Course Articulation Matrix

							Program Outcomes						
K L UNIVERSITY												

Course Articulation Matrix

S No	Course Code	Course Title	LTPSIN	Credits	CO NO	Description of the Course Outcome	1	2	3	4	5	6	7
	K L UNIVERSITY												

K L UNIVERSITY

DEPARTMENT OF PHYSICS

2024-2025 M.Sc Nanoscience and Technology

Course Articulation Matrix

S No	Course Code	Course Title	LTPSIN	Credits	CO NO	Description of the Course Outcome	1	2	3	4	5	6	7
1	24UC5201	Professional communication Skills	0-0-4-0-0-0	0	CO1	To develop the skill of contextual Vocabulary and Critical Reading					3		
					CO2	To demonstrate different types of personal and professional skills and apply them for growth in professional zone.					3		
					CO3	Apply the concepts of Mathematical Principles to solve problems on Arithmetic, Algebra & Geometry to improve problem solving ability.	3						
					CO4	Apply the concepts and using Logical thinking to solve problems on verbal & Non-Verbal Reasoning to develop Logical thinking skills.	3						

2	24NS5101	Fundamentals of Nanoscience & Nanotechnology	3-0-0-0-0-0	3	CO1	Understanding the basic concepts, Background, scientific revolutions of nanoscience and technology and understanding multifunction materials	2						
					CO2	Understanding the uniqueness of nanomaterial properties by comparing bulk materials with nanomaterials and applying to size dependent properties and challenges in nanotechnology.		3					
					CO3	Apply the concepts of dimensionality and size dependent phenomena to nanoscale materials and to observe size dependent variation in basic properties.	3						
					CO4	Apply the concepts and properties to advanced and recent special Nanomaterials like CNT, nano composites, carbon fullerenes and study their specific applications.		3					
3	24NS5102	Physics of Nanotechnology	3-1-0-0-0-0	4	CO1	Apply the concepts of various concepts of quantum mechanics to solve the problems related to the motion of electrons in microscopic level	3						

Sl No	Course Code	Course Title	L-T-P	Credits	CO	Course Outcome						
					CO2	Understand the fundamental concepts of wave optics, electromagnetic waves, interference and polarization of light		2				
					CO3	Apply the spin and orbital motion of electrons in determining magnetic properties of materials and identifies their role in classification soft & hard magnetic materials having specific engineering applications.			3			
					CO4	Apply the knowledge of crystal structures and understand the electrical properties of semiconductors			3			
4	24NS5103	Chemistry of Nanotechnology	3-1-0-0-0-0	4	CO1	Apply a working knowledge of the basic concept of Chemistry for Nanotechnology and chemical and physical properties changes.	3		3			
					CO2	Analyse several synthetic methods for the fabrication of nanoparticles.	3	3				3
					CO3	Apply the links between the structure and catalytical activity of the nanomaterials.	3			3	3	
					CO4	Illustrate the application and prospects of Chemistry for Nanotechnology	3				3	3
5	24NS5104	Synthesis and	3-1-6-0-0-0	7	CO1	Apply the principles of different Physical and chemical routes to synthesis as per the required application and properties	3					
					CO2	Apply the knowledge of structural characterization methods to analyze the performance of materials for required applications.		3				

Sr No	Course Code	Course Name	L-T-P-...-...	Credits	CO	Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7
		characterizations of Nano Materials-1			CO3	Apply the knowledge of spectroscopic characterization methods to analyze the performance of materials for required applications	3						
					CO4	Apply the knowledge of surface and thermal characterization methods to analyze the performance of materials for required applications.	3						
					CO5	Apply the knowledge of synthesis and characterization of nanomaterials to perform experiments and analyze the samples	4						
6	24NS5105	Nano Photonics	4-0-0-0-0-0	4	CO1	Apply the concept of fundamental in Nano Photonics for optical devices		3					
					CO2	Apply nonlinear optics principles to analyze and design optical devices			3				
					CO3	Demonstrate the application of photonic crystals in real-world scenarios		3					
					CO4	Apply the principles of nano photonics to design the simple photonic devices		3					
7	24NS5206	Synthesis and Characterization of Nanomaterials-2	3-0-0-4-4-0	6	CO1	Apply the principles of different Physical and chemical routes to synthesis as per the required application and properties	3						
					CO2	Apply the knowledge of structural characterization methods to analyze the material surface defects and their performance for required applications.	3						

S.No	Course Code	Course Name	L-T-P-S-E	Credits	CO	Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
					CO3	Apply the knowledge of magnetic and electrical characterization methods to analyze the performance of materials for required applications	3							
					CO4	Apply the knowledge of Bio-materials characterization methods to analyze the performance of materials for bio-medical applications.	3							
					CO5	Apply the knowledge of synthesis and characterization of nanomaterials to perform experiments and analyze the samples		4						
8	24NS5207	Emerging applications of nanotechnology	4-0-0-0-0-0	4	CO1	Understanding the principles of Nanotechnology and explaining its applications in the biomedical field with the intersection of nanotechnology and biomedicine.	2							
					CO2	Describe the Nanotechnology in Agriculture through precision and conventional farming methods and current developments in Nano-based agriculture systems.	3							
					CO3	Evaluate the impact of Nanotechnology on food processing, food quality, and ethical implications on food products.	3		3					
					CO4	Apply Nanoscale techniques to demonstrate the nanomaterial-biomolecular interactions and toxicity associated with using nanomaterials in biological systems.	3							
9	24NS6108	Advanced nanomaterials	3-0-0-0-0-0	3	CO1	Gain in-depth knowledge in the concepts of magnetism at nanoscale.	2							

					CO2	Gain good knowledge in Thermoelectric Materials and the advanced tools to study.	2					
					CO3	Understanding the various one dimensional semiconductors behaviours.		2				
					CO4	Understanding the structure properties of polymeric nanomaterials and applications.		2				
10	24NS6109	Advanced Nanobiotechnology			CO1	Understand the structure and properties of nanomaterials used in Nano technological applications		2				
					CO2	Understand the role of nanostructure assembly and impact of nanomaterials on biological processes		2				
					CO3	Apply the knowledge of nanotechnology in detecting various diseases using nano biosensors.		3				
					CO4	Apply the knowledge of nanotechnology in Agriculture and Food technologies		3				
11	24NS6110	Micro and Nano Electronic Devices	4-0-0-0-0-0	4	CO1	Understand the Basic Electronic devices and nano electronic devices, Mechanical Molecular Nano robotics Nano devices and Nano computers: Theoretical Models	2					

					CO2	Understand the Molecular scale electronics - Molecular materials for electronics – Carbon materials: Fullerene and CNTs.	2					
					CO3	Understand the Micro and Nano electrical Systems: - Overview	2					
					CO4	Understand the Future Nano systems -Nano machines, nano robots, electronics based on CNT, molecular Electronics.				2		
12	24NS6121	Flexi Core Course Nano Electronics	2-0-0-0-0-0	2	CO1	Understanding of the principles, limitations, and applications of nano electronics.		2				
					CO2	Understanding of the nano scale effects, techniques for nanoscale transistor fabrication, industrial CMOS technology, and non-classical elements of nano MOSFETs.		2				
					CO3	Understanding of the introduction to nanostructures, the fabrication and patterning techniques used to create nanostructures, and the characterization techniques.		2				
					CO4	Understanding of nano sensors, nano actuators, memory devices, photovoltaic cells, and their applications in communication, industry, commercial settings, agriculture, biomedical fields, and the Internet of Things (IoT).		2				
13	24NS6122	Artificial Intelligence Integration with	2-0-0-0-0-0	2	CO1	Gain the in-depth knowledge in the concepts Artificial Intelligence, Machine Learning, and Deep Learning	3					

		Nanotechnology			CO2	Gain and apply good knowledge of artificial intelligence in the nanotechnology.	3						
					CO3	Applying the artificial intelligence in nanoscale simulations	3						
					CO4	Apply the knowledge of artificial intelligence in Nano-Computing and High-Performance Computing.	3						
14	24NS52E1	Biology of Nanotechnology	3-0-0-0-0-0	3	CO1	Understand the concepts of Biomolecules used in Biotechnological processes	2						
					CO2	Understand the interaction between Biomolecules, immune components and applications of recombinant DNA Technology		2					
					CO3	Apply the principles of in-silico technology in designing drugs and concepts of Biosafety and bioethics	3						
					CO4	Apply the concepts of analytical techniques to characterize the bioanalytes used in various Pharma and Biotechnological industries.	3						
15	24NS52E2	Biochemistry	3-0-0-0-0-0	3	CO1	Understand the functions and properties of Proteins in biological systems	2						
					CO2	Understand the functions of Enzymes and kinetics in physiological systems	2						

#	Code	Course	L-T-P	Cr	CO	Description						
					CO3	Understand the structure, Functions and classification of Carbohydrates, Nucleic acids and Lipids in Biological system	2					
					CO4	Apply the importance of Metabolic pathways in Biotechnology sector.	3					
16	24NS52E3	Nanomagnetic Materials and Devices	3-0-0-0-0-0	3	CO1	Apply in-depth knowledge in the concepts of magnetism at both micro and nanoscale.	3					
					CO2	Apply good knowledge in Nanomagnetism and the advanced tools to study.	3					
					CO3	Applying the various imaging techniques to study the magnetic behaviors.	3					
					CO4	Apply the suitable applications of the magnetic materials based on the functional Properties in nano magnetic in data storage and biomedicine.	3					
17	24NS52E4	Societal Impacts of Nanotechnology	3-0-0-0-0-0	3	CO1	Understand the societal impacts of nanotechnology				2		
					CO2	Apply the economic impact of nanotechnology						3
					CO3	Apply the ethics and laws related to nanotechnology				3		
					CO4	Understand the societal impacts of nanotechnology						2
	24NS61E5	Nanotechnology for Renewable Energy	3-0-0-0-0-0	3	CO1	Apply the basic concepts of energy conversion	3					

		Materials					systems.								
18					CO2	Appraise the working of fuel cells current status and future trends	3								
					CO3	Apply the knowledge of photovoltaic cells and energy conversion systems to improve their performance.	3								
					CO4	Apply the knowledge of photovoltaic systems to understand the working of Solar cells.	3								
19	24NS61E6	Nanotechnology in Health Care	3-0-0-0-0-0	3	CO1	Understand the recent advancements in the field of Nanotechnology for diagnostic applications	3								
					CO2	Understand the knowledge of nanotechnology in detecting various diseases using nano biosensors.	2								
					CO3	Understand the concepts of nanotechnology in drug development applications	2								
					CO4	Apply the novel techniques in diagnosing various diseases using nano devices	3								
20	OENS0001	Material Science and Engineering	0-0-0-0-4-0	2	CO1	Understands structure of crystalline solids, kinds of crystal imperfections and appreciates structure-property relationship in crystals.	2								

					CO2	Understands spin and orbital motion of electrons in determining magnetic properties of materials and identifies their role in classification soft & hard magnetic materials having specific engineering applications.	2						
					CO3	Understands role of molecular level vibrations in determining thermal properties of materials, heat treatment methods for changing the microstructure of materials and micro and macro level responses of materials subjected to load, for identification of materials having specific engineering applications.	2						
					CO4	Understands the role of electronic energy band structures of solids in governing various electrical and optical properties of materials.	2						
21	OENS0002	Experimental Physics	0-0-0-0-4-0	2	CO1	- Understanding the basic concepts, Background, scientific revolutions of nanoscience and technology and understanding multifunction materials	2						
					CO2	Apply the principles of different chemical routes to synthesis as per the required application and properties.	3						
					CO3	- Understanding the basic difference between nano and bulk materials properties.	3						
					CO4	Apply the knowledge of structural characterization methods to analyze the performance of materials for required applications.	3						

4

22	23IE5201	Essentials of Research Design	1-1-0-0-0-0	2	CO1	Illustrate Research objects, steps involved in research and articulate appropriate Research Questions	3						
					CO2	Perform Literature Review in a Scholarly style and apply appropriate methods for Data collection	3	3					
					CO3	Represent the data in tabular/Graphical form and prepare data for analysis	3						
					CO4	Perform statistical modelling and analysis to optimize the data, prepare the data for publishing.	4	4					
23	23IE6104	Term Paper	0-0-8-0-0-0	4	CO1	Discovery of new insights, theories, or empirical findings that advance the existing knowledge base		3				3	4
24	23IE6205	Dissertation	0-0-32-0-0-0	16	CO 5	Discovery of new insights, theories, or empirical findings that advance the existing knowledge base		3				3	4
25	23CC5201	Value Added Course	0-0-0-0-8-0	0									