

## Lecture 1: Introduction

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## 1 Reference

### Books:-

- Introduction to the Theory of Computation by Michael Sipser [Sip13]
- Computational Complexity: A Modern Approach by Sanjeev Arora and Boaz Barak [AB09]
- Computational Complexity: A Conceptual Perspective by Oded Goldreich [Gol08]
- Mathematics and Computation: A Theory Revolutionizing Technology and Science by Avi Wigderson [Wig19]

### Lecture Notes:-

- Madhu Sudan: 2018 and 2021
- Venkat Guruswamy: 2011 and 2009
- Luca Trevisan: 2015, 2014, 2012, 2010
- Salil Vadhan: Notes
- Prahlad Harsha: 2021, 2020, 2018, 2014, 2013, 2012, 2011
- Jay Kumar Radhakrishnan: 2004

## 2 Basic Classes

**Note:-**

All the classes in this course are subsets of decidable problems

We know for any problem  $P$  a language  $L_P$  is associated.

$P$  := Class of problems that can be decided in deterministic polynomial time

$NP$  := Class of problems for which witness can be verified in deterministic polynomial time. Now it is obvious that  $P$  is contained in  $NP$ . But we don't know if  $P = NP$  or not.

## References

- [AB09] Sanjeev Arora and Boaz Barak. *Computational Complexity: A Modern Approach*. Cambridge University Press, 1st edition, 2009.
- [Gol08] Oded Goldreich. *Computational Complexity: A Conceptual Perspective*. Cambridge University Press, 2008.
- [Sip13] Michael Sipser. *Introduction to the Theory of Computation*. Cengage India Private Limited, third edition, 2013.
- [Wig19] Avi Wigderson. *Mathematics and Computation: A Theory Revolutionizing Technology and Science*. Princeton University Press, 2019.