXCUSE ME A SEC... I WANT
TO CHECK HOW MANY HITS I GOT
ON MY WEBSITE...

**Remember
this always a
possibility?**

- Better ask questions and clarify your understanding

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Why automatic control?

- Application of automation
 - Industrial: assembly lines, process plants BWM car assembly line <https://www.youtube.com/watch?v=VpwkT2zV9H0>
 - **ABB** food processing
 - Various new gadgets:
CD ROM drives, automatic xy stages, hard disc drive, robots, cruise control, electronic fuel injection, UAVs, **printer, scanner, washing machine**, xerox machine, ATM, missile systems, space rockets, liquid level controller, chemical plant, CNC machine, ... the list is endless

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Why understand microprocessor?

- It's a brain of all these applications →
- Any automatic control system implementation requires fair understanding of microprocessor and its programming
- Design and synthesis of automatic control systems

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How these work?

- Hard disc drive: data storage evolution
<https://www.youtube.com/watch?v=wteUW2sL7bc>
- CDROM drive : Gross positioning servo system
- CD ROM Drives: fine positioning and focussing servo system
- Scanner
- Micromouse
- Autofocus camera
- Deskjet printer

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Course Contents

- Introduction, Review of combinational logic circuits. Intro to Sequential circuits, prelim design of sequential circuits, flip-flops. Registers, counters, tri-state logic
- Register-register data transfer. Timing and control circuitry. Sequential circuit design examples design considerations for arriving at appropriate data/control paths.

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Course Contents

- Functional architecture of microprocessors, terminology. Intro to Microcontroller Programming. Interfacing – A/D, D/A, Timer.
- Introduction to feedback, dynamic system behaviour. Math review: Fourier series, transforms, LTI systems, notion of stability. Non-linear system behaviour, linearization.

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Course Contents

- Linear feedback controller design – frequency response based methods. PID control. Sampling theorem, Digital implementation of controllers

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Course Goals

- Be in position to develop logic for application and design preliminary digital circuits.
- Understand digital number representation.
- Know microprocessor fundamentals and be in position to find out resources, understand datasheets of a mc and programming logic
- Understand fundamentals of microprocessor interfacing with peripherals.
- Understand basics of digital control implementation

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Course Goals

- Understand fundamentals of feedback control system: "System perspective" of looking at dynamics
- Be able to model the system, linearize if not, and analyze it for stability and develop simple control algorithms
- Be in position to quantify parameters of control to match desired specifications

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Foundation Assumed

- Basics of digital circuits : part of EE 101
- Various logic gates NAND, NOR

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Course Evaluation

- 80% attendance policy
- Quizzes: 2 : 10% Missed quiz: 0
- Course project or additional Quizzes: 2 : 10%
- Assignments/Tut sessions: 10%
- Mid sem : 30%
- End sem : 40%
- Optional help sessions every week 1 hr
- Moodle

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Text Books

- Benjamin C. Kuo, Automatic Control Systems, 7th Ed., Prentice Hall, 1995.
- Randy H. Katz, Contemporary Logic Design, Benjamin/Cummings, 1994.
- Gaonkar, Microprocessor Architecture, Programming and Applications with 8085, 4th Ed.

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