# Graduate Program in Mechanical Engineering

# **College of Mechanical and Electrical Engineering**

## I. Educational Objectives

Guided by Xi Jinping's Thought on Socialism with Chinese Characteristics for a New Era, this program implements the fundamental task of fostering virtue and cultivating well-rounded professionals. Adhering to the "Four Orientations" (frontiers of international science and technology, economic development, national strategic needs, and people's health), the program aims to cultivate high-level technical professionals with innovative thinking, teamwork spirit, and lifelong learning capabilities, who are developed in moral, intellectual, physical, aesthetic, and labor education. Students will:

- (1) Master solid theoretical foundations and interdisciplinary methodologies.
- (2) Develop international perspectives and the ability to identify, analyze, and solve complex mechanical engineering problems.
- (3) Engage in scientific research, technical innovation, or management in mechanical engineering and related industries.

## **II. Research Directions**

### 1. Intelligent Manufacturing Systems Engineering

Research on optimization design, production scheduling, intelligent service, and digital twin technologies for complex equipment/systems throughout their lifecycle (design, manufacturing, and service).

### 2. Friction, Wear, and Advanced Materials

Research on forming technologies for critical components in major equipment, advanced wear-resistant materials, special metallic structural materials, and additive manufacturing.

### 3. Dynamics and Control of Electromechanical Systems

Research on modeling, control, robotic configuration, characteristics, and machine vision for high-speed, precision, and heavy-duty electromechanical systems.

### 4. Mechanical Fault Diagnosis and Intelligent Maintenance

Research on failure mechanisms, signal processing, intelligent diagnosis, performance prediction, and predictive maintenance for large-scale mechanical equipment and critical components.

### 5. Precision Machining and Green Manufacturing

Research on precision machining and green manufacturing theories, technologies, processes,

and equipment for high-performance, high-precision, and high-reliability components in advanced equipment, aligned with green, low-carbon, and sustainable development principles.

### 6. New Energy and Intelligent Connected Vehicles

Research on vehicle structural optimization, lightweight design, chassis dynamics control, active safety, battery state diagnosis, and energy management.

### 7. Micro/Nano Manufacturing and Intelligent Sensing

Research on micro/nano fabrication processes, micro/nano mechanical/biosensors, precision motion control, and intelligent perception for high-end equipment/instruments.

Note: The academic master's program in Intelligent Manufacturing Engineering (0802Z1) follows the curriculum of the "Intelligent Manufacturing Systems Engineering" direction.

# **III. Program Structure and Duration**

■ Duration: Full-time study with a minimum of 3 years (maximum 5 years). Thesis work

must span  $\geq 1.5$  years.

■ Credits: Total ≥32 credits, including ≥20 credits from core courses and 5 credits from mandatory modules.

Course Category	Course Code	Course Name	Hours	Credits	Semester	Department	Remarks
Degree Courses	991012	Theory and Practice of Socialism with Chinese Characteristics	32	2	2	College of Marxism	Carroral
	991018	English Intensive Reading	32	2	1	College of Foreign Languages	Required
	991019	English Listening and Speaking	32	2	2	College of Foreign Languages	
	991007	Numerical Analysis	64	4	1	College of	Discipline-

# **IV. Curriculum and Credit Requirements**

Course Category	Course Code	Course Name	Hours	Credits	Semester	Department	Remarks
						Mathematics and Information Science	Specific Required Courses (Minimum 4 credits)
	991008	Matrix Theory	32	2	1	College of Mathematic s and Information Science	
	991009	Probability and Mathematical Statistics	32	2	1	College of Mathematic s and Information Science	
	991010	Optimization Methods and Operations Research	32	2	1	College of Mechanical and Electrical Engineering	
	041201	*Modern Design Theory and Methods (Open Course)	32	2	1	College of Mechanical and Electrical Engineering	Discipline- Specific Required
	041202	Frontiers in Advanced Manufacturing Theory and Technology (Open	32	2	1	College of Mechanical and	Courses

Course Category	Course Code	Course Name	Hours	Credits	Semester	Department	Remarks
		Course)				Electrical Engineering	
						College of	
		Artificial				Computer	
	041203	Intelligence	32	2	2	Science and	
						Technology	
						College of	
		Intelligent				Mechanical	
	041204	Manufacturing	32	2	1	and	
		Engineering (Open Course)				Electrical	
						Engineering	Mandator
						College of	for
	041205	Manufacturing				Mechanical	Intelligent Manufactu ring
		System Modeling	32	2	2	and	
		and Simulation				Electrical	Systems
						Engineering	ng
						College of	(Minimum
		Intelligent				Mechanical	4 credits)
	041206	Optimization	32	2	1	and	
		Methods				Electrical	
						Engineering	
						College of	Mandator
						Mechanical	y Courses for
	041207	Robotics (Open	32	2	2	and	Dynamics
		Course)				Electrical	and Control of
						Engineering	Electrome
	041208	Electromechanical	32	2	1	College of	chanical Systems

Course Category	Course Code	Course Name	Hours	Credits	Semester	Department	Remarks
		System Simulation and Design				Mechanical and Electrical	(Minimum 4 credits)
						Engineering	
						College of	
		Advanced Dynamics		2		Mechanical	
	041209		32		2	and	
						Electrical	
						Engineering	
						College of	
		Machine Learning				Mechanical	
	041210	041210 and Intelligent Maintenance (Open	32	2	2	and	
		Course)				Electrical	Mandator
						Engineering	y Courses
						College of	for Mechanic
						Mechanical	al Fault
	041211	Mechanical	32	2	1	and	Diagnosis
		Vibration Theory				Electrical	Intelligent
						Engineering	Maintenan
						College of	(Minimum
						Mechanical	4 credits)
	041212	*Mechanical Fault	32	2	2	and	
		Diagnostics				Electrical	
						Engineering	
		*Modern Material				College of	Mandator
	041213	Technology (Open	32	2	2	Mechanical	y Courses
		Course)				and	Friction,

Course Category	Course Code	Course Name	Hours	Credits	Semester	Department	Remarks
						Electrical Engineering	Wear, and Advanced Materials
	041214	Advanced Material Forming Technology and Theory	32	2	1	College of Mechanical and Electrical Engineering	(Minimum 4 credits)
	041215	Principles of Metal Solidification	32	2	2	College of Mechanical and Electrical Engineering	
	041216	Modern Intelligent Sensing Technology (Open Course)	32	2	2	College of Mechanical and Electrical Engineering	Mandator v Courses
	041217	Machine Vision	32	2	1	College of Mechanical and Electrical Engineering	for Micro/Na no Manufactu ring and Intelligent Sensing
	041218	Modern Digital Signal Processing	32	2	2	College of Mechanical and Electrical Engineering	(Minimum 4 credits)

Course Category	Course Code	Course Name	Hours	Credits	Semester	Department	Remarks
	041219	Vehicle Noise and Vibration Control (Open Course)	32	2	2	College of Mechanical and Electrical Engineering	
	041220	Vehicle Electronic Control Hardware and Software Technology	32	2	College of Mechanica 1 and Electrical Engineerin	College of Mechanical and Electrical Engineering	Mandator y Courses for New Energy and Intelligent Connected Vehicles
	041221	*Energy-Saving and New Energy Application Technologies in Automotive Engineering	32	2	2	College of Mechanical and Electrical Engineering	(Minimum 4 credits)
	041222	Modern Precision and Special Machining (Open Course)	32	2	1	College of Mechanical and Electrical Engineering	Mandator y Courses for Precision
	041223	Green Design, Manufacturing, and Remanufacturing	32	2	2	College of Mechanical and Electrical Engineering	Machining and Green Manufactu ring (Minimum 4 credits)
	041224	Computer	32	2	2	College of	

Course Category	Course Code	Course Name	Hours	Credits	Semester	Department	Remarks
		Simulation and				Mechanical	
		Modeling of				and	
		Material Processing				Electrical	
						Engineering	
	001101	Introduction to	16	1	1	College of	
	991101	Dialectics of Nature	10	1	1	Marxism	
		Graduata Caraar				College of	
		Dianuale Career		1	2	Mechanical	
	041301	Finaling and	16			and	
		Guidanaa				Electrical	General
		Guidance				Engineering	Required
	041302	Mechanical				College of	
		Engineering				Mechanical	
		Literature Retrieval	16	1	2	and	
Non-Deg		and Academic				Electrical	
ree		Writing				Engineering	
Courses						College of	
		Modern Control				Mechanical	
	041303	Engineering	32	2	1	and	
		Lingineering				Electrical	
						Engineering	
						College of	Major
		Electicity and				Mechanical	Electives
	041304		32	2	1	and	
		r lasuelty				Electrical	
						Engineering	
	041305	Finite Element	32	2	1	College of	

Course Category	Course Code	Course Name	Hours	Credits	Semester	Department	Remarks
		Technology and Applications				Mechanical and Electrical Engineering	
	041306	Mechatronic Control Technology and Systems	32	2	2	College of Mechanical and Electrical Engineering	
	041307	Modern CAE Technology and Applications	32	2	1	College of Mechanical and Electrical Engineering	
	041308	Principles of Friction and Wear	32	2	2	College of Mechanical and Electrical Engineering	
	041309	Vehicle Control Technology	32	2	1	College of Mechanical and Electrical Engineering	
	041310	Electric Drive and Control Technology	32	2	1	College of Mechanical and	

Course Category	Course Code	Course Name	Hours	Credits	Semester	Department	Remarks
						Electrical	
						Engineering	
						College of	
		Random Signal				Mechanical	
	041311	Analysis and	32	2	2	and	
		Applications				Electrical	
						Engineering	
						College of	
		Microfluidic Chip				Mechanical	
	041312	Technology and	32	2	2	and	
		Applications				Electrical	
						Engineering	
						College of	
	041313	Frontiers in				Mechanical	
			32	2	2 1	and	
		Micro/Nano Optics				Electrical	
						Engineering	
						College of	
		Micro/Nano				Mechanical	
	041314	Manufacturing	32	2	1	and	
		Technology				Electrical	
						Engineering	
						College of	
		Frontiers in				Mechanical	
	041315	Flexible Hybrid	32	2	1	and	
		Electronics				Electrical	
						Engineering	

Course Category	Course Code	Course Name	Hours	Credits	Semester	Department	Remarks
	041316	Automotive Vibration and Noise Testing Methods	32	2	1	College of Mechanical and Electrical Engineering	
	041317	Automotive Safety Technology	32	2	2	College of Mechanical and Electrical Engineering	
	041318	*Mechanism Analysis and Synthesis	32	2	2	College of Mechanical and Electrical Engineering	
	041319	Mechanical Product Quality Inspection and Control	32	2	1	College of Mechanical and Electrical Engineering	
	041320	Engineering Experiment Design and Optimization Algorithms	32	2	1	College of Mechanical and Electrical Engineering	
	041321	Industrial Digital Twin Systems	32	2	2	College of Mechanical	

Course Category	Course Code	Course Name	Hours	Credits	Semester	Department	Remarks
						and Electrical Engineering	
	041322	Computer-Aided Geometric Design and Non-Uniform Rational B-Splines (NURBS)	32	2	2	College of Mechanical and Electrical Engineering	
	041323	*Multidisciplinary Optimization Design for Complex Equipment	32	2	1	College of Mechanical and Electrical Engineering	
	041324	Intelligent Workshop Scheduling Theory and Methods	32	2	2	College of Mechanical and Electrical Engineering	
	041325	Human-Computer Interaction Technology and Applications	32	2	2	College of Mechanical and Electrical Engineering	
	041326	Surface Modification and Treatment Technologies	32	2	1	College of Mechanical and Electrical	

Course Category	Course Code	Course Name	Hours	Credits	Semester	Department	Remarks
						Engineering	
						College of	
						Mechanical	
	041327	*CAD/CAM	32	2	2	and	
		Technology				Electrical	
						Engineering	
						College of	
						Mechanical	
	041328	Vibration and	16	1	2	and	
		Noise				Electrical	
						Engineering	
					3	College of	
		Thesis Proposal				Mechanical	
				1		and	
						Electrical	
						Engineering	
						College of	
		MilTerme				Mechanical	
Elective		Iviid-1 erm		1	1-6	and	
Compon		Assessment				Electrical	
ent						Engineering	
						College of	Academic Activities
						Mechanical	Paper
		Scientific Research		1	1-6	and	Publicatio
		Practice				Electrical	n, Academic
						Engineering	Competiti ons
		Academic		1	1-6	College of	Give a

Course Category	Course Code	Course Name	Hours	Credits	Semester	Department	Remarks
		Activities				Mechanical	Lecture
						and	Session
						Electrical	
						Engineering	
		Graduation Defense				College of	
						Mechanical	
				1	6	and	
						Electrical	
						Engineering	

Note: Open courses are taught collaboratively by faculty, external experts, and industry professionals via modular content, flexible scheduling (online/offline), and diverse formats (lectures, labs, on-site demonstrations).

## V. Mandatory Requirements

### 1. Thesis Proposal

- Topic Selection: Thesis topics must originate from the supervisor's research projects or pre-research projects, demonstrating theoretical significance or practical value.
- Timeline: The proposal must be completed by the first semester of the second academic year.

### 2. Mid-Term Assessment

- Scope: The school evaluates coursework performance, literature review quality, thesis proposal progress, publications, and thesis research advancement.
- Timeline: Conducted by the end of the third semester or the fourth semester.
- Support Measures: Students with slow progress receive academic guidance and support. Students unable to continue research may undergo a streamlining process upon mutual agreement between the student and supervisor.

### 3. Scientific Research Practice

- Content: Full participation in the research process, including literature review, research design, data collection/analysis, and report writing (research/experimental reports).
- Evaluation: Supervisors assess performance, and eligible students earn 1 credit.

### 4. Academic Activities

- Objectives: Expand academic horizons through external expert lectures, international conferences, and research exchanges.
- Requirements:

(1) Regularly attend academic seminars, lectures, and research progress meetings organized by the school, degree programs, or research groups.

- (2) Attend no fewer than 10 academic events during the program.
- (3) Deliver at least one academic presentation during the program.

### 5. Graduation Defense

Follow the Graduate Thesis Defense Regulations of Zhengzhou University of Light Industry.

# **VI. Degree Thesis**

Complies with national and institutional standards for academic integrity, originality, and technical rigor.

## VII. Graduation and Degree Conferral

Students who complete coursework (≥32 credits), pass the thesis defense, and meet ethical standards will graduate and be awarded a Master of Engineering degree by the university's

Academic Degree Committee.

# **VIII. Program Contributors**

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