NATIONAL DEFENCE UNIVERSITY
BARBAROS NAVAL SCIENCES AND ENGINEERING INSTITUTE

COURSE CATALOGS

Name Of Program	Naval Electronic Systems Engineering
Objective of the program	Naval Electronic Systems Engineering is the supplier of key enabling technologies to a wide variety including informatics, communication, control systems, marine electronic systems, electronic warfare and more.

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REQUIRED COURSES

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Course Name	Course Cathegory	Cr./Co.	Weekly Course Hours			National Credit	Total ECTC
			Total	Theoretical	Practice		
Embedded Systems	Required	Cr.	3	3	0	3	7,5
Evaluationary Approach to Electromagnetic Systems-1	Required	Cr.	3	3	0	3	7,5
Mathematical Methods in Engineering	Required	Cr.	3	3	0	3	7,5
Analytical Foundations of Electromagnetic Theory	Required	Cr.	3	3	0	3	7,5
Advanced Embedded System Design	Required	Cr.	3	3	0	3	7,5
Evaluationary Approach to Electromagnetic Systems-2	Required	Cr.	3	3	0	3	7,5
Electromagnetic Inverse Scattering Problems	Required	Cr.	4	2	2	3	7,5
Advanced Antenna Theory	Required	Cr.	3	3	0	3	7,5
Wireless Communication	Elective	Cr.	3	3	0	3	7,5
Naval Warfare Systems	Elective	Cr.	3	3	0	3	7,5

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COURSE DESCRIPTIONS

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Embedded Systems: An embedded system is a computer system with a dedicated function within a larger mechanical or electrical system, often with real-time computing constraints.

Evaluationary Approach to Electromagnetic Systems-1: To donate students with fundamental knowledge needed for research work in the newest branches of electromagnetic field theory in the time domain and various practical applications of that.

Evaluationary Approach to Electromagnetic Systems-2: To give a fundamental knowledge needed for research work in the newest branches of electromagnetic wave theory in the time domain and various practical applications of that.

Mathematical Methods in Engineering: Mathematical and experimental modeling in engineering. Tensor analysis. Extrema of a function and functionals. Differential mathematical models and solution methods. Weighted residual methods. Perturbation methods. Integral equations. Finite difference method. Boundary integral method. Finite element method.

Analytical Foundations of Electromagnetic Theory: Mathematical foundations: Hilbert space; method of moments. Fundamental theorems and concepts: the source concept; duality; uniqueness; image theory; equivalence principle; induction theorem, reciprocity, Green\'s functions; tensor Green\'s functions; integral equations; radiation field.

Advanced Embedded System Design: The objective of the course is to introduce the concept of Harvard + RISC architecture microcontrollers and design of embedded computing systems on typical applications including interrupts, timers, LCD and LED displays, keypads, a/d converters, rotary coders, stepper motors, serial and parallel communication interfacing.

Electromagnetic Inverse Scattering Problems: To give the first knowledges and concepts about the Inverse problems related to Electromagnetic waves. Higher order integral solutions: Higher order Born approximations, distorted wave methods.

Advanced Antenna Theory: To help them understand and use the properties and the types of antennas and antenna synthesis techniques for navy vessels.

Wıreless Communication: The principles of mobile communication systems, specifically cellular communication will be taught, and global view of wireless communications will be acquired.

Naval Warfare Systems: Radar frequency brands, radar systems, block diagrams, Radar range equation, power calculations and performance criteria, CW and FM-CW radars, pulse compression MTI systems, tracking radars and radar transmitters.

<u>Marine Mechanical Engineering Graduate Program</u>
<u>Course Catalog</u>

Name Of Program	Marine Mechanical Engineering
Objective of the program	Marine Mechanical Engineering, Marine Engineering or Naval architecture also known as naval engineering, is an engineering discipline dealing with the engineering design process, shipbuilding, maintenance, and operation of marine vessels and structures.

Course Name	Course Cathegory	Cr./Co.	Weekly Course Hours			National Credit	Total ECTC
			Total	Theoretical	Practice		
Thermal Systems in Navy Vessels	Required	Cr.	3	3	0	3	7,5
Advanced Thermodynamics	Required	Cr.	3	3	0	3	7,5
Welding Technology in Naval Architecture	Required	Cr.	3	3	0	3	7,5
Mathematical Methods in Engineering	Required	Cr.	3	3	0	3	7,5
Heat Exchanger Design	Required	Cr.	3	3	0	3	7,5
Advanced Heat Transfer	Required	Cr.	3	3	0	3	7,5
Tribology	Elective	Cr.	4	2	2	3	7,5
Weldıng Of Modern Technology	Elective	Cr.	3	3	0	3	7,5

COURSE DESCRIPTIONS

Mathematical Methods in Engineering: Mathematical and experimental modeling in engineering. Tensor analysis. Extrema of a function and functionals. Differential mathematical models and solution methods. Weighted residual methods. Perturbation methods. Integral equations. Finite difference method. Boundary integral method. Finite element method.

Welding Technology in Naval Architecture: Basic principles of welding and welded joints will be discussed. Up to date welding methods will be described. Materials used in ship construction and their welding abilities will be explained. Design of welded materials will be described and finally the quality and evaluation of welded joints

Thermal Systems in Navy Vessels: Thermodynamic fundamentals, gas power cycles, vapor power cycles, refrigeration, heat transfer, psychometrics and air conditioning, compressible and incompressible flow.

Advanced Thermodynamics: In this course, how macroscopic thermodynamics properties arise from the microscopic structure of atoms and molecules will be examined. Postulates of classical thermodynamics will be studied as well as equilibrium, reversibility and kinetic theory.

Welding Technology in Naval Architecture: Covered electrode technology, TIG, MIG and MAG welding technology, laser welding technique, friction stir welding methods to understand the basic concepts.

Heat Exchanger Design: This course surveys the principle concepts and methods of thermal design of heat exchangers. Topics include classification of heat exchangers, overview of heat exchanger design methodology, basic thermal design theory for recuperators, additional considerations for thermal design of recuperators, thermal design theory for regenerators, heat exchanger pressure drop analysis, surface basic heat transfer and flow friction characteristics, heat exchanger surface geometrical characteristics, heat exchanger design procedures, heat exchanger thermodynamic modeling and analysis, flow maldistribution and header design, fouling and corrosion in heat exchangers, heat pipe physics, types, design principles and applications.The class assumes the students have received prior graduate classes in heat transfer. Emphasis is placed on being able to formulate and solve typical heat exchanger design problems of engineering importance.

Advanced Heat Transfer: To introduce the students the basic problems of convective heat transfer with special emphasis on Fundamental Principles, Laminar Boundary Layer Flow, Laminar Duct Flow, Laminar Natural Convection, and Transition to Turbulence

Tribology: This course aims to teach and introduce the basic skills with examples fundamentals and applications of Tribology with Lubrication, Friction and Wear concept.

Weldıng Of Modern Technology: To introduce welding, soldering/brazing, adhesive bonding, riveting, thermic cutting and metal spraying processes, which are available in all industry branches and inevitable companion of manufacturing and to transfer up-to-date infomation regarding all processes. To introduce energy used in all welding processes in metal processing industries and to introduce necessary equipment, filler materials and media (coating, flux, powder, slag, paste, gas etc.) serving this energy to be transferred to welding area. To introduce joining techniques in manufacturing techniques, to relate material and design

Name Of Program	Cyber Security
Objective of the program	Cyber Security is one of the most active research and development fields in the world. The academic policy of the department functions in two main areas: education and research. On the theoretical side, the department focuses on algorithms, programming languages, information security and encryption issues; while on the application side, client - server systems, electronic commerce, databases, software development, interface design, security applications, system design, virtual reality and industrial process control are emphasized.

REQUIRED COURSES

Course Name	Course Cathegory	Cr./Co.	Weekly Course Hours			National Credit	Total ECTC
			Total	Theoretical	Practice		
Introduction to Cryptography	Required	Cr.	3	3	0	3	7,5
Securıty on the Wireless Networks	Required	Cr.	3	3	0	3	7,5
Network and Information Security	Required	Cr.	3	3	0	3	7,5
Malware Analysis	Required	Cr.	3	3	0	3	7,5
Data Management and Data Security	Required	Cr.	3	3	0	3	7,5
Computer Networks and Security	Required	Cr.	3	3	0	3	7,5
Data Mining and Data Security	Required	Cr.	4	2	2	3	7,5
Secure Software Development	Required	Cr.	3	3	0	3	7,5
Data Mining for Cyber Security	Elective	Cr.	3	3	0	3	7,5
Computer Forensics	Elective	Cr.	3	3	0	3	7,5

COURSE DESCRIPTIONS

Introduction to Cryptography: To learn cryptographic topics and to have skill of analysis and designing cyrptographic systems. To have skill of analysis for computer security systems.

Securıty on the Wireless Networks: The increase of users connection speed at satisfactory levels increased the usage of wireless network. A wide acceptance and the need of the wireless networks led to certain concerns regarding the overall security of the networks.

Network and Information Security: To give information about data and network security systems; the process of security system design; security risk analysis; analysis and designing of data and network security.

Malware Analysis: Malware analysis is the study or process of determining the functionality, origin and potential impact of a given malware sample such as a virus, worm, trojan horse, rootkit, or backdoor.

Data Management and Data Security :To give information about data and network security systems; the process of security system design; security risk analysis; analysis and designing of data and network security.

Computer Networks and Security Introduction to Computer Networks, Basic networking terminology, TCP layers: Transport Layer: Connectionless communication, Connection-oriented communication, Reliable communication algorithms, TCP and UDP protocols, Congestion control, Flow Control, Socket mechanism, Socket programming, RPC mechanism, Network Layer: Packet Switching, Circuit Switching, IP addresses, IP protocol, Routing tables, Routing algorithms: Link-state and Distance-vector algorithms, RIP, BGP, OSPF protocols, Hierarchical routing, NAT, ICMP protocol, Data-link Layer: Link-level (MAC) addressing, Multiple access protocols, Aloha, Ethernet, Token-ring, ARP and RARP protocols, Point-to-point protocols, PPP, Quality of service, ATM, MPLS, Local area network design, Switch and Router distinction, Proxies, Introduction to wireless networks, 802.11 protocol, Bluetooth, Wi-MAX, GSM networks, Mobile IP, MANET networks, Introduction to peer-to-peer networks, Sample peer-to-peer networks: Napster, Gnutella, Torrent, Chord.

Data Mining and Data Security: This course includes the theory and practicals of data mining techniques in cyber security. It's goal is to learn uses of data mining techniques in the solutions of cyber security problems.

Secure Software Development: Modular structure that provides data, type and packeting subprograms, performing processes running in parallel on real-time programming possibilites, exception handling, dependent features of data string with the provider of complete control over the string forms of involvement in an algorithmic programming language with facilities including the development of modular software and parallel process issues and structures roles. Although object-oriented algorithmic languages are not object-oriented languages,especially like modular structures, examination of aspects of object oriented programming prone.

Data Mining for Cyber Security: Introduction to advanced data mining techniques, including data mining pipeline, data preprocessing and cleaning, data reduction, data mining primitives, cluster analysis, clustering, association rule mining, series analysis and sequence mining, graph mining, web mining, data visualization, and data warehousing. Detailed applications from a wide variety of domains.

Computer Forensics: Computer Forensics is a branch of digital forensic science pertaining to evidence found in computers and digital storage media. The goal of computer forensics is to examine digital media in a forensically sound manner with the aim of identifying, preserving, recovering, analyzing and presenting facts and opinions about the digital information.

Naval Logistics Management Graduate Program
Course Catalog

Name Of Program	Naval Logistics Management
Objective of the program	The Logistics Management curricula are interdisciplinary, integrating mathematics, accounting, economics, management theory, operations analysis, and the specialty concentration into an understanding of the process by which the defense mission is accomplished.

REQUIRED COURSES

Course Name	Course Cathegory	Cr./Co.	Weekly Course Hours			National Credit	Total ECTC
			Total	Theoretical	Practice		
Marketing	Required	Cr.	3	3	0	3	7,5
Customer Relationship Management	Required	Cr.	3	3	0	3	7,5
Supply Chain Management	Required	Cr.	3	3	0	3	7,5
Quantitative Research	Required	Cr.	3	3	0	3	7,5
Public Relations and Publicity	Required	Cr.	3	3	0	3	7,5
Marketing Management	Required	Cr.	3	3	0	3	7,5
Logistics Management	Required	Cr.	4	2	2	3	7,5
Financial Management	Elective	Cr.	3	3	0	3	7,5
Advanced Research Techniques	Elective	Cr.	3	3	0	3	7,5

COURSE DESCRIPTIONS

Marketing: The course aims to give the student the basic theoretical and practical knowledge about marketing. A student who successfully finishes the course is expected to have acquired the competency to carry out related assessment procedures about problem foundations of marketing, environmental forces and marketing ethics, strategic marketing planning and forecasting, marketing research and marketing information systems, consumer buying behavior, organizational buying behavior, market segmentation, and product concepts.

Customer Relationship Management: "Customer Relationship Management" concept, which recently started to be important and became priority for each firm, was examined and study was made on a logistic firm that is one of the most successful firms in its sector. Before this such a comprehensive study hasn't been made in logistic sector, because of the fact that this study was prepared in order to be a model for further studies for other firms. In the study firstly components that will be used for the customer value application have been determined according to the internal dynamics of the company. In the customer classification stage, number of the provided services was taken in to consideration as an addition to the calculated customer value, which is a result of the calculation with the determined components. Different strategies have been formed for 6 customer group. With this study, firm top management level and all of the employees have been persuaded that focusing on existing customers is more advantageous than focusing on new customers. And in a short period new units have been formed for new strategies. It is expected that positive effects of these applications will be observed in a very short time.

Supply Chain Management: The management of the flow of goods and services, involves the movement and storage of raw materials, of work-in-process inventory, and of finished goods from point of origin to point of consumption. Interconnected or interlinked networks, channels and node businesses combine in the provision of products and services required by end customers in a supply chain. Supply-chain management has been defined as the "design, planning, execution, control, and monitoring of supply chain activities with the objective of creating net value, building a competitive infrastructure, leveraging worldwide logistics, synchronizing supply with demand and measuring performance globally

Quantitative Research: Quantitative Research is the systematic empirical investigation of observable phenomena via statistical, mathematical or computational techniques. The objective of quantitative research is to develop and employ mathematical models, theories and/or hypotheses pertaining to phenomena. The process of measurement is central to quantitative research because it provides the fundamental connection between empirical observation and mathematical expression of quantitative relationships.

Public Relations and Publicity: Products and production and distribution processes have become similar to each other as a result of the easy accessibility of technology in today's society. Practice of marketing communication is the main factor that determines the conditions of competition in this new environment. These practices cover activities directed in various segments like public relations, brand management and advertising. In this context, graduate programme in Marketing "Communication" and doctoral programme in "Public Relations and Publicity" cover basic courses on consumer culture, consumer behaviour, marketing communication and brand management, and also such topics from a wide range of fields as new trends in advertising and marketing, international applications, campaign design, art, digital marketing.

Marketing Management: The course considers tools and methods used to examine the marketing strategy from product, price, place and promotion strategiesas well as enabling students to integrate these topics with the previous introductory marketing course.

Logistics Management: This course is about the vital subjects of business logistics / supply chain – an area of management that can be essential to a firm's competitive strategy and revenue generation. The course presents an overview of logistics and supply chain management topics and provides fundamental techniques for understanding, resolving the issues, and designing better supply chain management processes.

Financial Management: Financial management refers to the efficient and effective management of money (funds) in such a manner as to accomplish the objectives of the organization. It is the specialized function directly associated with the top management. The significance of this function is not seen in the 'Line' but also in the capacity of 'Staff' in overall of a company. It has been defined differently by different experts in the field.

Advanced Research Technıques: The Role and the Importance of Research in Business, Decision Analysis and Value of Research, Data and Information Collection, Qualitative Business Research, Sampling, Experimental Models, Measurement and Scales, Quantitative Business Research, Hypothesis Testing, Parametric and Nonparametric Tests

<p align="center">Naval Operations Research Graduate Program
Course Catalog</p>

Name Of Program	Naval Operations Research
Objective of the program	Naval Operations research, is a discipline that deals with the application of advanced analytical methods to help make better decisions.

Course Name	Course Cathegory	Cr./Co.	Weekly Course Hours			National Credit	Total ECTC
			Total	Theoretical	Practice		
Stochastic Processes	Required	Cr.	3	3	0	3	7,5
Algorithms and Object Oriented Programming	Required	Cr.	3	3	0	3	7,5
Mathematical Modeling	Required	Cr.	3	3	0	3	7,5
Advance Planning of Production Systems and Control	Required	Cr.	3	3	0	3	7,5
Simulation Modelling	Required	Cr.	3	3	0	3	7,5
Operations Research for Naval Operations	Required	Cr.	3	3	0	3	7,5
Decision Theory	Required	Cr.	4	2	2	3	7,5
Graph Theory	Required	Cr.	3	3	0	3	7,5
Naval Operations Research	Elective	Cr.	3	3	0	3	7,5
Combinatorial Optimization	Elective	Cr.	3	3	0	3	7,5

COURSE DESCRIPTIONS

Stochastic Processes: Basic topics in probability (sample space and event, conditional probability, independent events), discrete and continuous random variables and applications, expected value, introduction to Markov chains, recurrence and limiting stationary distributions in Markov chains, exponential distribution and Poisson processes, Little's law, renewal theory, continuous-time Markov chains, birth and deaths processes, queueing theory.

Algorithms and Object Oriented Programming: To provide the concepts of Object Oriented Programming. To give an ability to use C# programming language to develop classes and to write Object Oriented Programs. To give an ability to re-use existing classes to write Object Oriented Programs.

Mathematical Modeling: Practical aspects, applications and implementation problems of mathematical programming models will be discussed and analyzed. In particular, linear programming, integer programming, and multiobjective programming models are considered. For these models, application areas, underlying assumptions, special technical considerations, typical implementation problems are investigated.

Advance Planning of Production Systems and Control: Overview of production systems and planning paradigms. Hierarchical planning, aggregation/disaggregation. Continuous and discrete lot-sizing models and solution methods. Distributed planning and coordination in supply chains.

Simulation Modelling: Simulation methodology, model formulation, systems dynamics, overview of simulation languages, generating random varieties, output data analysis, model validation, variance reduction techniques, experimental design and optimization.

Operations Research for Naval Operations: Develop necessary skills and competencies in basic mathematical OR methods and modeling. To give them basic mathematical tools to make research in mathematical modeling. To give necessary skills for their understanding of mathematical and quantitative content in their research for doctoral work. To enable them to think in terms of original and analytical terms.

Decision Theory: Bayesian decision theory; measurement theory; subjective probability. Dependency models; Bayesian networks; exact and approximate inference; computational complexity of inference. Influence diagrams; value of information; decision networks and connections to Markov decision processes. Case studies; risk sharing and decisions; implementation of decision models.

Graph Theory: Theory and applications of graphs and networks; properties of graphs; Hamiltonian and Eulerian walk problems; Travelling Salesman Problem and variants; design and analysis of shortest path, maximum flow and minimum cost network flow algorithms; matching and assignment; network simplex algorithm.

Naval Operations Research: To learn using different mathematical modeling techniques with OR. To learn using different methods that are used for numerical decision making. To learn finding optimal solutions to problems for navy.

Combinatorial Optimization: Theoretical analysis of algorithms and applications developed for combinatorial problems. Complexity Theory; Network flow problems; BAG problem; Traveling salesman problem; Mapping problem; Assignment problem; greedy algorithms. Algorithms developed for combinatorial problems are a programming language modeling using.