

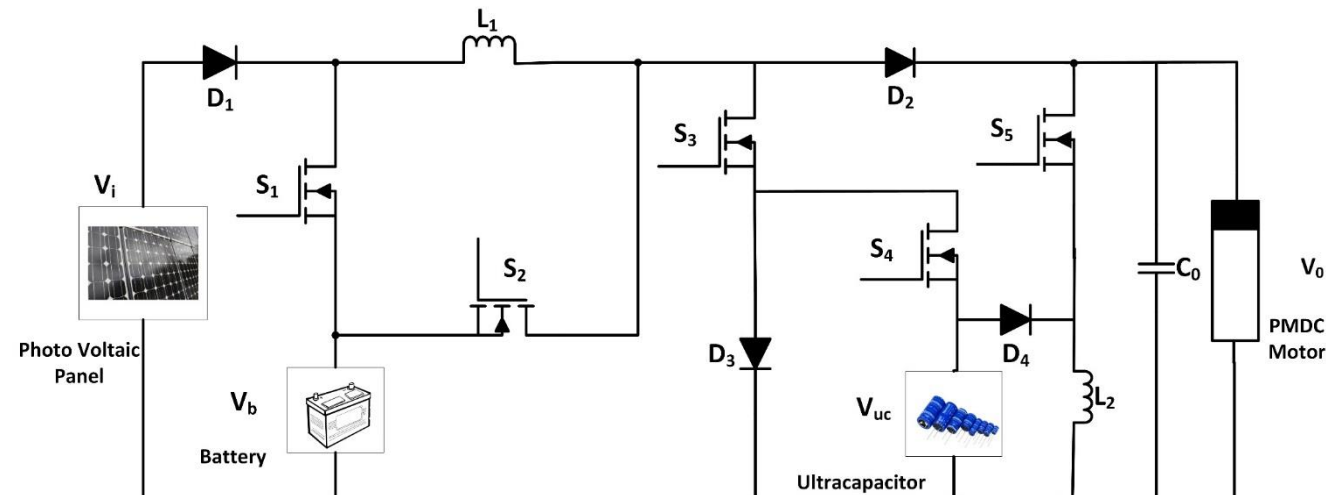
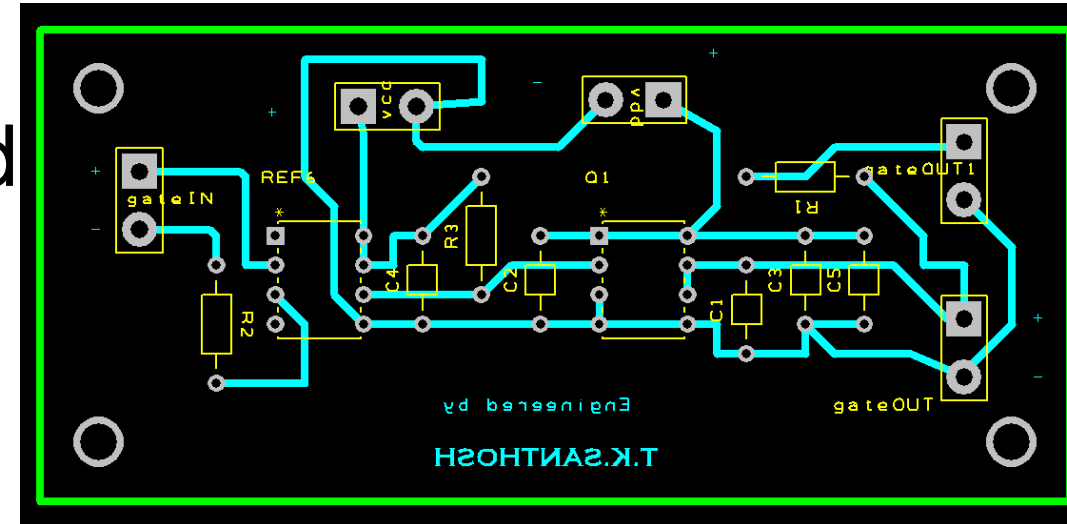
EEE104 – Principles of Electrical Engineering

1.0 Introduction and Administrivia

Dr.Santhosh.T.K.
santhosh@eee.sastra.edu
9942031340

Know Your Instructor

- My educational background
- Work experience
- Research Interests



Time to Introduce Yourself

- Please volunteer
- Your name, where are you from, what do you want to become.

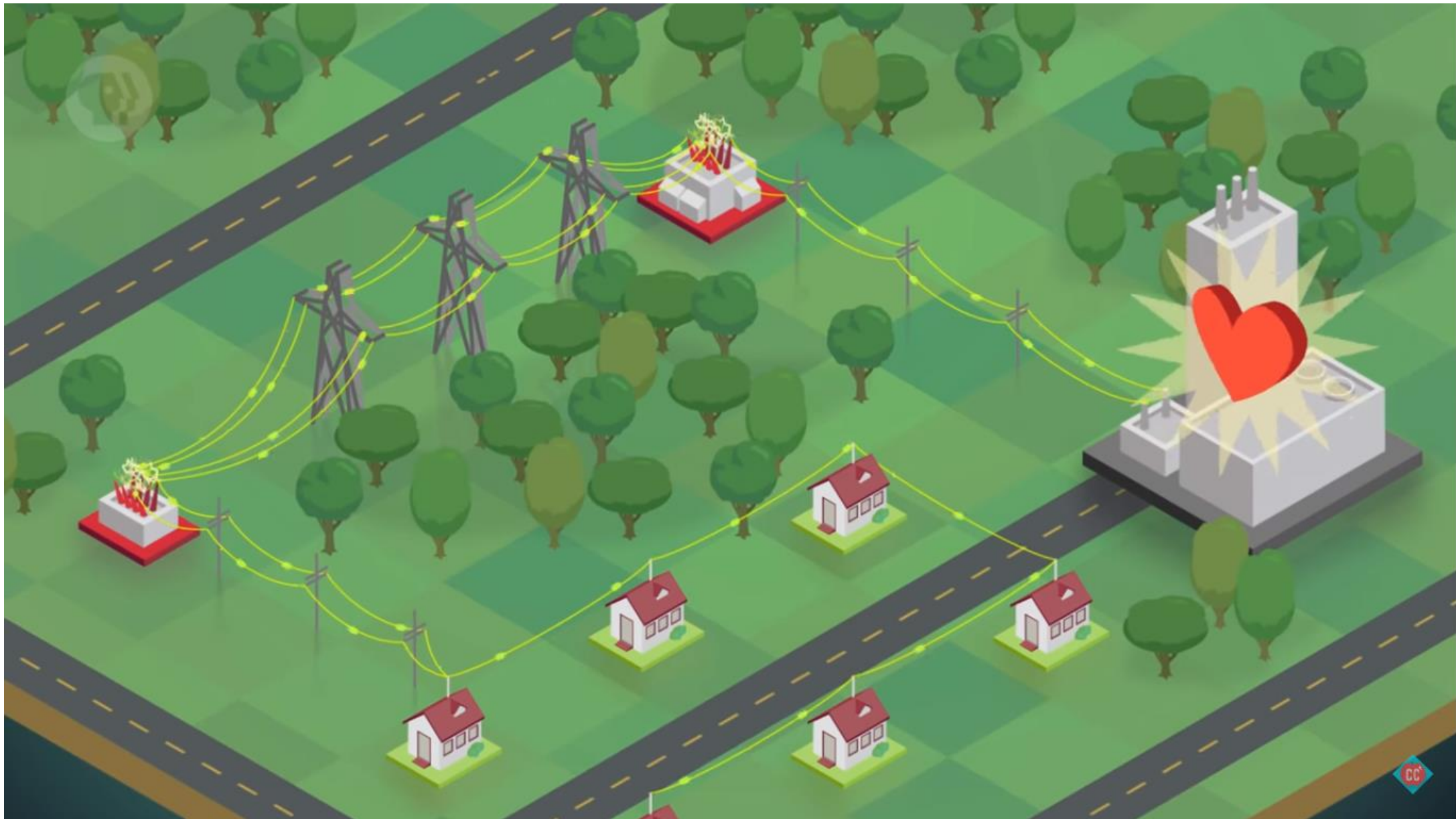
- Three online contact hours per week
 - Mix of lecture + PPT + videos
 - Will try flipped classroom for problems
 - Calculator is required. Any scientific calculator app will do.
- Theory + Lab course
- Post technical queries in Google Classroom (GCR)

History of Electrical Engineering

- Telecommunication
- Power & Lighting
- Computer Engineering

ENGINEERING

THE WORD “ENGINEERING” ITSELF COMES FROM THE LATIN INGENIUM, MEANING “**CLEVERNESS**”, AND INGENIARE, MEANING “TO DESIGN OR DEVISE”.



History



History



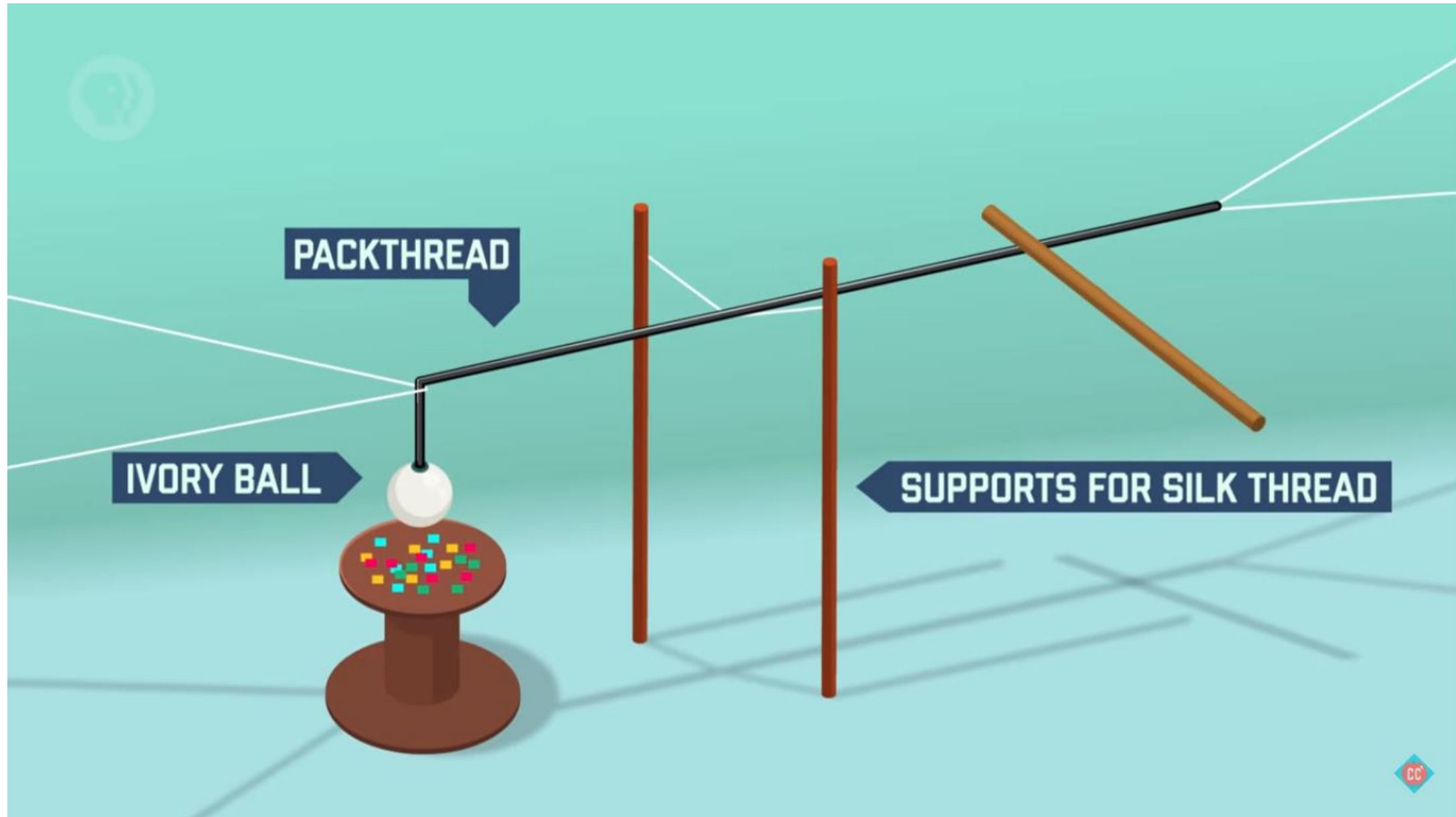
ENGINEATO!
GRAY NEVER LIKED TO STAY
STATIC

Fig 4.2

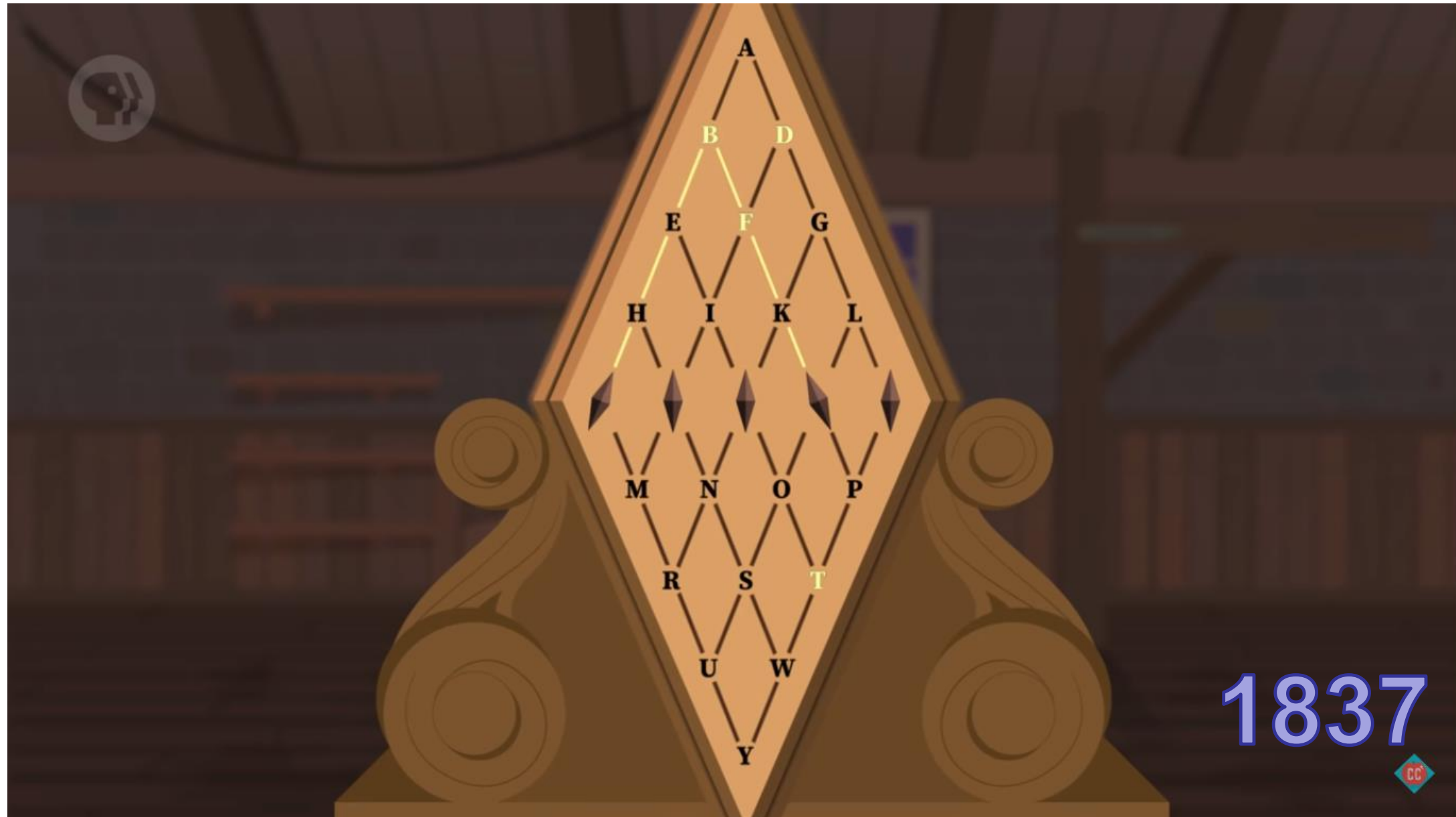
STEPHEN GRAY

1729

History - Telecommunications



Wheatstone Bridge (Telegraph)



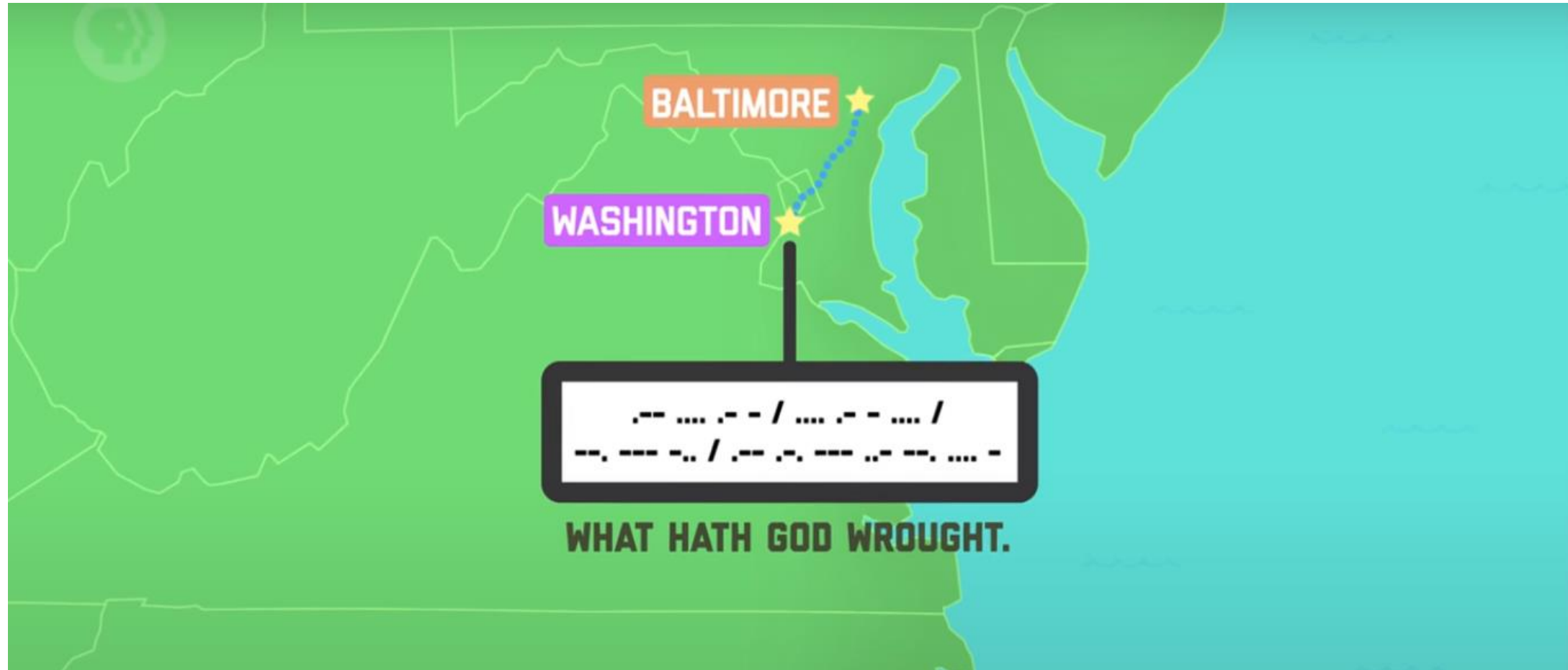
First Telegraph to London



Morse Code



First Morse Message



1844

TRANSATLANTIC TELEGRAPH LINE

NEWFOUNDLAND

IRELAND

1866

Power and Lighting

- 1831 – Arc Lighting – Sir Humphry Davy
- 1870 – Gramme Dynamo -Zénobe-ThéophileGramme

Incandescent Lamp

BY CAPITALIZING ON THE WORK OF MANY OTHERS, HIS **INCANDESCENT LIGHTING SYSTEMS** WERE SOON FEATURED AT POPULAR EXHIBITS SUCH AS THE PARIS LIGHTING EXHIBITION IN 1881 AND THE CRYSTAL PALACE IN LONDON.

WAR OF CURRENTS



THOMAS EDISON



**GEORGE
WESTINGHOUSE**



**NIKOLA
TESLA**



1890

WAR OF CURRENTS

DC (DIRECT CURRENT)



THOMAS EDISON

AC (ALTERNATING CURRENT)



**GEORGE
WESTINGHOUSE**



**NIKOLA
TESLA**

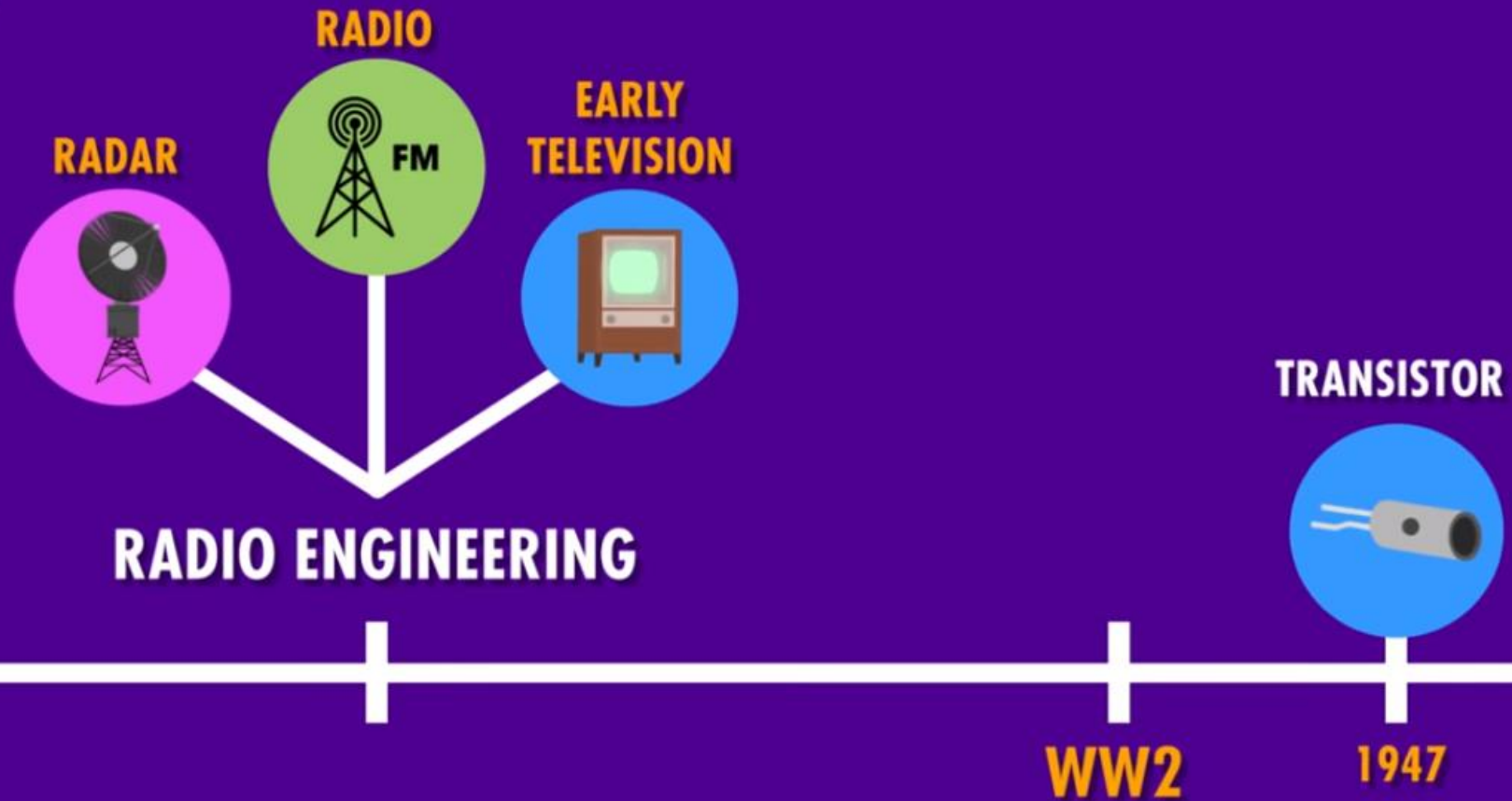


World Fair Chicago

1893



Computers

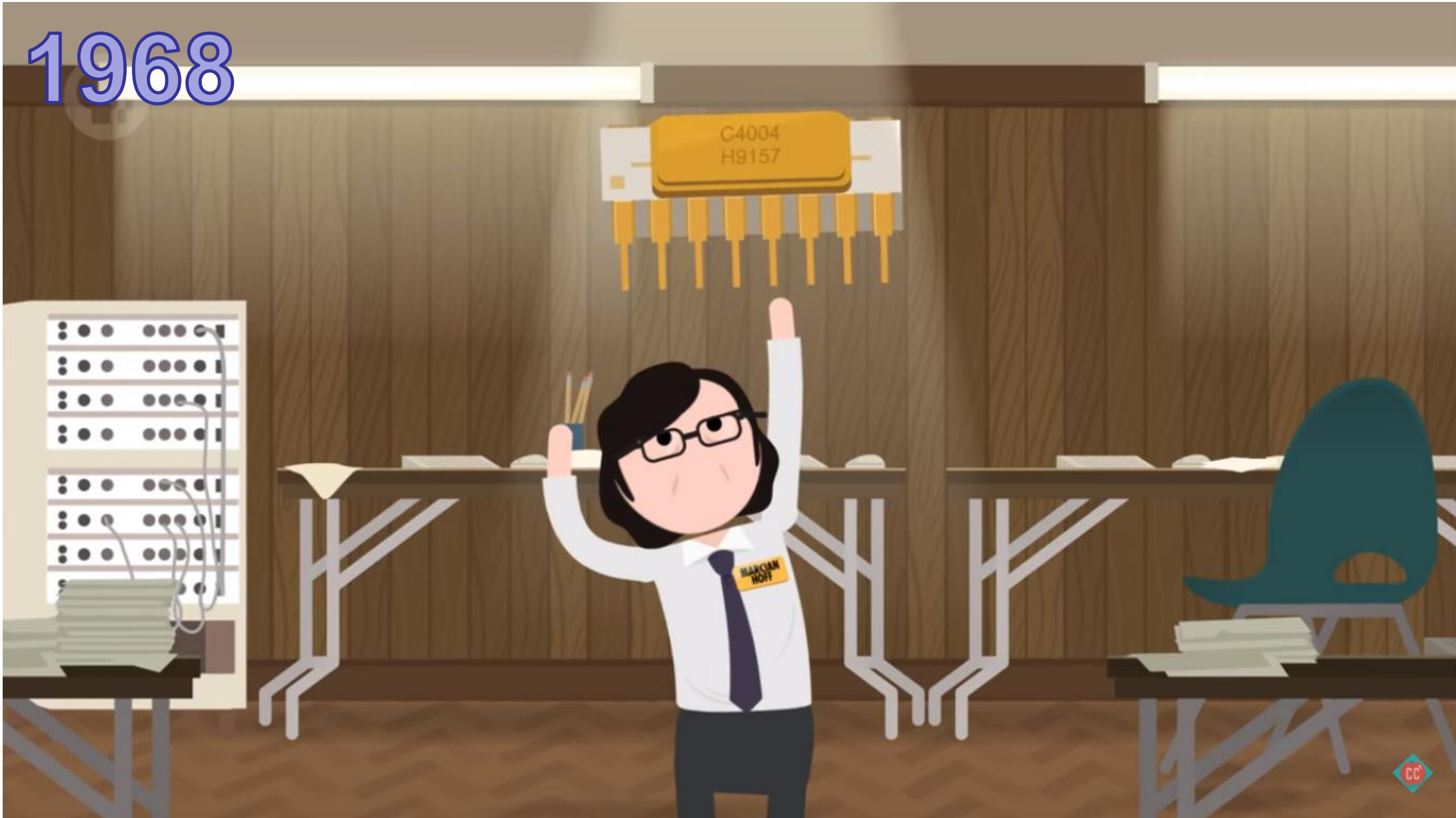


**THE POINT-CONTACT TRANSISTOR WAS
A SEMICONDUCTOR DEVICE THAT COULD
AMPLIFY OR SWITCH ELECTRICAL SIGNALS.
IT ALLOWED ELECTRICAL ENGINEERS TO
REPLACE VACUUM TUBES, WHICH WERE
BULKY, UNSTABLE, AND CONSUMED TOO
MUCH POWER.**



Computers

1968





- EEE104 – Principles of Electrical Engineering
- Course Objectives
 - Apply basic concepts of DC and AC circuits
 - Make use of the principles of electrostatics and electro mechanics.
 - Understand the basic methods for the measurement of electrical quantities.
 - Explore the concept of electrical Wiring and safety measures

Syllabus

UNIT – I

10 Periods

Introduction and Basic Concepts: Concept of Potential difference, voltage, current - Fundamental linear passive and active elements to their functional current-voltage relation - Terminology and symbols in order to describe electric networks - Concept of work, power, energy and conversion of energy- Principle of batteries and application.

Principles of Electrostatics: Electrostatic field - electric field intensity - electric field strength - absolute permittivity - relative permittivity - capacitor composite – dielectric capacitors - capacitors in series & parallel - energy stored in capacitors - charging and discharging of capacitors.

UNIT – II

14 Periods

DC Circuit Analysis: Voltage source and current sources, ideal and practical, Kirchhoff's laws and applications to network solutions using mesh analysis, - Simplifications of networks using series- parallel, Star/Delta transformation, DC circuits-Current-voltage relations of electric network by mathematical equations to analyse the network (Superposition theorem, Thevenin's theorem, Maximum Power Transfer theorem), Transient analysis of R-L, R-C and R-L-C Circuits.

AC Steady-state Analysis: AC waveform definitions - Form factor - Peak factor - study of R-L - R-C -RLC series circuit - R-L-C parallel circuit - phasor representation in polar and rectangular form - concept of impedance - admittance - active - reactive - apparent and complex power - power factor, Resonance in R-L-C circuits - 3 phase balanced AC Circuits

UNIT – III

10 Periods

Principles of Electro Magnetics and Electro-mechanics: Electricity and Magnetism - magnetic field and faraday's law - self and mutual inductance - Ampere's law - Magnetic circuit - Magnetic material and B-H Curve – Single phase transformer - principle of operation - EMF equation - voltage ratio - current ratio – KVA rating - Electromechanical energy conversion – Elementary generator and motors.

UNIT – IV

11 Periods

Measurements and Sensors: Introduction to measuring devices /sensors and transducers related to electrical signals - Elementary methods for the measurement of electrical quantities, impedance, power and energy in DC and AC systems and their practical application.

Electrical Wiring and Safety: Basic layout of distribution system - Types of Wiring System & Wiring Accessories –Electrical Safety - Necessity of earthing - Types of earthing.

TEXT BOOKS

1. A. E. Fitzgerald, Kingsely Jr Charles, D. Umans Stephen, *Electric Machinery*, Tata McGraw Hill, Sixth Edition, 2005.
2. B. L. Theraja. *A Textbook of Electrical Technology*, vol. I, S. Chand and Company Ltd., New Delhi, 2012.
3. V. K. Mehta, *Basic Electrical Engineering*, S. Chand and Company Ltd, New Delhi, 2006.
4. I.J. Nagrath and Kothari, *Theory and problems of Basic Electrical Engineering*, Prentice Hall of India Pvt. Ltd., Second Edition, 2004.

REFERENCES

1. Edward Hughes, *Electrical Technology*, Pearson Education Publication, Tenth Edition, 2011.
2. Vincent. Del. Toro. *Electrical Engineering Fundamentals*, Prentice Hall India, Second Edition, 2015.
3. A Sudhakar, Shyammohan, *Circuits and Networks: Analysis and Synthesis*, Tata McGraw Hill Education, Fifth Edition, 2017.

LIST OF EXPERIMENTS

1. Familiarization of electrical Elements, sources, measuring devices and transducers related to electrical circuits
2. Verification of basic laws of electric circuits
3. Verification of voltage division and current division rules
4. Verification of Thevenin's and Norton's Theorem
5. Verification of Superposition and Maximum Power Transfer theorem
6. Simulation of R-L-C series circuits for $X_L > X_C$, $X_L < X_C$ & $X_L = X_C$
7. Simulation of Time response of RC circuit
8. Verification of relation in between voltage and current in three phase balanced star and delta connected loads.
9. Demonstration of measurement of electrical quantities in DC and AC systems.
10. Voltage-current relationship in a R-L & R-C series circuits and to determine the power factor of the circuit
11. Domestic wiring
12. Demonstration of electric power supply system
13. Demonstration of statically induced EMF

Course Learning Outcomes

- Analyze DC circuits using mesh analysis and apply network theorems
- Analyze AC circuits and find power and power factor in three phase AC circuits
- Relate the concepts of electrostatics and electromagnetics to understand the construction and applications of batteries, machines and transformers
- Summarize various methods for the measurement of electrical quantities and demonstrate domestic wiring concepts

Thank you

References

- <https://www.youtube.com/watch?v=3nB1Ntku06w>