University of Kerala

Discipline	**PHYSICS**				
Course Code	**UK1MDCPHY104**				
Course Title	**PHYSICS OF EVERYDAY APPLIANCES**				
Type of Course	**MDC**				
Semester	**I**				
Academic Level	**100 - 199**				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	3	3 Hrs	-	-	3 Hrs
Pre-requisites					
Course Summary	"This course provides a basic exploration of the physical principles underlying everyday appliances and technologies. From the basics of electronics and electricity to modern communication technology, students will gain a comprehensive understanding of how various devices work, their impact on energy consumption and efficiency."				

BOOKS FOR STUDY:

1. Louis A Bloomfield – "How things works – The physics of everyday life" - 5-th Edition - Willy Publications (2013)
2. Eric Kleinert - "Trouble shooting and repairing major appliances" Third Edition - McGraw Hills companies (2013)
3. Disseminating Star Labelling in Household Appliance (DISHA) Operational Manual, Bureau of Energy Efficiency

BOOKS FOR REFERENCE:

1. Edison's Electric Light: The Art of Invention (Johns Hopkins Introductory Studies in the History of Technology)
2. LED Lighting: A Primer to Lighting the Future, Sal Cangeloso
3. "The Physics of Everyday Things: The Extraordinary Science Behind an Ordinary Day" by James Kakalios
4. "Optics" by Eugene Hecht

WEB REFERENCES

1. https://www.energy.gov/articles/history-light-bulb
2. Energy_efficient_Ceiling_fans_using_BLDC_motors-A_practical_implementation - Dr Mahesh Rao (https://www.researchgate.net/profile/Mahesh-Rao-8/publication/325922681_Energy_efficient_Ceiling_fans_using_BLDC_motors-A_practical_implementation/links/5b2c7dcfa6fdcc8506bc8680/Energy-efficient-Ceiling-fans-using-BLDC-motors-A-practical-implementation.pdf)
3. Induction stoves: An option for clean and efficient cooking in Indonesia – Tiandho, Yuant etal 2020 (doi:10.1088/1757-899X/1034/1/012068)

DETAILED SYLLABUS: THEORY

Module	Unit	Content	Hrs	CO No
I	**Lighting Devices (Ref Web Link -1, Book-1 section 13.2-13.3, Book 3)**		**9**	
	1	History of light bulbs	1	1
	2	Discharge lamps, fluorescent lamps - mercury, metal-halide, and sodium lamps	3	1
	3	Light-emitting diodes- working of led	2	1
	4	Lasers - types of lasers	1	1
	5	Need for saving energy - bee standards & labelling	2	1
II	**Mirrors, Lenses, and Camera (Book-1, section 14.1)**		**7**	
	6	Introduction to mirrors and lenses, real images - focusing and lens diameter	2	2

	7	Focal lengths and f-numbers - improving the quality of a camera lens - the viewfinder and virtual images	2	2
	8	Image sensors - limit of resolution	2	2
	9	Eyes and eye glasses	1	2
III	**Heat Transfer and Cooling Systems (Book-1, section 7.1, 8.2, 8.1)**		**11**	
	10	Woodstoves -thermal conductivity, conduction, convection, radiation, heat capacity	1	3
	11	Microwave ovens – speed, frequency, and wavelength in electromagnetic waves - polar and nonpolar molecules - working of ovens	2	3
	12	Induction stoves - basic principles	2	3
	13	Automobiles - using thermal energy: heat engines – the internal combustion engine, efficiency	3	3
	14	Air conditioners - pumping heat against its natural flow - how an air conditioner cools the indoor air - how an air conditioner warms the outdoor air	3	3
IV	**Other Domestic Appliances (Book-1, section 9.1, 9.2, Web Link-2)**		**9**	
	15	Clocks- working - time and space, natural resonance, simple harmonic motion, frequency, period, amplitude	3	1
	16	Musical Instruments: sound; music; vibrations in strings, air, surfaces, fundamental and higher-order modes; harmonic and nonharmonic overtones; sympathetic vibration; standing and traveling waves; transverse and longitudinal waves.	5	1
	17	BLDC Motors - features, applications (Fan, Pump)	1	1
V*	**Hands on Training (Book-2, Chapter 6 & 7)**		**9**	
	18	(Any five experiments to be done) 1. Soldering technique 2. Electric tester	9	4

		3. Checking the continuity of electrical components in simple circuits using multimeter 4. Assembling/replacing of fuse wire in household devices 5. Familiarization of resistor, capacitor, diode, transformer 6. One lamp controlled by one switch - soldering 7. One lamp controlled by two switch - soldering 8. Led bulb/tube light making, and troubleshooting 9. Finding the focal length of lens 10. Making of simple electrical extension boards 11. Electric earthing system 12. Energy auditing of devices		

COURSE OUTCOMES

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Summarize the basics of lighting technology, domestic appliances including proficiency in energy efficiency standards and labelling programs established by the Bureau of Energy Efficiency (BEE)	R, U	PSO-1, 4,6
CO-2	Understand the working of optical systems and imaging devices such as camera.	R, U	PSO-1, 2,3,4
CO-3	Discuss basic knowledge of heat transfers and technology in common appliances.	R, U	PSO-1, 4
CO-4	Administer practical skills through hands-on experiments, including soldering, circuit construction etc.	R, U, Ap	PSO-3,6,7

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: PHYSICS OF EVERYDAY APPLIANCES

Credits: 3:0:0 (Lecture: Tutorial: Practical)

CO No.	CO	PO / PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO-1	Demonstrate a comprehensive understanding of lighting technology.	PO 4,7/ PSO-1, 4,6	U	F, C	L	P
CO-2	Understand the working of optical systems and imaging devices such as camera.	PO 4,7/ PSO-1, ,2,3,4	R, U	F, C, P	L/T	P
CO-3	Develop basic knowledge of heat transfers and technology in common appliances.	PO 4,7/ PSO-1,4	R, U	F, C, P	L	-
CO-4	Develop fundamental Knowledge of electronics and electricity and also to develop practical skills through hands-on experiments, including soldering, circuit construction etc.	PO 3,4,7/ PSO-3,67	R, U, A	F,C,P	L	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO-1	2	-	-	3	-	3	-	-	-	-	1	-	-	1	-
CO-2	2	3	3	3	-	-	-	-	-	-	1	-	-	1	-
CO-3	2	-	-	3	-	-	-	-	-	-	1	-	-	1	-
CO-4	-	-	3	-	-	3	3	-	-	1	1	-	-	3	-

Correlation Levels:

Level	-	1	2	3
Correlation	Nil	Slightly / Low	Moderate / Medium	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

CO No	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO-1	✓	-	-	✓
CO-2	✓	-	-	✓
CO-3	✓	✓	-	✓
CO-4	✓	✓	-	-