

B.SC. PHYSICS

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
III	25UPHVAC1	Value Added Course - I	30	-	-	100	100
Course Title		HYDRAULIC SYSTEMS					

SYLLABUS		
Unit	Contents	Hours
I	Introduction to Hydraulic systems Hydraulic systems - Applications of hydraulic systems - Hydraulic Pump - Pump Lift - Pressure Regulation - Advantages and Disadvantages of Hydraulic system	6
II	Hydraulic Pumps Classification of Hydraulic Pumps - Gear Pumps - External gear pump - Lobe Pump- Internal Gear Pump - Gerotor Pump	6
III	Control Valves Direction control valve - Check Valves - Spool valve - Two way valves - Three way valves - Four way valves	6
IV	Actuation Mechanism and Flow Control Valves Solenoid actuation - Hydraulic actuation - Plug or glove valve - Butterfly valve - Ball Valve	6
V	Pressure Relief Valves Direct type of relief valve - Unloading Valve - Sequence valve - Counterbalance Valve - Pressure Reducing Valve	6

Text Book(s):
1. Y Osama Mohammed Elmardi Suleiman Khayal, NPTEL – Mechanical – Mechatronics and Manufacturing Automation, 2020.
Reference Book(s):
2. Basic Hydraulics and Components, Yuken Kogyo., Ltd., Overseas Business Department, Tokyo, JAPAN
3. Basic Hydraulic Systems and Components Edition A, US Army Aviation Logistics School Fort Eustis, Virginia.
Web Resource(s):
Hydraulic System Lessons, https://www.e4training.com/menusummary1.php

Course Outcomes	
Upon successful completion of the course, the student will be able to:	
CO No.	CO Statement
CO1	identify various applications of hydraulic systems in industries and machinery.
CO2	Evaluate the role of pressure regulation for system safety and performance optimization.
CO3	Analyze the importance of flow control in hydraulic systems for efficiency and precision.
CO4	assess the role of control valves in directing and regulating fluid flow in hydraulic systems.
CO5	evaluate pump lift and pressure regulation in hydraulic systems.

Course Coordinators: Mr. J. Umar Malik, Dr. J. Ebenezar, Dr. A. Abbas Manthiri, Dr. A. S. HajaHameed, Mrs. M. Shobanambigai, Mrs. G. Pragadeeswari

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
V	25UPHVAC2	Value Added Course - II	30	-	-	100	100
Course Title		ELECTRONIC CIRCUIT ANALYSIS USING LT SPICE SIMULATOR					

SYLLABUS		
Unit	Contents	Hours
I	Introduction to LT spice Brief Introduction on the Tool - Installation and Setup LTSpice - Hotkeys and Few other useful features -Basic Simulation and SPICE commands	6
II	RC and RL Circuits Low-pass filter - High-pass filter - Band-pass filter	6
III	Diode Circuits Clippers - Positive clipper - Negative clipper - Double-ended clipper - Bridge Rectifier – Filters	6
IV	BJT Circuits Characteristics of an NPN BJT - CE amplifier – DC analysis - AC analysis - Transient analysis	6
V	Op-Amp Gain of the op-amp – adder/subtractor - logarithmic op-amp circuit	6

Text Book(s):
1. ShreyasMurali, Guide to Basics of LT Spice-XVII, 2023
Reference Book(s):
1. PoojaMohindruPankajMohindru, Electronic Circuit Analysis Using LTspice XVII Simulator, CRC Press Taylor & Francis Group, 2022
3. ZhengHaunQun, LT spice Manual, Department of Electrical and Computer Engineering National University of Singapore, 2016
Web Resource(s):
1. http://www.linear.com/designtools/software/ .
2. https://ltspice-xvii.software.informer.com/

Course Outcomes	
Upon successful completion of the course, the student will able to:	
CO No.	CO Statement
CO1	install and set up LTspice for circuit analysis.
CO2	simulate and interpret the frequency response of low-pass, high-pass, and band-pass filters.
CO3	analyze the characteristics of an electronic devices using LTspice.
CO4	evaluate the behavior of passive circuits using LTspice simulations.
CO5	design and simulate electronic circuits efficiently.

Course Coordinators:

Dr. S. Abbas Manthiri, Dr. S. Shek Dhavud, Mr. S. Mohamed Ibrahim Sulaiman Sait
Dr. C. Hariharan, Dr. L. Umaralikhan, Dr. P. Revathi

M.SC. PHYSICS

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
III	25PPHVAC1	Value Added Course - 1	30	-	-	100	100
Course Title		LASER-ULTRASONICS: PRINCIPLES AND INDUSTRIAL APPLICATIONS					

SYLLABUS		
Unit	Contents	Hours
I	Principle and Generation of Laser-Ultrasonics Introduction to Laser-ultrasonics - Laser ultrasonic transducer - Laser Generation of Ultrasound - Thermoelastic generation - Generation by ablation or vaporization	6
II	Laser Detection of Ultrasound Laser detection of ultrasound - Confocal Fabry-Perot interferometer - Photorefractive two-wave mixing interferometer - Imaging and multiplexing with a photorefractive two-wave mixing interferometer	6
III	Interferometric Detection Schemes Interferometric detection schemes - Sagnac interferometer - CHOT for Cheap Optical Transducer - Detection laser - Digital Signal Processing	6
IV	Thickness Measurement On-line wall thickness gauging of seamless tubes - Thickness determination of microelectronic thin layers - Thickness determination and elastic properties determination of microelectronic thin layers – Thickness determination of other coatings	6
V	Flaw Detection Inspection of aircraft structures made of polymer-matrix composites - Detection of cracks and other flaws in metals - Material characterization - Laser shockwave testing	6

Text Book(s):
1. Jean-Pierre, Monchalin, Laser-Ultrasonics: Principles and Industrial Applications, National Research Council (NRC) of Canada, Ultrasonic and Advanced Methods for Nondestructive Testing and Material Characterization, C H Chen editor, World Scientific Publishing Co., 2007
Reference Book(s):
1. Scherleitner, E., Reitingner, B., Hettich, M., Berer, T., Burgholzer, P. (2019). Laser Ultrasonics. In: Ida, N., Meyendorf, N. (eds) Handbook of Advanced Nondestructive Evaluation. Springer, Cham.
2. C.B Scruby, L.E Drain, Laser Ultrasonics Techniques and Applications, Taylor and Francis group, New York, 1990
Web Resource(s):
1. https://laser-ut.tecner.com
2. https://www.ndt.net/search/docs.php3?id=25250

Course Outcomes	
Upon successful completion of the course, the student will able to:	
CO No.	CO Statement
CO1	explain the fundamental concepts of laser-ultrasonics and its applications in non-destructive testing (NDT).
CO2	apply laser shockwave testing for material characterization and defect identification.
CO3	analyze imaging and multiplexing methods using photorefractive interferometry.
CO4	investigate laser-ultrasonic applications for flaw detection in aircraft composite structures and metals.
CO5	evaluate the factors influencing laser-induced ultrasound generation and their effects on materials.

Course Coordinators:

Dr. N. Peer Mohamed Sathik, Dr. R. RadhaKrishnan, Major F.S.Muzammil, Dr. R. Raj Mohamed, Dr. V. Kalyavalli, Mrs. M. Ayisha