EAST WEST UNIVERSITY

Department of EEE

Section: 1

Course Code: EEE305

Course Title: Electromagnetic Fields and Wave

Project (Task 02)

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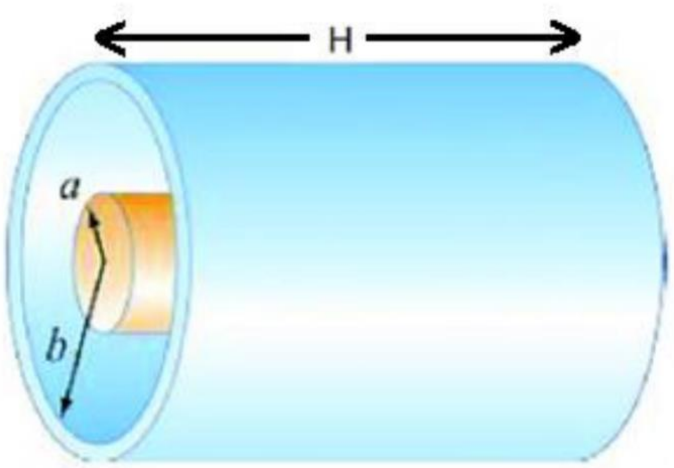
Theory

The capacitance of a cylindrical capacitor depends on four design parameters:

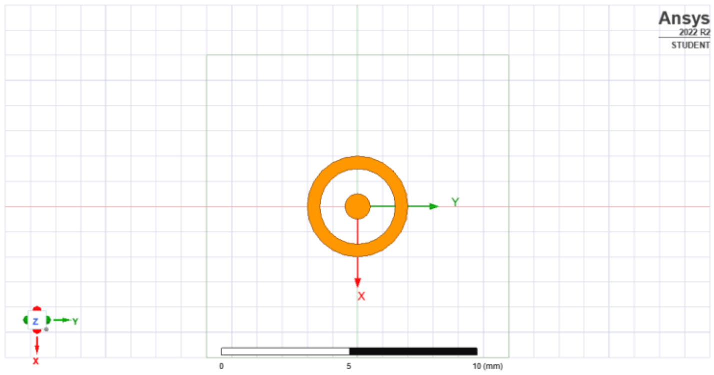
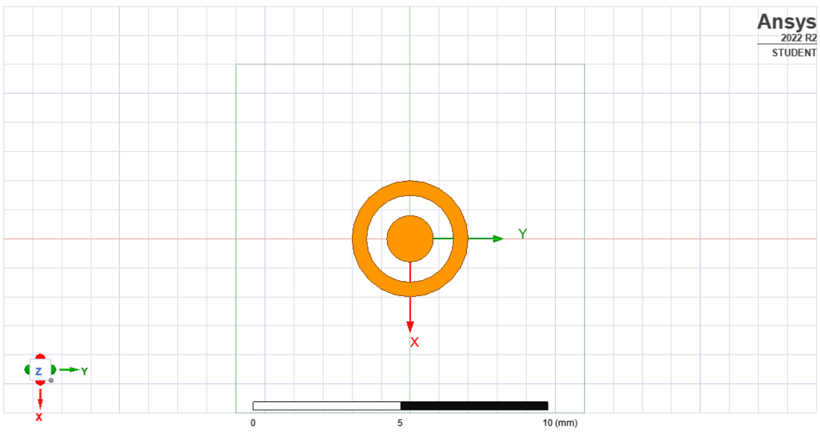
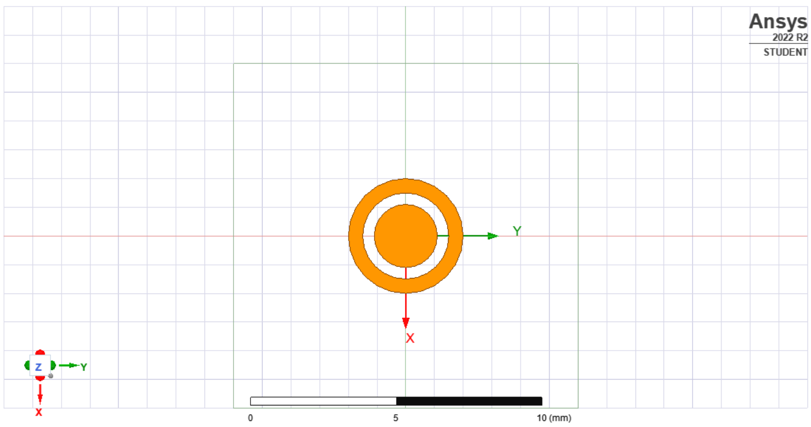
1. Radius of the inner cylinder (a)
2. Radius of the outer cylinder (b)
3. Length of the capacitor (H)
4. Permittivity of the material between the two cylinders (ε_r)



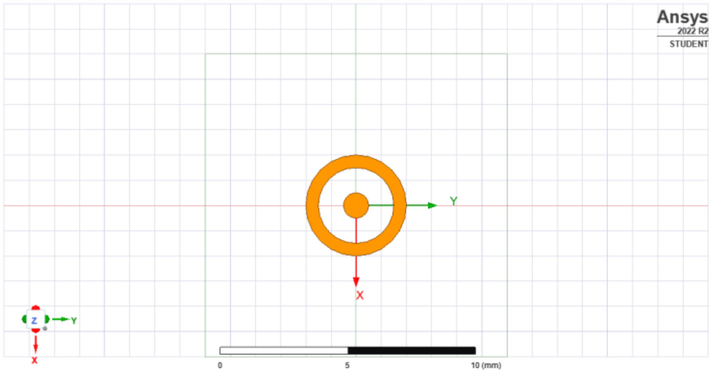
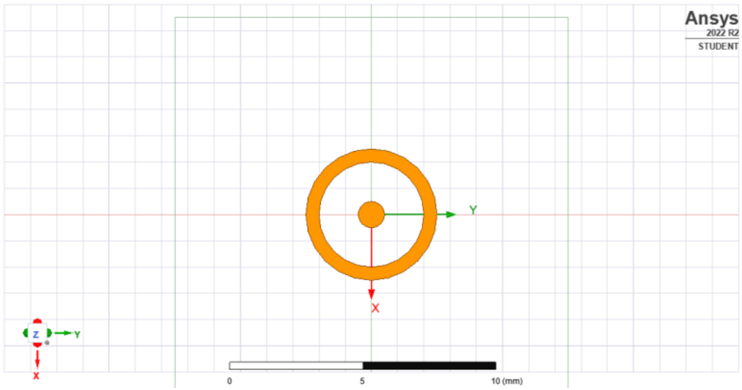
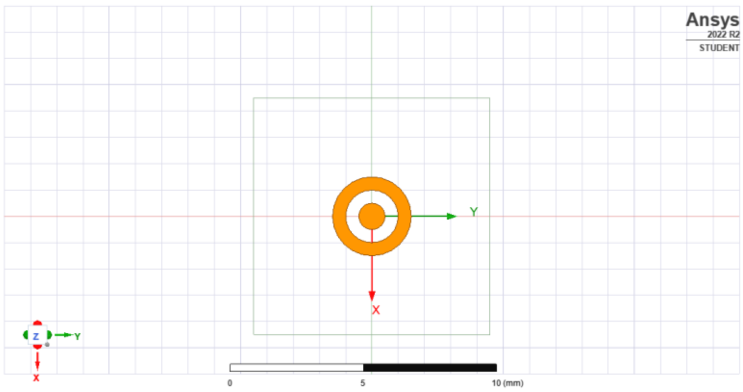
$$C = \frac{2\pi\varepsilon_0\varepsilon_r H}{\ln\left(\frac{b}{a}\right)}$$

Circuit Diagrams

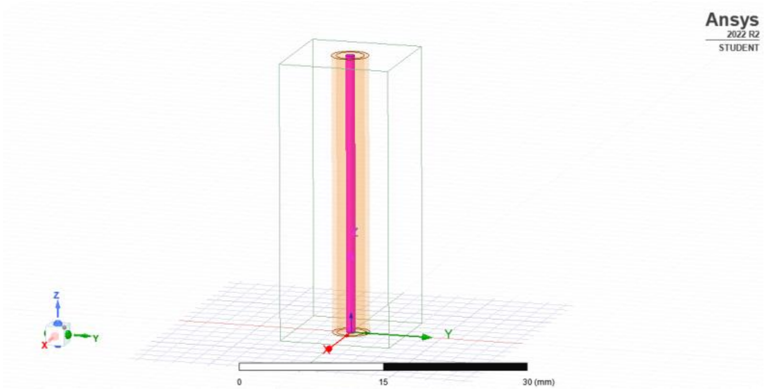
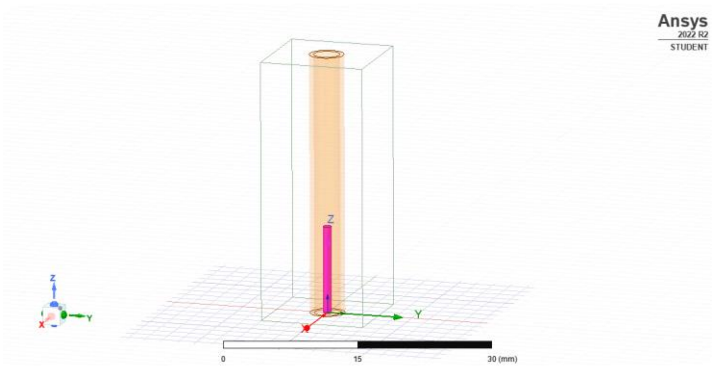
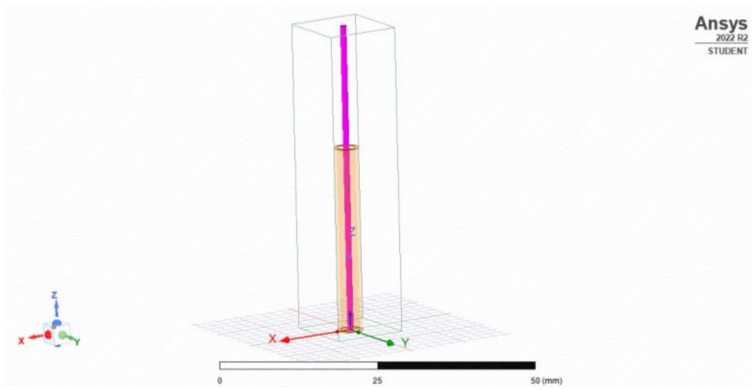
Vary a

SL No.	A (mm)	B (mm)	H (mm)	Material, ε_r	Screenshot
01.	0.5	1.5	30	Air/Vacuum (1)	
02.	0.8	1.5	30	Air/Vacuum (1)	
03.	1.1	1.5	30	Air/Vacuum (1)	

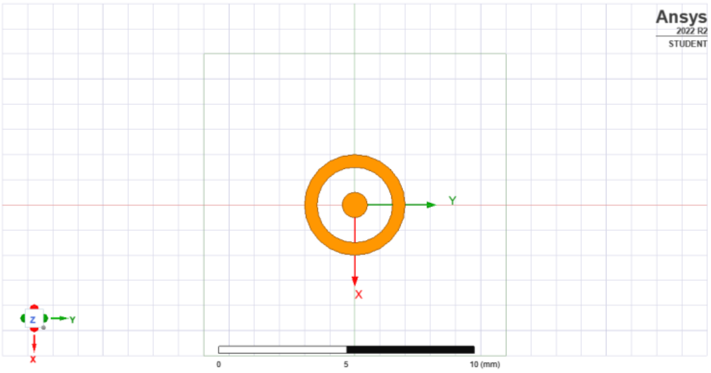
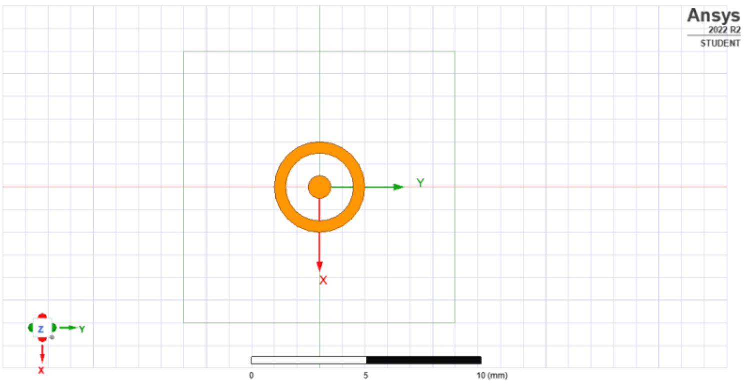
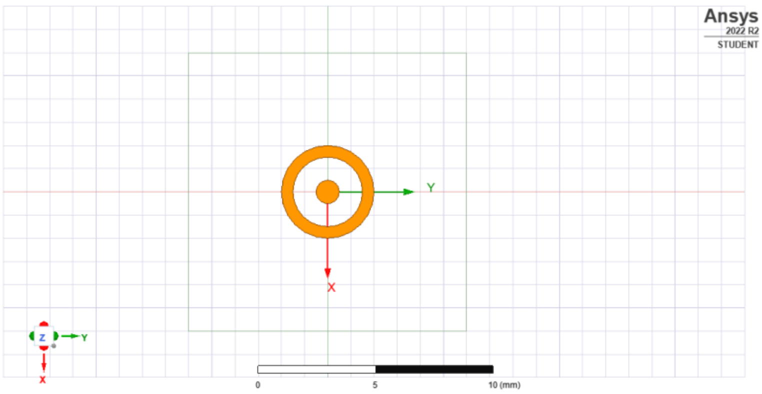
Vary b

SL No.	a (mm)	b (mm)	H (mm)	Material, ε_r	Screenshot
01.	0.5	1.5	30	Air/Vacuum (1)	
02.	0.5	2	30	Air/Vacuum (1)	
03.	0.5	1	30	Air/Vacuum (1)	

Vary H,

SL No.	a (mm)	b (mm)	H (mm)	Material, ε_r	Screenshot
01.	0.5	1.5	30	Air/Vacuum (1)	
02.	0.5	1.5	10	Air/Vacuum (1)	
03	0.5	1.5	50	Air/Vacuum (1)	

Vary ε_r

SL No.	a(mm)	b(mm)	H(mm)	Material, ε_r	Screenshot
01.	0.5	1.5	30	Air/Vacuum(1)	
02.	0.5	1.5	30	Teflon (2.1)	
03	0.5	1.5	30	FR4 epoxy (4.4)	

Vary a

SL No.	a(mm)	b(mm)	H(mm)	Material, ε_r	Capacitance (pF) from simulation	Capacitance (pF) from equation
01.	0.5	1.5	30	Air/Vacuum(1)	1.5328	1.5192
02.	0.8	1.5	30	Air/Vacuum(1)	2.6654	2.655
03	1.1	1.5	30	Air/Vacuum(1)	5.4001	5.3811

Vary b

SL No.	a(mm)	b(mm)	H(mm)	Material, ε_r	Capacitance (pF) from simulation	Capacitance (pF) from equation
01.	0.5	1.5	30	Air/Vacuum(1)	1.5328	1.5192
02.	0.5	2	30	Air/Vacuum(1)	1.2175	1.2039
03	0.5	1	30	Air/Vacuum(1)	2.4179	2.4078

Vary H

SL No.	a(mm)	b(mm)	H(mm)	Material, ε_r	Capacitance (pF) from simulation	Capacitance (pF) from equation
01.	0.5	1.5	30	Air/Vacuum(1)	1.5328	1.5192
02.	0.5	1.5	10	Air/Vacuum(1)	0.53472	0.5064
03	0.5	1.5	50	Air/Vacuum(1)	2.5125	2.5319

Vary ε_r

SL No.	a(mm)	b(mm)	H(mm)	Material, ε_r	Capacitance (pF) from simulation	Capacitance (pF) from equation
01.	0.5	1.5	30	Air/Vacuum(1)	1.5328	1.5192
02.	0.5	1.5	30	Teflon (2.1)	3.2113	3.1902
03	0.5	1.5	30	FR4 epoxy (4.4)	6.7082	6.6843