



BAKI ALI NEFT MƏKTƏBİ BAKU HIGHER OIL SCHOOL

COMPUTER ENGINEERING (Bachelor's Degree Program, 5 years) CURRICULUM (T+P+L)=(Lecture+Tutorial+Laboratory)

YEAR 1 (Semester 1), Fall

Course ID	Course name	In class hours (T+P+L)	Credits ECTS	Course Description
COMP 101	Application of ICT in Engineering-1	4+0+4	10	This course provides an overview of Information and Communication Technology (ICT) and its applications in various fields. It covers fundamental concepts of computer hardware, software, networking, data management, cybersecurity, and emerging technologies such as cloud computing, artificial intelligence (AI), and the Internet of Things (IoT). The course also emphasizes digital literacy, ethical considerations, and the role of ICT in business, education, and society.
ENG 101	English 1	0+20+0	20	

YEAR 1 (Semester 2), Spring

Course ID	Course name	In class hours (T+P+L)	Credits ECTS	Course Description

COMP 102	Application of ICT in Engineering-2 (Python)	3+0+5	10	This course is devoted to Python programming language. Python is a language with a simple syntax, and a powerful set of libraries. It is an interpreted language, with a rich programming environment, including a robust debugger and profiler. While it is easy for beginners to learn, it is widely used in many scientific areas for data exploration. This course is an introduction to the Python programming language for students without prior programming experience. The course fully covers the basics of programming in the Python programming language and programming techniques, customs and vocabulary including the most common library functions and the usage of the preprocessor. Previous programming experience is not required.
ENG 102	English 2	0+20+0	20	

YEAR 2 (Semester 3), Fall				
Course ID	Course name	In class hours (T+P+L)	Credits ECTS	Course Description
MATH 201	Calculus	2 + 3 + 0	6	This course provides a foundational understanding of calculus, covering key concepts such as limits, derivatives, integrals, and their applications. Students will learn to analyze functions, compute rates of change, and solve real-world problems using differentiation and integration techniques. The course also explores the Fundamental Theorem of Calculus, optimization problems, and introductory differential equations. Emphasis is placed on conceptual understanding, problem-solving, and mathematical reasoning.
MATH 203	Analytic Geometry	2 + 2 + 0	6	This course explores the principles of analytic geometry, combining algebra and geometry to study geometric figures in a coordinate system. Topics include the Cartesian coordinate system, equations of lines and curves, conic sections, transformations, and three-dimensional geometry. Students will develop problem-solving skills

				by analyzing the geometric properties of shapes and their algebraic representations.
MATH 205	Discrete Mathematics	2 + 2 + 0	6	This course provides an introduction to discrete mathematical structures and their applications in computer science, engineering, and mathematics. Topics include logic and proof techniques, set theory, combinatorics, relations and functions, graph theory, and Boolean algebra. Emphasis is placed on developing mathematical reasoning, problem-solving skills, and the ability to analyze discrete structures used in computing and applied sciences.
CE 201	Programming Language	2 + 0 + 4	8	This course introduces students to the fundamentals of programming using the C language. Topics include basic syntax, data types, control structures, functions, pointers, arrays, and file handling. Emphasis is placed on structured programming, problem-solving techniques, and memory management. By the end of the course, students will be able to write efficient and optimized C programs for a variety of applications.
AZL 211	Azerbaijani Language and Art of Speech	1 + 2 + 0	4	

YEAR 2 (Semester 4), Spring

Course ID	Course name	In class hours (T+P+L)	Credits ECTS	Course Description
MATH 202	Differential Equations	2 + 2 + 0	4	This course provides an in-depth study of ordinary differential equations (ODEs) and their applications in engineering, physics, and applied sciences. Topics include first-order and higher-order differential equations, systems of differential equations, Laplace transforms, and numerical methods. Students will develop analytical and computational techniques to solve differential equations and apply them to real-world problems.

PHYS 202	Physics	2 + 1 + 1	5	This course explores the fundamental principles of electricity, including electric charge, electric fields, circuits, and electromagnetism. Topics include Coulomb's law, Gauss's law, electric potential, capacitance, resistance, Ohm's law, Kirchhoff's laws, and applications of electromagnetism such as induction and AC/DC circuits. Students will develop problem-solving skills and apply theoretical concepts through calculations and experiments.
CE 202	Object-oriented programming	2 + 0 + 3	5	This course introduces the principles of object-oriented programming (OOP), focusing on concepts such as classes, objects, inheritance, polymorphism, encapsulation, and abstraction. Students will learn to design and implement software using OOP methodologies in a programming language such as Java, C++, or Python. Emphasis is placed on problem-solving, software design, and best practices in programming.
CE 204	Data Structures & Algorithms	2 + 0 + 3	5	This course provides a comprehensive introduction to data structures and algorithms, focusing on their implementation, analysis, and applications in software development. Students will learn fundamental data structures such as arrays, linked lists, stacks, queues, trees, and graphs, along with essential algorithms for searching, sorting, and optimization. Emphasis is placed on efficiency, complexity analysis, and problem-solving techniques used in real-world applications.
HIST 202	History of Azerbaijan	3 + 2 + 0	5	This course explores the rich and complex history of Azerbaijan, from ancient times to the modern era. It covers key historical events, including the formation of early civilizations, the influence of major empires, the rise of the Azerbaijani nation, the Soviet period, and the country's independence. Students will examine Azerbaijan's cultural, political, and economic developments, as well as its role in regional and global affairs.
	Internship 1	4 weeks	6	

YEAR 3 (Semester 5), Fall

Course ID	Course name	In class hours (T+P+L)	Credits ECTS	Course Description
MATH 301	Linear Algebra	2 + 2 + 0	6	This course provides an introduction to the fundamental concepts of linear algebra, including vector spaces, linear transformations, matrices, and systems of linear equations. Emphasis is placed on theoretical understanding and practical applications in fields such as computer science, engineering, physics, and economics. Students will develop problem-solving skills and learn how linear algebra is used in real-world scenarios.
CE 301	Numerical Methods for Engineering	2 + 0 + 2	6	This course introduces numerical techniques for solving engineering problems that cannot be addressed using analytical methods. Topics include root-finding algorithms, numerical differentiation and integration, solving systems of linear and nonlinear equations, interpolation, curve fitting, and numerical solutions to differential equations. Emphasis is placed on the application of numerical methods using computational tools and programming languages such as MATLAB or Python.
CE 303	Computer graphics	3 + 0 + 3	6	This course provides an introduction to the fundamental concepts and techniques of computer graphics, covering both theoretical foundations and practical applications. Topics include rasterization, transformations, 2D and 3D modeling, rendering, shading, and animation. Students will gain hands-on experience in graphics programming using tools such as OpenGL, WebGL, or other graphics libraries. The course explores how computer graphics are used in gaming, simulations, virtual reality, and visual effects.
ESH 202	Electrical Safety	2 + 2 + 0	6	This course provides an in-depth understanding of electrical safety principles, hazards, and best practices for working with electrical systems. Topics include electrical shock and arc flash hazards, grounding and insulation, safe work procedures, personal protective equipment (PPE), and electrical codes and standards. Emphasis is placed on risk assessment, accident prevention, and compliance with

				workplace safety regulations to ensure a safe environment for electrical workers and engineers.
CE 305	Operating Systems	2 + 0 + 2	6	This course provides an in-depth study of operating system (OS) concepts, including process management, memory management, file systems, and system security. Students will explore the principles behind OS design and implementation, with a focus on multitasking, concurrency, and resource allocation. The course includes practical applications through hands-on projects using Linux, Windows, or other operating systems.

YEAR 3 (Semester 6), Spring				
Course ID	Course name	In class hours (T+P+L)	Credits ECTS	Course Description
MATH 302	Probability & Statistics	2 + 2 + 0	5	This course introduces fundamental concepts in probability and statistics, providing students with the skills needed to analyze and interpret data. Topics include probability theory, random variables, distributions, hypothesis testing, regression analysis, and statistical inference. Emphasis is placed on real-world applications in science, engineering, business, and data analysis. Students will also gain hands-on experience using statistical software and programming tools such as Python, R, or Excel.
CE 302	Fundamentals of Electrical Engineering	2 + 0 + 2	5	This course provides a comprehensive introduction to the fundamental principles of electrical engineering. Topics include circuit analysis, electrical components, AC and DC circuits, electromagnetic fields, and electrical power systems. Students will develop problem-solving skills through theoretical analysis and hands-on laboratory experiments, gaining a strong foundation for advanced studies in electrical and electronic engineering.

CE 304	Formal Languages and Automata	2 + 2 + 0	4	This course explores the theoretical foundations of computer science, focusing on formal languages, automata theory, and computational complexity. Topics include finite automata, regular expressions, context-free grammars, Turing machines, and decidability. Emphasis is placed on understanding computational models and their applications in compiler design, artificial intelligence, and algorithm analysis.
CE 306	Computer Networks	2 + 0 + 2	5	This course provides a comprehensive introduction to computer networking concepts, protocols, and architectures. Topics include network models, data communication, routing, switching, network security, and wireless communication. Students will gain hands-on experience with network configuration, troubleshooting, and simulation tools, preparing them for real-world applications in IT and cybersecurity.
MATH 304	Mathematical Modelling	2 + 2 + 0	5	This course introduces students to the principles and techniques of mathematical modeling, focusing on how mathematical methods can be used to describe, analyze, and predict real-world phenomena. Topics include deterministic and probabilistic models, differential equations, optimization, and simulation techniques. Applications span engineering, physics, biology, economics, and social sciences.
	Internship 2	4 weeks	6	

YEAR 4 (Semester 7), Fall				
Course ID	Course name	In class hours (T+P+L)	Credits ECTS	Course Description
CE 401	Artificial Intelligence	2 + 2 + 0	5	This course provides an introduction to the fundamental concepts, techniques, and applications of artificial intelligence (AI). Topics include problem-solving, search algorithms, knowledge representation, machine learning, natural language processing, and robotics. Students will gain hands-on experience by implementing AI techniques using programming languages such as Python.

CE 403	Database fundamentals	2 + 0 + 2	5	This course introduces the fundamental concepts of database systems, focusing on database design, development, and management. Topics include relational database models, Structured Query Language (SQL), normalization, indexing, and transactions. Students will gain hands-on experience with database management systems (DBMS) such as MySQL, PostgreSQL, or SQLite.
CE 405	Introduction to Electronics	2 + 0 + 2	5	This course provides a foundational understanding of electronics, covering essential concepts such as circuit components, semiconductor devices, and basic circuit analysis. Students will explore both analog and digital electronics, with a focus on diodes, transistors, operational amplifiers, and logic gates. Practical applications and hands-on circuit design using breadboards and simulation tools will be emphasized.
CE 407	Signals and Systems	2 + 0 + 2	5	This course introduces the fundamental concepts of signals and systems, focusing on their mathematical representation, analysis, and applications in engineering. Topics include continuous and discrete-time signals, linear time-invariant (LTI) systems, Fourier series and transforms, Laplace and Z-transforms, and sampling theory. The course provides a strong foundation for further studies in digital signal processing, communications, and control systems.
CE 409	Digital Logic Design	2 + 0 + 2	5	This course introduces the fundamental principles of digital logic design, focusing on the analysis and implementation of digital circuits. Topics include number systems, Boolean algebra, logic gates, combinational and sequential circuits, finite state machines, and memory elements. Students will gain hands-on experience designing and simulating digital circuits using hardware description languages (HDLs) and simulation tools such as Verilog or VHDL.
CE 411	Principles of Computer Communications (Elective)	2 + 0 + 2	5	This course provides a fundamental understanding of computer communication systems, covering key concepts in data transmission, networking protocols, and communication architectures. Topics include network models, error detection, multiplexing, switching, and wireless communication. The course emphasizes the principles

				behind modern network technologies, including the Internet, mobile networks, and emerging communication trends.
CE 413	Control Systems (Elective)	2 + 0 + 2	5	This course introduces the fundamental concepts of control systems, focusing on the analysis and design of linear control systems. Topics include system modeling, time and frequency domain analysis, stability criteria, and controller design techniques. Students will learn how to design and analyze control systems using mathematical tools and simulation software such as MATLAB. Applications span robotics, automation, aerospace, and industrial process control.
CE 415	Operations Research (Elective)	2 + 0 + 2	5	This course introduces the fundamental concepts and techniques of Operations Research (OR), focusing on mathematical modeling, optimization, and decision-making in complex systems. Topics include linear and nonlinear programming, network optimization, game theory, queuing theory, and simulation. The course emphasizes real-world applications in logistics, manufacturing, finance, and engineering.
CE 417	Scripting Language (Elective)	2 + 0 + 2	5	This course introduces students to scripting languages and their applications in automation, web development, system administration, and data processing. Topics include syntax, data structures, file handling, regular expressions, and automation scripting using popular scripting languages such as Python, Bash, JavaScript, or Perl. The course emphasizes hands-on programming and problem-solving.

YEAR 4 (Semester 8), Spring				
Course ID	Course name	In class hours (T+P+L)	Credits ECTS	Course Description
CE 402	Computer Architecture	2 + 0 + 2	5	This course explores the fundamental principles of computer architecture, focusing on the design and organization of modern computer systems. Topics include instruction set architecture (ISA), processor design, memory hierarchy, input/output systems, and parallel computing. The course provides insights into how hardware and software interact to optimize system performance.

CE 404	Digital Signal Processing	2 + 0+ 2	5	This course introduces the fundamental principles and techniques of Digital Signal Processing (DSP), focusing on the analysis and manipulation of digital signals. Topics include discrete-time signals and systems, Fourier transforms, digital filter design, and real-time DSP applications. The course emphasizes both theoretical concepts and practical implementation using programming tools such as MATLAB or Python.
CE 406	Web & Mobile Programming	2 + 0 + 2	5	This course introduces students to the fundamentals of web and mobile application development, covering front-end and back-end technologies, frameworks, and best practices. Topics include HTML, CSS, JavaScript, React, mobile app development with Flutter or React Native, APIs, and database integration. The course emphasizes hands-on development of responsive and interactive applications.
CE 408	System Analysis and Modelling	2 + 0+ 2	4	This course provides an in-depth understanding of system analysis and modeling techniques used in software and systems engineering. Students will learn about structured and object-oriented approaches to system development, including requirements analysis, process modeling, data modeling, and system design using UML (Unified Modeling Language). The course emphasizes real-world applications in software development, business processes, and engineering systems.
CE 410	Cloud Computing (Elective)	2 + 0 + 2	5	This course introduces the fundamental concepts, architecture, and technologies of cloud computing. Topics include cloud service models (IaaS, PaaS, SaaS), virtualization, cloud security, containerization, and distributed computing. Students will gain hands-on experience with cloud platforms such as AWS, Microsoft Azure, or Google Cloud, exploring cloud deployment, storage, and security management.
CE 412	System Simulation (Elective)	2 + 0 + 2	5	This course introduces the concepts, methods, and applications of system simulation, focusing on modeling real-world systems for analysis and decision-making. Topics include discrete-event simulation, Monte Carlo methods, queuing models, and system

				dynamics. Students will gain hands-on experience using simulation tools such as MATLAB, Arena, or Python-based simulation libraries.
CE 414	Secure Programming (Elective)	2 + 0 + 2	5	This course focuses on secure software development practices to prevent vulnerabilities and cyber threats. Topics include secure coding principles, common security flaws (such as buffer overflows, injection attacks, and cross-site scripting), cryptographic techniques, and secure software development lifecycle (SDLC). Students will learn how to write robust and secure code in languages such as C, C++, Python, and Java.
CE 416	Network Security (Elective)	2 + 0 + 2	5	This course provides an in-depth understanding of network security principles, threats, and defense mechanisms. Topics include cryptographic techniques, network protocols, firewalls, intrusion detection and prevention systems, virtual private networks (VPNs), and wireless security. Students will explore real-world security threats, ethical hacking techniques, and best practices for securing networks.
CE 418	System Programming (Elective)	2 + 0 + 2	5	This course focuses on low-level programming and interaction with operating system components, enabling students to develop efficient and robust system-level software. Topics include process management, file systems, memory management, inter-process communication, and device drivers. Programming is done primarily in C and assembly language in a Unix/Linux environment.
	Internship 3	4 weeks	6	

YEAR 5 (Semester 9), Fall				
Course ID	Course name	In class hours (T+P+L)	Credits ECTS	Course Description
CE 501	Software Engineering	2+ 0 + 2	5	This course provides a comprehensive introduction to software engineering principles, methodologies, and best practices for designing, developing, testing, and maintaining high-quality software systems. Topics include the software development lifecycle (SDLC),

				agile methodologies, software architecture, design patterns, version control, and software testing. Students will work on real-world projects to gain hands-on experience in software development processes.
CE 503	Embedded Systems	2 + 0+ 2	5	This course provides an in-depth understanding of embedded systems, focusing on hardware-software integration, real-time processing, and system optimization. Topics include microcontrollers, real-time operating systems (RTOS), peripheral interfacing, embedded C programming, and hardware communication protocols. Students will work on hands-on projects using microcontrollers such as ARM Cortex, AVR, or ESP32.
CE 505	Robotics	2 + 0 + 2	5	This course provides an introduction to robotics, covering fundamental concepts in robot design, kinematics, dynamics, control systems, and artificial intelligence. Students will explore robotic sensing, motion planning, embedded programming, and automation. Hands-on experience will be gained through simulations and real-world robotic applications using platforms such as Arduino, Raspberry Pi, or ROS (Robot Operating System).
CE 507	Microprocessors & Microcontrollers	2 +0 + 2	5	This course provides an in-depth study of microprocessors and microcontrollers, focusing on their architecture, programming, interfacing, and real-world applications. Students will learn about assembly language programming, peripheral interfacing, memory management, and real-time embedded system development using platforms such as 8051, AVR, ARM Cortex, and ESP32. Hands-on projects will reinforce theoretical concepts.
ECON 501	Engineering Economics	2 + 2 + 0	5	This course introduces the fundamental principles of engineering economics, focusing on economic decision-making in engineering and technology-related projects. Topics include cost analysis, time value of money, cash flow estimation, investment evaluation, risk assessment, and cost-benefit analysis. The course equips students with the financial and economic tools needed to assess engineering projects and make informed decisions.

CE 509	IT Project Management (Elective)	2 + 2+ 0	5	This course provides an overview of project management principles, methodologies, and best practices specifically tailored for IT projects. Students will learn about project planning, scheduling, risk management, resource allocation, and team collaboration using industry-standard frameworks such as Agile, Scrum, and PMBOK. The course also covers project documentation, stakeholder communication, and the use of project management tools like Jira, Trello, or Microsoft Project.
CE 511	Computer Design (Elective)	2 + 0 + 2	5	This course covers the principles and methodologies of designing modern computer systems, including processor architecture, memory hierarchy, input/output systems, and performance optimization. Students will explore topics such as instruction set architecture (ISA), pipelining, parallel processing, and hardware-software co-design. The course includes practical projects on designing and simulating computer components using hardware description languages (HDLs) such as VHDL or Verilog.
CE 513	Programming in Parallel & Distributed Systems (Elective)	2 + 0 + 2	5	This course explores the principles and techniques of parallel and distributed computing, focusing on the development of high-performance applications. Topics include parallel programming models, distributed system architectures, concurrency control, load balancing, and fault tolerance. Students will gain hands-on experience with parallel programming frameworks such as OpenMP, MPI, CUDA, and distributed computing tools like Hadoop and Apache Spark.
CE 515	Real-time Systems (Elective)	2 + 0 + 2	5	This course covers the fundamental concepts and design principles of real-time systems, focusing on the development of time-critical applications in embedded and industrial environments. Topics include real-time operating systems (RTOS), scheduling algorithms, real-time communication, and system reliability. Students will work on hands-on projects using RTOS frameworks such as FreeRTOS or RTEMS.
CE 517	Functional Programming (Elective)	2 + 0 + 2	5	This course introduces the principles of functional programming, a paradigm that treats computation as the evaluation of mathematical functions and avoids changing states and mutable data. Students will

				explore concepts such as first-class functions, higher-order functions, recursion, immutability, and lazy evaluation. The course will use functional programming languages like Haskell, Lisp, or Scala, with hands-on exercises in real-world applications.
CE 519	Object-oriented Modelling & Design (Elective)	2 + 0 + 2	5	This course covers the principles and techniques of object-oriented modeling and design, focusing on creating scalable, maintainable, and reusable software systems. Students will learn object-oriented analysis, design patterns, UML (Unified Modeling Language), and software architecture best practices. Hands-on exercises and case studies will be used to apply these concepts in real-world software development projects.
CE 521	Introduction to Blockchain (Elective)	2 + 0 + 2	5	This course provides an introduction to blockchain technology, its architecture, and its applications beyond cryptocurrencies. Students will learn about distributed ledgers, cryptographic security, consensus mechanisms, smart contracts, and decentralized applications (DApps). Hands-on projects will involve working with blockchain platforms like Ethereum, Hyperledger, and Solidity programming for smart contracts.
CE 523	Multimedia Systems (Elective)	2 + 0 + 2	5	This course explores the fundamental concepts and technologies behind multimedia systems, including audio, video, graphics, and interactive applications. Students will learn about multimedia data representation, compression techniques, streaming technologies, and multimedia application development. Hands-on projects will include working with tools and frameworks for multimedia content creation, processing, and delivery.
CE 525	Database Administration (Elective)	2 + 0 + 2	5	This course provides an in-depth understanding of database administration, focusing on database management, security, performance tuning, backup, and recovery strategies. Students will learn how to install, configure, and maintain relational database management systems (RDBMS) such as MySQL, PostgreSQL, Oracle, or Microsoft SQL Server. Hands-on projects will cover database security, user management, query optimization, and high-availability solutions.

CE 527	System Administration (Elective)	2 + 0 + 2	5	This course provides a comprehensive introduction to system administration, covering the installation, configuration, maintenance, and security of computer systems and networks. Students will learn how to manage operating systems (Linux/Windows), automate administrative tasks, configure network services, implement security measures, and troubleshoot system issues. Hands-on labs will focus on real-world system administration tasks using industry-standard tools.
CE 529	DevOps (Elective)	2 + 0 + 2	5	This course provides an in-depth understanding of DevOps principles, tools, and practices for automating and streamlining the software development and deployment process. Students will learn about continuous integration (CI), continuous delivery (CD), infrastructure as code (IaC), monitoring, and security. The course includes hands-on experience with industry-standard tools such as Docker, Kubernetes, Git, Jenkins, Ansible, Terraform, and cloud platforms like AWS, Azure, and Google Cloud.

YEAR 5 (Semester 10), Spring				
Course ID	Course name	In class hours (T+P+L)	Credits ECTS	Course Description
MACD 502	Fundamentals of Civil Defence and Medical Aid	1 + 1 + 0	5	This course introduces students to the principles of civil defence, emergency preparedness, disaster response, and basic medical aid. It covers topics such as risk assessment, fire safety, evacuation procedures, first aid, CPR, and disaster management strategies. Students will gain practical knowledge on how to respond to emergencies, provide immediate medical assistance, and contribute to community safety.
	Internship 4	10 weeks	15	
	Final Project		10	The Final Project for Computer Engineers is a capstone course where students apply their knowledge and skills to design, develop, and implement a comprehensive engineering project. This course allows students to explore real-world problems, conduct research, and

				develop innovative solutions using software, hardware, or a combination of both. Students will work individually or in teams to create a fully functional prototype, documented with reports and presentations.
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Head of Information Technology Department,
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Naila Allahverdiyeva