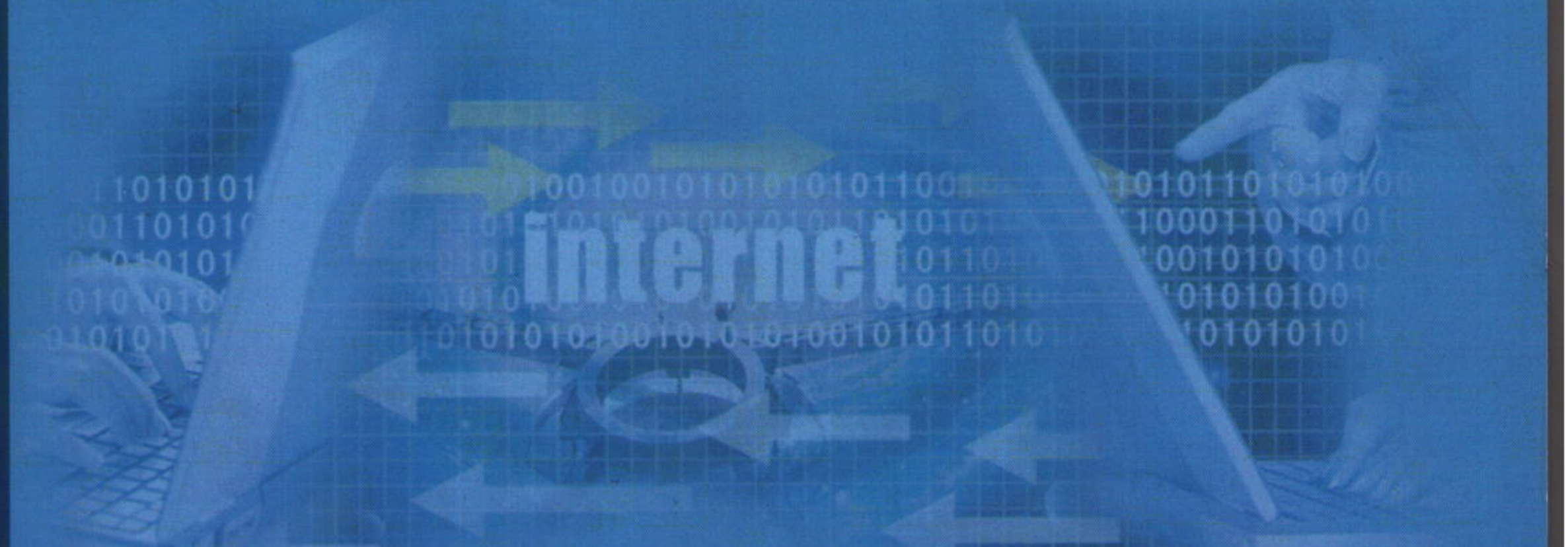
附件四、项目相关研究报告

4.4 制定人才培养新方案

在“卓越计划”宏观指导框架下，融入国际工程教育专业认证、CDIO、项目式教学新理念，形成了以专业优势与特色为吸引力的校企协同育人合作机制，提出了“校企协同育人，3+1”人才培养模式，“3+1”人才培养模式不是简单地前 3 年在校学习，后 1 年到企业实习，而是按照“走出去、走回来、工学交替、学用相长”螺旋上升的教改思路，确定了培养顺序：2.5 年（学校）+0.5 年（校企）+0.5 年（校企）+0.5 年（企业）。

创新与实践了通识教育、学科基础教育、专业工程教育、校内外工程实践、课外素质能力拓展的五模块人才培养新方案，着力全面提高学生的综合素质。构建了多层次、多模块、柔性化的“分段渐进式”企业工程实践培养方案，充分利用校企不同教学环境和教学资源，将在校的理论学习、基本训练与在企业的工程实践有机结合起来，按照教育规律循序渐进地、分阶段分层次地培养学生的工程意识、工程素质和工程实践能力。

2012



河南科技大學

HENAN UNIVERSITY OF SCIENCE & TECHNOLOGY

卓越工程师教育培养计划

Excellent engineer training program

河南科技大学教务处
Office of Academic Affairs of
Henan University of Science and Technology

中国 洛阳
LUOYANG CHINA

机械设计制造及其自动化专业本科

卓越工程师培养方案

Excellence Engineer Undergraduate Training Program for Specialty in Machinery Design Manufacturing and its Automation

一、培养目标

Ⅰ Educational Objectives

培养掌握扎实的工程科学与人文社科知识，具备现代机械设计与分析、工艺与制造、测试与试验、集成与开发及其自动化技术的基本知识和应用能力，具有较强的工程能力和创新意识，良好的团队合作精神，能在机械制造企业从事设计开发、应用研究、运作管理等方面工作的卓越高级工程技术人才。

The aim is to train application-oriented excellent engineers who can adapt to the requirements of high-quality engineering and technical personnel due to the development of the national economy, science technology, and society, to satisfy the production practice demands in mechanical engineering, and have solid professional knowledge, strong engineering ability and innovative consciousness, and good teamwork spirit, and can engage in design, manufacturing, maintenance and operation management.

二、培养要求

Ⅱ Educational Requirements

1．掌握机械工程基础技术知识、操作技能和工程方法，了解机械工程领域的新产品、新技术、新工艺以及技术发展趋势。

1.1 具有从事机械工程工作所需的工程科学技术知识以及一定的人文和社会科学知识。

1.2 掌握扎实的机械工程基础知识和本专业的基本理论知识，了解本专业的发展现状和趋势。

1.3 熟悉机械工程领域的技术标准，了解机械行业的相关政策、法律和法规。

2．具备运用适当的理论和实践方法解决机械工程实际问题的能力，在机械产品、机械制造系统的设计、运行和维护或解决实际工程问题方面得到系统化训练。

2.1 了解市场、用户的需求变化以及技术发展，具备初步的机械产品和机械制造设备（系统）设计能力和维护维修能力。

2.2 具有较强的创新意识和进行机械产品创新设计的初步能力。

3 具有初步的项目和工程管理能力。

3.1 具有较强的质量、环境、职业健康安全和法律意识，能在法律法规规定的范畴内，按确定的相关标准和程序要求开展工作。

3.2 能运用经济管理知识，具有项目预算和机械产品成本核算的初步能力。

3.3 能运用生产管理知识，具有制定机械产品生产计划和进行生产管理的初步能力。

3.3 具有一定的组织管理能力和进行项目任务分解、人力和资源调度的初步能力。

3.4 具有团队协作精神，参与团队管理、协调团队工作，确保工作进度。

3.5 具备应对危机与突发事件的初步能力。

4．有效的沟通与交流能力和较强的获取知识、终身学习的能力。

4.1 具有较强的表达和沟通能力。

4.2 具有较强的交流能力。

4.3 具有较强的获取知识、终身学习的能力。

5．具备良好道德和较强的责任感。

1. Students will master basic technical knowledge, skills and engineering methods of mechanical engineering; understanding new products, new technologies, new processes and the developing trend of the technology in the field of mechanical engineering.

1.1 Students will possess knowledge of engineering science required to engage in mechanical engineering and technology and certain knowledge of the humanities and social sciences.

1.2 Students will Master solid mechanical engineering technical knowledge and the basic theoretical knowledge; understanding the development status and trends of this profession.

1.3 Students will familiar with technical standards in the field of mechanical engineering; understand the relevant policies, laws and regulations in machinery industry.

2. Students will possess the ability to solve practical problems in mechanical engineering by employing appropriate theories and practice methods, and acquire systematic training in the area of mechanical products, machinery manufacturing system design, operation and maintenance, or solving practical engineering problems.

2.1 Students will understand the change of the market and customers' requirements and the development of technology, and possess the planning ability of developing the initial mechanical products and machinery manufacturing equipments (systems).

2.2 Students will possess strong mechanical products design ability and strong innovative consciousness and a preliminary ability of innovative design of mechanical products.

3. Students will possess preliminary abilities of project and engineering management.

3.1 Students will possess strong consciousness of quality, environment, occupational health and safety, and law; and can work according to the relevant standards and procedures within the specified scope of laws and regulations.

3.2 Students can employ knowledge of economic management and possess preliminary abilities of project budget and cost accounting of mechanical products.

3.3 Students will possess certain organization management skills and preliminary abilities of project task decomposition, scheduling of personnel and resources.

3.4 Students will possess teamwork spirit to participate in team management and coordinate team work and ensure the work schedule.

3.5 Students will possess preliminary abilities to deal with crises and emergencies.

4. Students will possess effective communication skills and strong ability of knowledge acquiring and lifelong learning.

4.1 Students will possess strong expression and communication skills.

4.2 Students will possess strong communication skills.

4.3 Students will possess strong ability of knowledge acquiring and lifelong learning.

5. Students will possess good morals and strong sense of responsibility.

三、专业特点

Ⅲ Characteristic Specialty

本专业依托形成的行业背景和办学特色，推进校企全方位合作深度，以提高学生的工程意识、工程素质、工程实践能力为导向，将校内的通识教育与企业的专业教育有机结合，使学生掌握机械设计、制造和机电一体化技术的基础理论，受到现代卓越机械工程师的工程综合能力的基本训练。

Relying on the formation of industry background and school characteristics, promoting school-enterprise round cooperation depth, and to improve the engineering awareness, engineering quality, and engineering practice ability of students, to combine the general education in school and the professional education in enterprise, students master the basic theory of the mechanical design, manufacturing and mechatronics

technology, and basic training by the ability of modern excellence engineer.

四、主干学科与主要课程

Ⅳ Major Disciplines & Major Courses

主干学科：力学、机械工程。

Major Disciplines：Mechanics and Mechanical Engineering

工程图学、理论力学、材料力学、机械工程材料、机械原理、机械设计、电工与电子技术、测试技术、控制工程基础、机械制造工艺学、轴承设计与计算、轴承制造学、轴承制造装备、轴承测试技术、数控技术等。

Major Courses：Engineering Graphics, Theoretical Mechanics, Mechanics of Materials, Engineering Materials, Mechanical Principle, Mechanical Design, Fundamental of Electrical & Electric Technology, Testing Technology, Fundamental of Control Engineering, Mechanical Manufacturing Technology, Bearing Design and Calculation, Bearing Manufacturing Technology, Bearing Machine Tools, Bearing Testing Technology, NC Technology, etc.

五、学制与学位

Ⅴ Length of Program and Degree

学制：四年

Duration: Four years

学位：符合《河南科技大学普通本科学生学士学位授予办法》规定的毕业生授予工学学士学位。

Degree Granted: The graduates meeting the regulation of “methods of bachelor's degree awarding for the undergraduate students of Henan University of Science and Technology” can be given the Bachelor′s Degree in Engineering.

六、最低毕业学分要求

Ⅵ Graduation Credit Criteria

通识教育学分 General Education Courses		学科平台课程学分 Basic Disciplinary Courses		专业方向课程学分 Specialized Courses		工程实践教学学分 Engineering Practice Schedule		总学分 Total
必修学分 Required credit	课内素质教育学分 Taught course credit	学科基础必修课学分 Required basic courses credit	学科基础选修课学分 Elective basic courses credit	专业方向必修课学分 Specialized required course credit	专业方向选修课学分 Specialized elective course credit	必修学分 Required credit	课外素质教育学分 Extra-curriculum credit	**193**
34	**10**	**71.5**	**5**	**13.5**	**6**	**47**	**6**	

七、教学进程计划表

Ⅶ Program Schdule

课程类别 Course Type	课程性质 Course Mode	课 程 名 称 Course Title	学分 Credit	学时分配 Hours Distribution				考试/考查 Graded Course/ Pass - Fail Course	建议修读学期 Suggested Term	开课单位 Course-Offering Department
				总学时 Tot hrs.	.理论 Taught	实验 Exp.	实践 Practi-ce			
通识课程 General Education Courses	必修课 Required Courses	大学英语（基础） College English(1)	3.5	56	56			考试	1	外语
		大学英语（提高） College English(2)	4	64	64			考查	2	外语
		大学英语（拓展 1） College English(3)	4	64	64			考查	3	外语
		大学英语（拓展 2） College English(4)	4	64	64			考试	4	外语
		体育(1) Physical Education(1)	1	32	32			考查	1	体育
		体育(2) Physical Education(2)	1	32	32			考查	2	体育
		体育(3) Physical Education(3)	1	32	32			考查	3	体育
		体育(4) Physical Education(4)	1	32	32			考查	4	体育
		思想道德修养与法律基础 Morals, Ethics and Fundamentals of Law	2.5	40	40			考查	1	马院
		毛泽东思想和中国特色社会主义理论体系概论 Introduction to Mao Zedong Thought and Socialism with Chinese Characteristics	4.5	72	72			考试	5	马院
		马克思主义基本原理 Marxism Philosophy	3	48	48			考试	1	马院
		中国近现代史纲要 Outline of Contemporary and Modern Chinese History	2	32	32			考查	3	马院
		专业导论 Introduction to Professional	0.5	8	8			考查	1	机电
		企业导论 Introduction to Enterprise	0.5	8	8			考查	5	机电
		计算机基础 Foundation of Computer	1.5	40	16		24	考查	1	电信
		小 计 Subtotal	**34**	**780**						
	课内素质教育（全校公选课） General Education Course (Public Elective Courses)	人文社科类 Humanities and Social Sciences Courses	2	要求全体学生至少取得 10 学分，每类课程至少选修 2 学分。课程设置见附件。 All students are required to achieve at least ten credits, and at least two credits are required in each category. See appendix.						
		管理经济类 Economics and Management Courses	2							
		艺术教育类 Arts Education Courses	2							
		自然科学类 Natural Sciences Courses	2							
		就业指导类 Career Guidance Courses	2							
		小 计 Subtotal	**10**							

课程类别 Course Type	课程性质 Course Mode	课 程 名 称 Course Title	学分 Credit	学时分配 Hours Distribution				考试/考查 Graded Course/ Pass - Fail Course	建议修读学期 Suggested Term	开课单位 Course-Offering Department
				总学时 Tot hrs.	.理论 Taught	实验 Exp.	实践 Practi-ce			
学科平台课程 Basic Disciplinary Courses	学科基础必修课 Required Courses	工程化学 Engineering Chemistry	2	32	26	6		考查	1	化工
		高等数学 A(1) Advanced Mathematics A(1)	5.5	88	88	0		考试	1	数学
		高等数学 A(2) Advanced Mathematics A(2)	5.5	88	88	0		考试	2	数学
		工程图学 A(1) Engineering Graphics A(1)	3	48	48	0		考试	1	机电
		工程图学 A(2) Engineering Graphics A(2)	2.5	40	40	0		考试	2	机电
		高级语言程序设计 A Advanced Language Programming A	3	60	40	20		考查	2	电信
		大学物理 A(1) College Physics A(1)	3.5	56	56	0		考试	2	物理
		大学物理 A(2) College Physics A(2)	3.5	56	56	0		考试	3	物理
		实验物理 Lab Physics	1.5	48	0	32/16		考查	2/3	物理
		线性代数 Linear Algebra	2	32	0	32		考查	3	数学
		理论力学 B Theoretical Mechanics B	4	64	0	64		考试	3	建工
		金属材料成形基础 B Forming Fundamentals of Metallic Materials B	2.5	40	0	40		考查	3	材料
		概率与数理统计 Probability and Mathematics Statistic	2.5	40	0	40		考查	4	数学
		材料力学 B Material Mechanics B	4	64	56	8		考试	4	建工
		电工与电子技术 A(1) Electrical & Electronic Technology A(1)	3	48	48	0		考试	3	电信
		电工与电子技术 A(2) Electrical & Electronic Technology A(2)	2.5	40	40	0		考试	4	电信
		电工与电子技术实验 Experiments of Electrical & Electronic Technology	0.5	24	0	12/12		考查	3/4	电信
		机械工程材料 Mechanical Engineering Materials	2.5	48	32	16		考查	4	材料
		互换性与技术测量 A Interchangeability and Measurement Technology A	2	32	26	6		考查	4	机电
		机械原理 A Mechanical Principle A	4	64	58	6		考试	4	车动
		控制工程基础 Fundamental of Control Engineering	2.5	40	34	6		考试	5	机电

课程类别 Course Type	课程性质 Course Mode	课 程 名 称 Course Title	学分 Credit	学时分配 Hours Distribution				考试/考查 Graded Course/ Pass - Fail Course	建议修读学期 Suggested Term	开课单位 Course-Offering Department
				总学时 Tot hrs.	.理论 Taught	实验 Exp.	实践 Practi-ce			
		机械工程测试技术 Mechanical Engineering Testing Technology	2.5	40	32	8		考查	5	机电
		液压与气压传动 A Hydraulic and Pneumatic Transmission A	3	48	40	8		考查	5	机电
		机械设计 A Mechanical Design A	4	64	58	6		考试	5	车动
		小 计 Subtotal	**71.5**	**1212**						
	学科基础选修课 Elective Courses	AutoCAD 机械绘图 AutoCAD Mechanical Drawing	1.5	32	12	20		考查	3	机电
		软件工程基础 Fundamental of Software Engineering	2	32	24	8		考查	3	机电
		机械产品造型设计 Mechanical Products Modeling Design	1.5	32	12	20		考查	4	机电
		生产与运作管理 Production and Operations Management	2	32	32	0		考查	4	机电
		机械优化设计 Mechanical Optimization Design	2	32	28	4		考查	5	机电
		机械系统创新设计 Innovative Design of Mechanical Systems	2	32	30	2		考查	5	机电
		注：每个学期至少选修 1 门课程，合计≧5 学分。 Note: Per Term at Least Elective One Course, Total Credits≧5.								
		小 计 Subtotal	**15**	**216**						

课程类别 Course Classification	课程性质 Course Nature	课 程 名 称 Course Title	学分 Credit	学时分配 Hours Distribution				考试/考查 Graded Course/ Pass - Fail Course	建议修读学期 Suggested Term	开课单位 Course-Offering Depart-ment
				总学时 Tot hrs.	.理论 Taught	实验 Exp.	实践 Practi-ce			
专业课程 Specialized Courses	专业必修课 Required Courses	机械制造工艺学（双语） Mechanical Manufacture Technology (Bilingual Teaching)	2.5	40	40			考试	6	机电
		轴承设计与计算 Bearing Design and Calculation	2.5	40	40			考试	6	机电
		轴承制造学 Bearing Manufacturing Technology	2.5	40	40			考试	6	机电
		轴承制造装备 Bearing Machine Tools	2.5	40	40			考试	6	机电
		轴承设计与制造综合实验 Integration Experiments of Bearing Design and Manufacturing	1	38	0	38			6	校企
		轴承测试技术 Bearing Testing Technology	2.5	40	36	4		考查	7	机电
		小 计 Subtotal	**13.5**	**192**						
	专业选修课 Elective Courses	轴承热处理技术 Bearing Hot Treatment Technology	2	32	30	2		考查	7	校企 2 选 1
		切削与磨削原理 Cutting & Grinding Principles	2	32	26	4		考查	7	
		轴承应用技术（双语） Bearing Application Technology (Bilingual Teaching)	2	32	32	0		考查	7	企业
		轴承摩擦学 Tribology of Bearings	2	32	28	4		考查	7	机电
		数控技术（双语） NC Technology (Bilingual Teaching)	2.5	40	32	8		考查	7	机电
		弹性力学与有限元技术应用 Elastic Mechanics and Application of Finite Element Technology	2	32	22	10		考查	7	机电
		轴承振动与噪声 Bearings Vibration and Noise	2	32	30	2		考查	7	机电
		选修学分合计≧6 学分 Total Elective Credits≧6								
		小 计 Subtotal	**14.5**	**232**						

八、工程实践教学进程表

Ⅸ Engineering Practicum Schedule

工程实践环节名称 Engineering Practicum Courses			学分 Credits	周数 Weeks	建议学期 Suggested Term	开课单位 Course Offering Department
校内工程实践 Engineering Practicum in School	入学教育与军训 Entrance Education and Military Training		2	2	1	学生处
	机械工程实训 Mechanical Engineering Practicum		5	5	2	工训
	电工电子实训 Electrical and Electronic Practicum		1	1	2	工训
	机械零部件测绘与计算机绘图 Mechanical Parts Mapping and Computer Drawing		1	1	3	机电
	机械原理课程设计 Course Design of Mechanical Principle		1	1	4	车动
	机械设计课程设计 Course Design of Mechanical Design		3	3	5	车动
企业工程实践 Engineering Practicum in Enterprise	企业认知实习 Visiting Practice		1	1	4	企业
	企业生产实践 Production Practice		3	3	6	企业
	企业岗位实践 Post Practicum	企业职业素养实训 Professional Ethics Training	3	3	7	企业
		现场操作与管理 On-site Operation and Management	5	5	7	企业
	企业项目设计 Projects Design	轴承工艺课程设计 Curriculum Design of Bearing Manufacturing Technology	3	3	7	企业
		轴承设计课程设计 Curriculum Design of Bearing Design	1	1	7	企业
		轴承装备课程设计 Curriculum Design of Bearing Machine Tools	2	2	7	企业
	毕业设计 Graduation Design		16	16	8	企业
小计 Subtotal			**47**			
课外素质教育 Extra-curriculum Education			**6**			
合计 Total			**53**			