

能源与动力工程（船舶）专业（卓越工程师班） 2017 版本本科培养方案

Undergraduate Education Plan for Specialty in Energy & Power Engineering（Excellent Engineer Class）（2017）

专业名称	能源与动力工程（船舶）	主干学科	船舶与海洋工程
Major	Energy & Power Engineering	Major	Marine and ocean engineering
计划学制	四年	授予学位	工学学士
Duration	4 Years	Degree Granted	Bachelor of Engineering

最低毕业学分规定

Graduation Credit Criteria

课程类别 Course Classification 课程性质 Course Nature	通识教育课程 Public Basic Courses	专业教育课程 Specialized Courses	个性课程 Personalized Course	集中性实践 Practice Courses	课外学分 Study Credit after Class	总学分 Total Credits
必修课 Required Courses	29	64	\	32	\	170
选修课 Elective Courses	9	20	6	\	10	

一、培养目标与毕业要求

I Educational Objectives & Requirement

（一）培养目标

- （1）具有良好的人文社会科学理论知识和素养，较扎实地掌握自然科学基础理论知识；身心健康，具备良好的敬业精神、社会责任感和工程职业道德；关注当代全球和社会中的能源危机和环境污染等问题；具有环境保护意识、能源安全意识、质量意识、产品安全和安全生产意识。
- （2）具有能源动力系统与自动化方向所必要的基础理论知识和专业知识，具有进行动力机械与热工设备设计、运行、实验研究的基本能力。
- （3）培养能在国民经济相关部门从事能源与动力系统设计、制造等方面工作的，具有创新精神与实践能力的高级工程技术人才。
- （4）具有熟练应用各种技术手段查询资料、获取信息的能力；具有应用语言、文字、图形等进行工程技术表达和交流的能力；掌握一门外国语以及计算机应用的基本能力。
- （5）具有良好的口头和书面表达和交流沟通能力、良好的团队意识和合作精神，具有终身学习的能力。

（一）Educational Objectives

1. Has the good humanities and social science literacy, basic science theory knowledge, good professional ethics, a good sense of social responsibility and the engineering professional ethics; be healthy in physical and psychological, Pay attention to the energy crisis and environmental pollution, etc.; has the consciousness of environmental protection, energy security, quality, product safety and production safety.
2. Has the necessary basic theoretical knowledge and professional knowledge of energy and power engineering and automation program, and has the basic ability in designing, running and

experimental research of the dynamical machinery and the thermal equipment.

3. To cultivate the innovation and practical engineering talents engaged in energy and power engineering designing, developing and manufacturing.
4. Possess the basic ability to use a variety of techniques seek information, express and exchange engineering technology by using language, text, graphics ,use a foreign language and basic computer skills.
5. Get skills of good oral and written expression and communication, good team spirit and cooperation and lifelong learning.

(二) 毕业要求

- (1) **工程知识:** 能够将数学、自然科学、工程基础和能源与动力工程专业知识用于能源与动力工程领域的工程实践, 解决实际工程问题。
- (2) **问题分析:** 能够应用数学、自然科学和能源与动力工程领域的基本原理, 结合对科技文献研究的结果, 分析船舶、能源与动力工程领域的实际工程问题, 以获得有效结论。掌握典型能源动力设备的规律与原理、与工程过程相关的性能分析, 以及优选、匹配原理和方法。
- (3) **设计/开发解决方案:** 能够设计针对船舶、能源与动力领域的工程问题, 自主设计和自主解决与能源与动力工程(系统)相关的科学问题和工程问题, 并能够在设计环节中体现创新意识。
- (4) **研究:** 能够基于科学原理、采用科学方法对能源与动力工程专业的复杂工程问题进行研究, 包括设计实验、收集、处理、分析与解释数据, 通过信息综合得到合理有效的结论并应用于工程实践。能够理解内燃机污染物的生成机理, 掌握其控制方法与途径; 掌握动力机械状态监测、故障诊断与电子控制技术。
- (5) **使用现代工具:** 能够针对能源动力系统的工程问题, 开发、选择与使用恰当的技术和工具, 包括建模、数值模拟和分析, 并能够理解其局限性。
- (6) **工程与社会:** 能够基于能源与动力工程相关背景知识进行合理分析, 评价能源与动力工程专业实践解决方案对经济、环境、安全、法律以及文化的影响, 并理解应承担的责任。
- (7) **环境和可持续发展:** 了解当代全球问题和社会问题, 能够理解和评价能源与动力工程专业涉及到的生产、使用、维护等过程对环境、社会可持续发展的影响, 尤其是能源动力设备运营过程中环境污染。
- (8) **职业规范:** 学生具有良好的思想素质、身体素质、心理素质、文化修养、社会道德和责任担当等人文素养, 能够在工程实践中理解并遵守工程职业道德和规范, 履行责任。
- (9) **个人与团队:** 在涉及能源与动力工程专业的复杂工程问题时, 能够在多学科组成的团队中承担个体、团队成员或负责人的角色, 具有良好的团队意识和合作精神。
- (10) **沟通:** 能够就能源与动力工程问题与业界同行及社会公众进行有效沟通和交流, 包括撰写报告和设计文稿。具备一定的国际视野, 能够在跨文化背景下进行沟通和交流。学生具有良好的口头和书面表达和交流能力, 至少熟练掌握一门外语能够进行能源与动力工程技术交流沟通和翻译。
- (11) **项目管理:** 在与能源与动力专业相关的多学科环境中理解、掌握、应用工程管理原理与经济决策方法, 具有一定的组织、管理和领导能力。
- (12) **终身学习:** 具有进行终身学习的愿望和能力, 具有适应能源与动力技术不断发展的能力。

(二) Educational Requirement

To meet the graduation requirements, the student shall:

1. Engineering knowledge:

be able to apply mathematics, natural sciences, engineering fundamentals and the specialization of energy

and power engineering in engineering practice to solve practical problems.

2. Problem analysis:

be able to use mathematics, natural sciences and engineering principles in the area of energy and power engineering, as well as research on literature, to analyze practical problems in the area of marine engineering and energy and power engineering and obtain valid conclusions;

master the principles of typical marine power machinery, performance analysis in engineering process, and principles and methods of optimization and matching.

3. Solution design/development:

be able to independently design scientific and engineering problems with innovations in the area of marine engineering and energy and power engineering, as well as find solutions for them.

4. Research:

be able to perform investigations of complex energy and power engineering problems using research-based knowledge and research methods including experiment design, data-collection, data-processing, data-analysis and explanation, to obtain reasonable and valid conclusions that can be used in engineering practice;

understand the mechanism of pollutant formation in internal combustion engines, and the methods and pathways for pollution control;

master the techniques of condition monitoring, fault diagnosis and electronic control of power machine.

5. Modern tool usage:

be able to develop, select and apply appropriate techniques and tools to solve energy and power engineering problems, including the development of models, numerical simulations and data analysis, with an awareness of their limitations.

6. Engineering and society:

be able to assess appropriately on economic, environmental, safety, legal and cultural issues and the consequent responsibilities relevant to solutions to energy and power engineering practice.

7. Environment and sustainability

have a comprehensive understanding of global issues and society's problems;

be able to understand and evaluate the sustainability and impact of energy and power engineering practice (the process of production, usage, and maintenance) in societal and environmental conditions, especially for the environmental pollutant during the equipment operation.

8. Ethics:

be of high ideological standards, sound physical and mental conditions, considerable culture, good ethical and moral qualities, and commit to professional ethics and responsibilities and norms of engineering practice.

9. Individual and team work:

be able to function effectively as an individual, a member or a leader in a multidisciplinary team, for solving

complex energy and power engineering problems, and have a good sense of teamwork and spirit of collaboration.

10. Communication:

be able to communicate effectively on energy and power engineering problems with the engineering community and with society at large, including writing reports and documentation;

have global outlook to a certain extent and be able to communicate in a multicultural environment;

have good abilities of both oral and written communication skills, and demonstrate the proficiency in at least one foreign language, being capable of communicating and translating technical ideas in energy and power engineering.

11. Project management:

obtain knowledge and understanding of engineering management principles and economic decision-making and apply these to work in energy and power engineering-related multidisciplinary environments, and develop skills of organization, management and leadership to a certain extent.

12. Life-long learning:

recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the technological change in energy and power engineering.

附：培养目标实现矩阵

	培养目标 1	培养目标 2	培养目标 3	培养目标 4	培养目标 5
毕业要求 1	√	√	√		
毕业要求 2		√	√		
毕业要求 3		√	√		
毕业要求 4		√	√	√	
毕业要求 5		√	√	√	
毕业要求 6	√			√	√
毕业要求 7	√	√	√		
毕业要求 8	√				√
毕业要求 9	√			√	√
毕业要求 10				√	√
毕业要求 11	√			√	√
毕业要求 12	√			√	√

二、专业核心课程与专业特色课程

II Core Courses and Characteristic Courses

(一) 专业核心课程:

机械设计、工程热力学、传热学、内燃机学、自动控制原理

Core Courses: Mechanical Design, Engineering Thermodynamics, Heat Transfer, Internal-combustion Engine Theory, Principles of Automatic-Control.

(二) 专业特色课程:

专业特色课程: 内燃机排放控制, 动力机械监测与控制, 内燃机增压技术, 振动与噪声控制, 动力系统自动化, 气体与双燃料发动机

Characteristic Courses: Emissions Controlling of Internal-combustion Engines , IC Engine Condition Monitoring &Controlling , Internal Combustion Engine Supercharging Technology , Controlling of Vibration and Noise, Automation of Power System, Gas Fuel Engines and Dual-fuel Engines

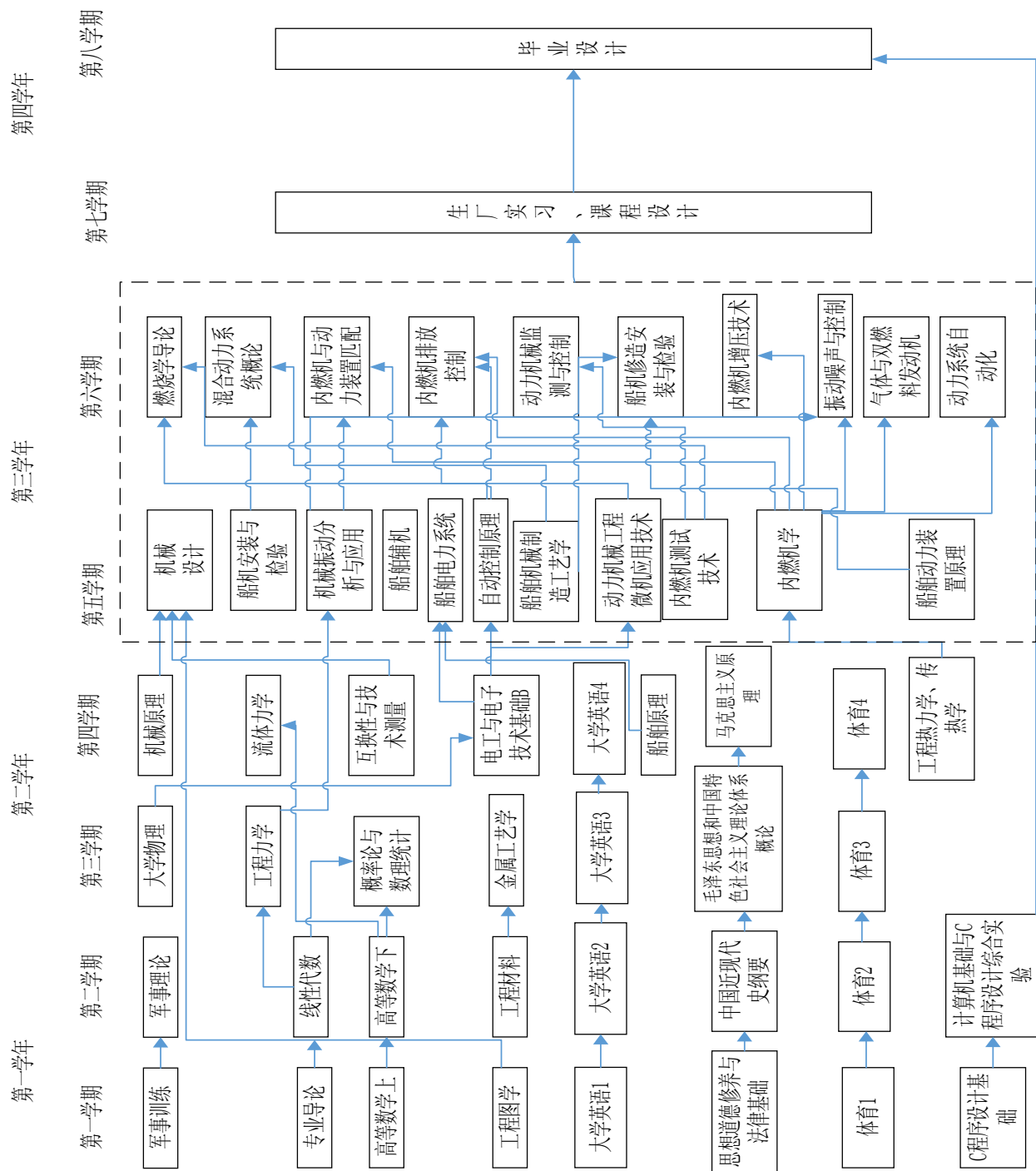
附: 毕业要求实现矩阵:

专业 核心 课程	专业 特色 课程	课程名称	能源与动力工程(船舶)专业(卓越工程师班)毕业要求											
			(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
		思想道德修养与法律基础						√		√	√	√		
		中国近现代史纲要							√	√		√		√
		毛泽东思想和中国特色社会主义理论概论							√	√		√		√
		马克思主义基本原理							√	√		√		√
		军事理论								√			√	√
		体育								√	√			√
		大学英语									√	√	√	√
		C 程序设计基础		√	√		√							
		计算机基础与 C 程序设计综合实验		√	√		√							
		专业导论	√			√	√	√	√					√
		高等数学	√	√	√	√	√							
		线性代数	√	√	√	√	√							
		概率论与数理统计	√	√	√	√	√							
		大学物理	√	√	√	√	√							
		物理实验	√	√	√	√	√							
		工程图学	√	√	√	√	√							
		工程材料	√	√	√	√	√							
		互换性与技术测量	√	√	√	√	√							
		机械原理	√	√	√	√	√							
√		机械设计	√	√	√	√	√							
		金属工艺学	√	√	√	√	√							
		工程力学	√	√	√	√	√							
		工程力学实验	√	√	√	√	√							
		流体力学	√	√	√	√	√							
		电工与电子技术基础	√	√	√	√	√							
√		工程热力学	√	√	√	√	√	√	√					
√		传热学	√	√	√	√	√	√	√					
		工程热力学与传热学实验	√	√	√	√	√	√	√					
√		自动控制原理	√	√	√	√	√	√	√					
√		内燃机学	√	√	√	√	√	√	√					
		船舶动力装置原理	√	√	√	√	√	√	√					

专业 核心 课程	专业 特色 课程	课程名称	能源与动力工程（船舶）专业（卓越工程师班）毕业要求											
			(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
		船舶机械制造工艺学	√	√	√	√	√	√	√					
		船舶原理	√	√	√	√	√	√	√					
		内燃机测试技术	√	√	√	√	√	√	√					
		动力机械工程微机应用技术	√	√	√	√	√	√	√					
		船舶辅机	√	√	√	√	√	√	√					
		内燃机专业英语					√					√	√	√
		船机安装与检验	√	√	√	√	√	√	√					
		内燃机与动力装置匹配	√	√	√	√	√	√	√					
	√	内燃机排放控制	√	√	√	√	√	√	√					
	√	动力机械监测与控制	√	√	√	√	√	√	√					
		内燃机工作过程仿真计算	√	√	√	√	√	√	√					
		机械振动分析与应用	√	√	√	√	√	√	√					
	√	内燃机增压技术	√	√	√	√	√	√	√					
		信号分析与处理	√	√	√	√	√	√	√					
		燃烧学导论	√	√	√	√	√	√	√					
		汽车概论	√	√	√	√	√	√	√					
		混合动力系统概论	√	√	√	√	√	√	√					
	√	气体与双燃料发动机	√	√	√	√	√	√	√					
		发动机结构	√	√	√	√	√	√	√					
		工程计算基础	√	√	√	√	√	√	√					
	√	振动与噪声控制	√	√	√	√	√	√	√					
		船舶电力推进技术	√	√	√	√	√	√	√					
	√	动力系统自动化	√	√	√	√	√	√	√					
		船舶污染控制	√	√	√	√	√	√	√					
		军事训练								√			√	√
		机械制造工程实训	√			√				√	√			√
		柴油机结构认知与实操	√			√				√	√			√
		内燃机课程设计	√	√	√	√	√			√	√	√	√	√
		生产实习	√	√	√	√	√	√	√	√	√	√	√	√
		毕业论文	√	√	√	√	√	√	√	√	√	√	√	√

三、课程教学进程图

III Teaching Process Map



四、 理论教学建议进程表

IV Theory Course Schedule

课程编号 Course Number	课 程 名 称 Course Title	学分 Crs	学时分配 Including					建议 修读 学期 Suggested Term	先修课程 Prerequisite Course
			总学时 Tot hrs.	实验 Exp.	上机 Ope- ration	实践 Prac- tice	课外 Extra- cur		
(一) 通识必修课程									
General Education Required Courses									
4220001111	思想道德修养与法律基础 Morals, Ethics and Fundamentals of Law	3	48			8		1	
4220002111	中国近现代史纲要 Outline of Contemporary and Modern Chinese History	2	32					2	
4220003111	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	96			32		3	
4220005111	马克思主义基本原理 Marxism Philosophy	3	48			8		4	
1060003131	军事理论 Military Theory	1	32				16	2	
4210001171	体育 1 Physical Education I	1	26					1	
4210002171	体育 2 Physical Education II	1	34					2	
4210003171	体育 3 Physical Education III	1	34					3	
4210004171	体育 4 Physical Education IV	1	34					4	
4030002181	大学英语 1 College English I	3	60				12	1	
4030003181	大学英语 2 College English II	2	44				12	2	大学英语 1
4030004181	大学英语 3 College English III	2	44				12	3	大学英语 2
4030004181	大学英语 4 College English IV	2	44				12	4	大学英语 3
4120335171	C 程序设计基础 Fundamentals of Computer Program Design(C)	2	32					2	
4120336171	计算机基础与 C 程序设计综合实验 Foundations of Computer and C Language Programming Experiments	1	32		32			2	
小 计 Subtotal		29	640	0	32	48	64		

课程编号 Course Number	课 程 名 称 Course Title	学分 Crs	学时分配 Including					建议 修读 学期 Suggested Term	先修课程 Prerequisite Course
			总学时 Tot hrs.	实验 Exp.	上机 Ope- ration	实践 Prac- tice	课外 Extra- cur		
(二) 通识选修课程 General Education Elective Courses									
创新创业类 Innovation and Entrepreneurship Courses		要求至少取得 9 个学分，且必须选修艺术体育类课程中的艺术类相关课程并取得至少 2 个学分，在创新创业类课程中至少选修一门课程，在人文社科类或经济管理类课程中至少选修一门。 Students are required to obtain at least 9 credits, which must cotain art courses of 2 credits from the category of Art and Physical Education Courses,at least one course from the category of Innovation and Entrepreneurship Courses, and at least one course from the category of Arts and Social Science Courses or the category of Economy and Management Courses.							
人文社科类 Arts and Social Science Courses									
经济管理类 Economy and Management Courses									
科学技术类 Science and Technology Courses									
艺术体育类 Art and Physical Education Courses									
(三) 专业必修课程 Basic Disciplinary RequiredCourses									
4150105111	专业导论 Introduction to Materials Physics	1	16					1	
4050063111	高等数学 A 上 Advanced Mathematics I	5	80					1	
4050064111	高等数学 A 下 Advanced Mathematics II	5	80					2	
4180267171	工程图学 A 上 Engineering Graphics I	3	56				8	1	
4180268171	工程图学 A 下 Engineering Graphics II	2.5	56				16	2	工程图学上
4070072111	工程材料 A Engineering Materials	2.5	40	4				2	
4050229111	线性代数 Linear Algebra	2.5	40					2	高等数学上
4050463131	大学物理 B Physics	5	80					3	
4050224111	物理实验 B Physics Lab.	1	32	32				4	大学物理
4050058111	概率论与数理统计 B Probability and Mathematical Statistics	3	48					3	高等数学下 线性代数
4180023111	互换性与测量技术 B Interchange Ability & Measurement	2	32	4				3	
4180273171	金属工艺学 B Metal Technology	2	32	2				3	
4140077111	工程力学 B Engineering Mechanics	4	64					3	
4140078111	工程力学 B 实验 Mechanics Experiments	0.5	16	16				3	工程力学

课程编号 Course Number	课 程 名 称 Course Title	学分 Crs	学时分配 Including					建议 修读 学期 Suggested Term	先修课程 Prerequisite Course
			总学时 Tot hrs.	实验 Exp.	上机 Ope- ration	实践 Prac- tice	课外 Extra- cur		
4180033111	机械原理 Mechanism and Machine Theory	3.5	56	4				4	
4140658171	流体力学 D Fluid Mechanics	2	32					4	
4100011111	电工与电子技术基础 B Fundamentals of Electrical Engineering & Electric Technology	5.5	88	20				4	
4150249171	工程热力学 C Engineering Thermodynamics	2	32					4	
4150250171	传热学 D Heat Transfer	2	32					4	
4150227171	工程热力学与传热学实验 Lab. of Engineering Thermodynamics and Heat Transfer	0.5	16	16				4	工程热力学与传热学
4180272171	机械设计 Mechanical Design	3.5	56	4				5	机械原理
4150251171	自动控制原理 E Automatic Control Theory	2	32	2				5	
4150201131	内燃机学 C Internal Combustion Engine Theory	4	64	4				5	工程热力学与传热学
小 计 Subtotal		64	1080	108	0	0	24		
(四) 专业选修课程 Specialized Elective Courses									
4150081111	信号分析与处理 Signal Analysis and Disposal	2	32					4	
4140033111	船舶原理 C Theoretical Naval Architecture	2	32					4	
4150254171	内燃机测试技术 Measuring Methodology of IC Engine	2	32	4				5	
4150185131	动力机械工程微机应用技术 Computer Application Technology in Power Machinery and Engineering Machinery and Engineering	2	32	4				5	
4150255171	船舶辅机 B Marine Auxiliary Machine	2	32					5	流体力学 D
4150252171	船舶动力装置原理 B Principle & Design of Marine Power Plant	2	32	2				5	
4150253171	船舶机械制造工艺学 C Marine Machinery Manufacture Technology	2	32	2				5	

课程编号 Course Number	课 程 名 称 Course Title	学分 Crs	学时分配 Including					建议 修读 学期 Suggested Term	先修课程 Prerequisite Course
			总学时 Tot hrs.	实验 Exp.	上机 Ope- ration	实践 Prac- tice	课外 Extra- cur		
4150241171	船机安装与检验 Installation and Inspection of Marine Machinery	2	32					5	船舶原理
4150262171	发动机结构 Construction of Engines	2	32	4				5	
4150242171	动力机械监测与控制 IC Engine Condition Monitoring & Controlling	2	32	4				6	自动控制原理
4150054111	机械振动分析与应用 Mechanical Vibration Analysis	2	32	2				6	
4150259171	燃烧学导论 An Introduction to ombustion	2	32	4				6	
4150140121	内燃机专业英语 English of Internal-combustion Engine	2	32					6	内燃机学
4150256171	内燃机与动力装置匹配 Matching of IC Engines and Power Plant	2	32					6	内燃机学
4150257171	内燃机排放控制 Emissions Controlling of Internal-combustion Engines	2	32	2				6	内燃机学 自动控制原理
4150258171	内燃机工作过程仿真计算 Simulation of working process in internal combustion engines	2	32		4			6	内燃机学
4150188131	内燃机增压技术 B Internal Combustion Engine Supercharging Technology	2	32	2				6	内燃机学
4150127111	汽车概论 B Structure of Automobile	2	32					6	内燃机学
4150260171	混合动力系统概论 Introduction to Hybrid Power	2	32					6	内燃机学
4150261171	气体与双燃料发动机 Gas Fuel Engines and Dual-fuel Engines	2	32	2				6	内燃机学
小 计 Subtotal		40	640	32	4	0	0		
修读说明：要求至少选修 20 学分。 NOTE: Minimum subtotal credits:20.									
(五) 个性课程 Personalized Electice Courses									
4150263171	工程计算基础 The Fundamentals of Engineering Calculation	2	32		8			5	

课程编号 Course Number	课 程 名 称 Course Title	学分 Crs	学时分配 Including					建议修读学期 Suggested Term	先修课程 Prerequisite Course
			总学时 Tot hrs.	实验 Exp.	上机 Operation	实践 Practice	课外 Extra-cur		
4150008111	船舶电力推进技术 Ship Electric Propulsion Technology	2	32	4				6	
4150041111	动力系统自动化 B Automation of Power System	2	32	4				6	自动控制原理
4150265171	船舶污染控制 Ship Pollution Control	2	32					6	
4150264171	振动与噪声控制 Controlling of Vibration and Noise	2	32					6	
小 计 Subtotal		10	160	8	8	0	0		
修读说明：学生从以上个性课程和学校发布的其它个性课程目录中选课，要求至少选修 6 学分。 NOTE: Students can select courses from above and the other personalized courses in catalog, and are required to obtain at least 6 credits.									

五、集中性实践教学环节

V Practice Schedule

课程编号 Course Number	实践环节名称 Practice Courses Name	学分 Crs	周数 Weeks	建议修读学期 Suggested Term
1060002111	军事训练 Military Training	1.5	3	1
4180114111	机械制造工程实训 C Training on Mechanical Manufacturing Engineering	2	2	4
4180320171	机械设计课程设计 B Course Design of Mechanical Design	2	2	5
4100069111	电工电子实习 B Practice in Electrical Engineering & Electronics	1	1	5
4150214131	柴油机结构认知与实操 B The Structure Cognition and Operation for Diesel Engine.	2	2	5
4150266171	内燃机课程设计 Course Design of IC Engine	3	3	7
4150267171	能源与动力工程专业生产实习 Practice of Specialty	12	12	7
4150268171	毕业论文 Graduation Thesis	8.5	17	8
小 计 Subtotal		32	42	

六、其它要求

VI Recommendations on Course Studies

- 1、《形势与政策》和《心理健康教育》课程为课外必修课程，分别计 2 个和 1 个课外学分。
 - 2、学生选修的通识选修课程和从学校发布的个性课程目录中选修的个性课程，要求与本专业培养方案内设置的课程内容不重复。
- 1.Situation & Policy (2 credits) and Mental Health Education (1 credit) are the required extracurricular courses.
 - 2.The selected General Education Elective Courses and Personalized Elective Courses from the courses program by university must be different from the major undergraduate education plan in content.

学院教学责任人：杨志勇
专业培养方案责任人：贺玉海