Eastern Mediterranean University

"Virtue, Knowledge, Advancement"

FACULTY OF ENGINEERING

MECHANICAL ENGINEERING DEPARTMENT

GRADUATE PROGRAMs

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THE WORLD UNIVERSITY RANKINGS 2019 TOP 800

QS STARS RATED FOR EXCELLENCE 2019 TEACHING

QS STARS RATED FOR EXCELLENCE 2019 FACILITIES

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ABOUT EMU

The Eastern Mediterranean University (EMU) based on the Mediterranean Island of Cyprus was established in the year 1979 in Northern Cyprus. Since then, EMU has grown exponentially to claim its position as a worldwide renowned public university, with over 55,000 graduates and currently providing education to over 20,000 students. As EMU embarks on its 40th anniversary, it stands as a Times Higher Education Ranking University in the 601-800 band, 5-Star achieving university awarded by the QS ranking intuition, with over 100 undergraduate and schools programs, over 80 post graduate programs and providing education to students from more than 100 countries. The university that has 3 km^2 campus. Students of EMU benefit from a wide variety of sports facilities. A modern stadium with a capacity of 5,000 seats, tartan athletics track, cardio center, spinning and TRX halls and an open area of 66,500 m^2 for sports and closed sports complex with a capacity of 3,500 seats are only some of the facilities from which students can benefit. EMU offers a colorful and high quality campus life enriched by numerous social and cultural activities organized by more than 50 student clubs and international student associations operating under the International Office. EMU has a fully equipped Health Center with 13 specialist doctors and a private ambulance. As well as the Health Center, there are over 30 research centers some of which directly provide services for students. Students can directly benefit from the services of the Center for Psychological Counseling, Guidance and Research (PDRAM) and the Center for Graduate Communications and Career Research.

FACULTY OF ENGINEERING

The EMU Engineering Faculty was established in 1983, and as of today has 9050 graduates. Presently, the faculty has 22 undergraduate, 8 post graduate and 5 PhD programs in 5 departments with about 2800 students from 35 different countries. The mission of the EMU Engineering Faculty is to contribute to betterment of our society through the pursuit of innovative education, active learning and cutting edge scientific research in a competitive and sustainable environment and maintain our regional leadership by setting a good example. We also aim to provide opportunities and create an esteemed academic environment for the exchange of diversity of cultures, social, political and ideological knowledge and professional talents among the students as well as the faculty.

MECHANICAL ENGINEERING DEPARTMENT

The Department of Mechanical Engineering (ME) is one of the first three departments established in this University. The graduate program of the department was started in 1990. The Department offers programs of study leading to the degrees of Bachelor of Science (B.S.) in Mechanical & Mechatronics Engineering, Master of Science (M.S.), and Doctor of Philosophy (Ph.D.) in Mechanical Engineering. The Mechanical Engineering Department has the largest population of international students in EMU at present. The BS Mechanical and Mechatronics Engineering programs are accredited by ABET (Accreditation Board for Engineering and Technology). The mission of the Mechanical Engineering Department is to cultivate on the creation integration, transfer and application of knowledge relevant to the disciplines of Mechanical and Mechatronics Engineering. The purpose of the post graduate program is to contribute to the technological improvement to serve national and international communities. Through continuously developing our educational and research programs, our graduates become professional leaders who can apply their knowledge and skills to work on the engineering problems encountered by community and industry.

ADMISSION REQUIREMENTS

For Master's and PhD programs, evidence of English language proficiency is required. If you do not have a valid English language qualification that meets the EMU requirements your level will be assessed by examination at EMU. For details, please check https://grad.emu.edu.tr/en/admission/english-language-requirement

M.Sc. in Mechanical Engineering

M.Sc. program requires a minimum CGPA of 2.75/4.0 (or international equivalent) in a related science or engineering discipline; for applicants with CGPA below 2.75 (between 2.5 and 2.75) the departmental graduate committee may ask the candidates to take a number of deficiency courses from the undergraduate program before they are admitted to the program.

Ph.D. in Mechanical Engineering

For the Ph.D. program the standard academic entry requirement is a minimum CGPA of 3.0/4.0 (or international equivalent) obtained from a related science or engineering undergraduate discipline. The applicant is also required to have a Master's Degree in a mechanical engineering-related field and submit a research proposal (brief explanation about his/her research interests). Admission of applicants to the PhD program is subject to the availability of a supervisor in the proposed research field.

TUITION FEE & SCHOALRSHIP

Scholarships and research assistantships to deserving candidates. For more information and details on the application process, admission requirements, Tuition fees, scholarship opportunities and research assistant opportunities please visit the EMU's Institute of Graduate Studies and Research website. https://grad.emu.edu.tr/en

PROGRAM REQUIREMENTS

The fields of study in the Mechanical Engineering Department are classified into three groups: Thermal-fluid Science and Energy; Materials and Manufacturing; Mechanics and Machine Design, and Electromechanical Systems. Students accepted for the graduate program should have taken the courses or their equivalents as given below. Otherwise the candidate will be asked to take all or some of the courses not taken before.

a. Thermal-fluid Science Energy: Thermodynamics (MENG 245, 246), Heat Transfer (MENG 345), Fluid Mechanics (MENG 353)
b. Materials and Manufacturing: Materials Science (MENG 286), Manufacturing Processes (MENG 364), Strength of Materials (MENG 222)
c. Mechanics and Machine Design: Dynamics of Machinery (MENG 331)), Control System (MENG 332), Machine Elements (MENG 375, 376)
d. Mechatronics: Systems Control (MENG332), Electromechanical Systems, and Industrial Automation.
e. Engineering Mathematics courses are prerequisite for students in all of three groups besides familiarity in one computer language.

MASTER OF SCIENCE

A Master student needs to take 7 Technical courses and 2 Non-credit courses (Seminar and Advanced writing) as one of Master degree requirement. Two MATH courses, as approved by the department, are compulsory for every student. Please note that the listed courses below can only be taken instead of one mathematic course of MS program.
Besides MATH and Non-credit courses, a student needs to take at least 3 departmental courses (i.e., with MENG code). The remaining 2 courses are elective and can be taken with the permission of concerned supervisor.
A Master student can take an undergraduate course (from area electives with MENG 400 code), which will be counted as one of the three departmental courses required to be taken.

CURRICULUM

Course Code	Course Title	Credit	Lecture Hour (hrs/week)	Lab / Tutorial (hrs/week)
MENG500	M.S. Thesis	No-Credit	-	-
REQ1	Required Course	3	3	-
REQ2	Required Course	3	3	-
REQ3	Required Course	3	3	-
REQ4	Required Course	3	3	-
REQ5	Required Course	3	3	-
REQ6	Required Course	3	3	-
REQ7	Required Course	3	3	-
MENG598	Seminar	No-Credit	-	-

DOCTORATE OF PHILOSOPHY

A PhD student needs to take 7 Technical courses and 2 Non-credit courses (Seminar and Advanced writing) as one of Master degree requirement. However, advanced writing can be exempted for a student if he/she has already taken this course in Master program. Two MATH courses, as approved by the department, are compulsory for every student. Please note that the listed courses below can only be taken instead of one mathematic course of PHD program. Besides MATH and Non-credit courses, a student needs to take at least 3 departmental courses (i.e., with MENG code). The remaining 3 courses are elective and can be taken with the permission of concerned supervisor. A PhD student, contrary to a Master student, is not allowed to take any undergraduate course (with 400 code). After fulfilling the course requirement, the student is required to register for PhD qualifying exam with the advisor. Prior to appear in exam, applicant (or supervisor) must update graduate school by filling the relevant form. This exam consists of two parts; written and oral exams. The objective of the written exam is to test the student's background in the proposed field of research. The streams and the relevant subjects of the written exam are as follows:

a- Thermal Energy and Fluid Science group

- Applied Mathematics
- Heat Transfer
- Thermodynamics
- Fluid Mechanics

b- Materials and Manufacturing group

- Applied Mathematics
- Materials Science
- Manufacturing Processes
- Strength of Materials

c- Mechanics and Machine Design group

- Applied Mathematics
- Machine Elements
- Dynamics and Vibration
- System Control

d- Mechatronics/Electro-Mechanical group

- Applied Mathematics
- System Control
- Electromechanical Systems
- Industrial Automation

The exam depending on the instructor could be open or close book. The exam (written & oral) is organized and evaluated by a committee with ***at least three members.*** To qualify exam, a student should secure at least 65% marks in each subject. Students who fail the qualifying examination are allowed to retake the exam for the second time only after three months. In case a student successfully qualifies exam, s/he must appear for oral exam, preferably within a week. S/He is expected to explain his research plan thoroughly. Further requirements for thesis and graduation are outlined in "Lisansüstü Öğretim Yönetmeliği". Prior to appoint of a Ph.D thesis jury, the candidate must have: (a) At least one paper published (or accepted) related to his/her thesis research field in SCI/SCIE journal. (b) Secured minimum 16 points from the scientific activities described in the list of EMU Academic Assessment Criteria. The distribution of marks for publications is as below:

Type	Points
SCI	**15**
SCIE	**12**
Int. Conference	**5**

CURRICULUM

Course Code	Course Title	Credit	Lecture Hour (hrs/week)	Lab/Tutorial (hrs/week)
MENG600	Ph.D. Thesis	No-Credit	-	-
REQ1	Required Course	3	3	-
REQ2	Required Course	3	3	-
REQ3	Required Course	3	3	-
REQ4	Required Course	3	3	-
REQ5	Required Course	3	3	-
REQ6	Required Course	3	3	-
REQ7	Required Course	3	3	-
MENG699	Ph.D. Qualifying Exam	No-Credit	-	-

CORE COURSES

MENG 511 Applied Computational Methods for Engineers (3,0) 3

The course is an applied approach to solve different types of equations that aries in engineering analysis. The course contains: solution of systems of linear algebraic equations, eigen-value problems; nonlinear equations; polynomial approximation, numerical differentiation and integration; ordinary differential equations and partial differential equations.

MENG515 – Multidisciplinary Design Optimization (3,0) 3

Multidisciplinary Design Optimization (MDO) deals with the optimization of several engineering disciplines simultaneously. It provides the opportunity to find the optimal solution of a system accounting for the interactions between the different disciplines. The topics covered include: Introduction to Optimization, Design Architectures, Unconstrained & Constrained Optimization, KKT Conditions, Genetic Algorithm, Particle Swarm Optimization, Simulated Annealing, Multi-Objective & Hybrid Optimization, Design of Experiments, Robust Design & Meta-Modeling, FMEA, VMEA, Post Optimality Analysis.

MENG 522 Fracture Mechanics (3,0) 3

Mechanism of fracture and crack growth. The elastic crack-tip stress field, the crack-tip plastic zone. The energy principle; energy release rate, criterion for crack growth, crack resistance, compliance, J-Integral and tearing modulus. Dynamic fracture mechanics and crack arrest. Plane strain fracture toughness, plane stress and transitional behaviour. Elastic-plastic fracture, fatigue crack propagation, fracture resistance of materials. Application of fracture mechanics. Prediction of fatigue crack growth.

MENG 525 Elasticity (3,0) 3

Analysis of stress and strain. Constitutive equations. Plane problems of elasticity. Torsion and flexure of beams. Variational methods, theorems of minimum potential energy and complementary energy. Approximate solution by means of variational methods. Introduction to plate theory.

MENG 533 Advanced Mechanical Vibrations (3,0) 3

1D Wave examples (strings), Sound in fluids, Acoustic impedance, Source energy, intensity and power, Sources, reciprocity, Green's functions, etc., Sound absorption and absorbing materials, Sound in waveguides, mufflers and silencer, Sound in enclosures

MENG 541 Advanced Thermodynamics (3,0) 3

The first and second laws of thermodynamics. The two laws combined: the destruction of energy. Energy generalized. Single-phase, multiphase and chemical reactive systems. Refrigeration and power generation. Thermodynamic design.

MENG 542 Components of Energy Systems (3,0) 3

Piping systems, Heat exchangers, Prime movers, pumps, fans, nozzles, turbines, modeling and simulation, Steady-state simulation, Transient simulation, System optimization and risk analysis, Uncertainty analysis, Fluid transients.

MENG 551 Advanced Fluid Mechanics (3,0) 3

Fundamentals equations, flow kinematics and special forms of governing equations. Two-dimensional potential flow, three-dimensional potential flow. Viscous flow: incompressible flow and compressible flow of fluids.

MENG 555 Computational Fluid Dynamics (CFD) (3,0) 3

Introduction, vector and tensor algebra; Governing equations; Equilibrium equations; Diffusion equation; Euler equation; Advection equations; advection-diffusion equation; boundary and initial conditions; Permeative and stream function-vorticity approach; Approximate methods. Finite difference, weighted residual-finite elements, finite volume; Accuracy and error analysis, Higher order schemes; Staggered grid concept; Pressure correction schemes; Flow in porous media, turbulent flow modeling.

MENG 559 Transport Phenomena in Porous Media (3,0) 3

Emphasis on the principle of mechanics of fluid flow through a porous medium, (continuity equation, momentum equation with its extensions), heat transfer through a porous meduium (energy equation with its extensions to more complex situation), mass transfer, force convection, external natural convection, internal natural convection and mixed convection in a porious medium and their application for solving engineering problems.

MENG 561 Manufacturing Systems Engineering (3,0) 3

CAD/CAM Hardware; CAD/CAM software, Integrative manufacturing Planning and control, Group Technology, Computer Integrated manufacturing (CIM), Modeling methodologies and analysis tools for CIM, Systems analysis and design methods, Computer Assisted Systems Engineering (CASE).

MENG 562 Advanced CAD/CAM (3,0) 3

Principles of CAD, Mathematical theory of graphics, Principles of geometric modeling, Terminology of bezier curves, B splines and NURBS, Parametric representation of curves and surfaces; Principles of NC technology and its components, Adaptive control technology, Necessities and types of precise tooling in NC based manufacturing, Advanced methods for NC program of instructions, Information requirements of manufacturing, Role of group technology in CAM, Contribution of CAD/CAM and NC technology in advanced manufacturing

MENG 575 Advanced Biomechanics (3,0) 3

Introduction to mechanics and biomechanics; Static, Kinematic and Dynamic concepts for analyzing musculoskeletal joint motion; Joint mechanics; Musculoskeletal tissues and tissue modeling; Biomaterials; Joint prosthesis design and analysis; Implant materials and coating; Musculoskeletal and artificial joint contact and tribology; Software for analyzing human body joints.

MENG 544 Advanced Heat Transfer (3,0) 3
Conservation principles; mass, momentum and energy. Fluid stresses and flux laws; boundary layer theory and the integral equations of the boundary layer. Momentum and heat transfer in laminae in external and internal flow. Momentum and heat transfer in turbulent external and internal flow; natural convection.

MENG 545 Transport Phenomena (3,0) 3
Heat, mass and momentum transfer with emphasis on the analogies between them. Introduction to transport phenomena. Heat, mass and momentum diffusivities. The balance or conservation concept. One and more dimensional balance equation. Steady-state transport. Transport with a net convection flux. Fluid flows in duct. Heat and mass transfer in duct flow. Unsteady-state transport. Transport coefficient.

MENG 546 Advanced Internal Combustion Engines (3,0) 3
Review of basic principles of engine operation. Thermo-chemistry and properties of engine working fluids. Thermodynamic analysis of engine processes. Mathematical modeling and simulation of engine processes and cycles. Study of various engine schemes.

MENG 547 Energy Management and Utilization (3,0) 3
Energy consumption, conservation and resources. Energy audits, economic analysis. Management and organization of conservation programs. Analysis of thermal-fluid systems. Energy conservation in combustion systems, steam and condensate systems. Heat exchangers, heat recovery and insulation. Energy conservation in industrial system, industrial cogeneration. Power circuits, electrical machinery, electrical energy conservation. Industrial energy use profiles.

MENG 548 Power Generation Systems (3,0) 3
Thermal power plants, steam power plants, solar thermal power plants, Organic Rankine Cycle, Gas Turbines, Carbon dioxide power cycles, Diesel power plants, Other power generating systems, Economic analysis of power plants, power plant simulation and performance analysis.

MENG 582 Plastic Forming of Metals (Plasticity) (3,0) 3
Stress, Strain, Macroscopic plasticity and yield criteria, Work hardening, Plastic instability, Strain rate and temperature, Ideal work, Slab analysis, Formability, Forming limits, Advanved forming processes

MENG 583 Application of Virtual Reality (VR) in Manufacturing (3,0) 3
Design-Centered Virtual Manufacturing (VM) – part modeling, rapid prototyping, virtual assembly, and prototyping of mechanical systems. Production-Centered VM-shop floor planning, virtual manufacturing cell, virtual manufacturing process. Virtual Machining-constructing a virtual operation, process simulation and prediction, virtual numerical control. VR Instruments-hardware, software, VR programming.

MENG 584 Advanced Manufacturing Processes (3,0) 3
Advanced materials and material Technologies, Materials developed through Space Related Technologies, Advanced processes for plastic forming and casting; Precision machining-sources of error (Thermal, Static, Dynamic, Process Related), Precision machining processes, Vibration and thermal assisted machining, High-speed processing, Application of FEM in machining, Manufacturing of semiconductor devices, Electronic assembly and packaging, Rapid prototyping technologies; Manual and computer assisted part programming, Flexible manufacturing systems [FMS] and Robotics.

MENG 587 Mechanical Behavior of Materials (3, 0) 3
Elastic properties Mechanical tests Micro-plasticity of crystals and plastic deformation Grain boundaries Strain-hardening Creep Strengthening mechanisms(solute-hardening, precipitation-hardening) Fracture-brittle fracture (Griffith theory) Ductile fracture (ductile-brittle transition) Fatigue fracture.

ELECTIVE COURSES

In order to meet the compulsory two mathematics course requirement of the graduate program, the course must be selected from the following pool of courses after the approval of the concerned advisor/supervisor:

CIVL543	Finite Element Method
COMP587	Artificial Intelligence
COMP588	Computational Intelligence
EE 521	Linear System Theory
EE 571	Probability Theory & Stochastic Processes
IENG511	Optimization Theory
IENG512	Advanced Linear Programming
IENG518	Non-Linear Optimization
IENG581	Design and Analysis of Experiment
IENG583	Advanced Statistics
MATH587	Advanced Engineering Mathematics
MATH687	Advanced Methods of Applied Mathematics
MENG511	Applied Computational Methods for Engineers
MENG555	Computational Fluid Dynamics
PHYS511	Mathematical Methods for Engineers & Scientists I
PHYS611	Mathematical Methods for Engineers and Scientists II

FACULTY MEMBERS

Hasan HACISEVKI

Chair of the Department. Dr. Hacisevki received his B.S, M.S and Ph.D. degrees from Eastern Mediterranean University. Dr. Hacisevki`s research interests include Experimental studies in Fluid Dynamics, Automotive Engineering and Mechanical Design.
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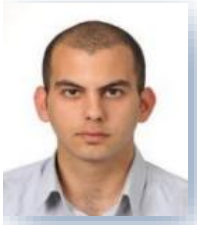

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Professor of Mechanical Engineering. Dr. Atikol is a Professor of Mechanical Engineering. He received his B.S degree from the University of Leicester and M.Sc. degree from the University of Manchester. He completed his Ph.D. in Eastern Mediterranean University. Dr. Atikol`s research interests are Energy Management, Planning and Utilization, Solar Energy and Desalination. He has been the director of EMU Energy Research Center since 2004.
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Associate Professor of Mechanical Engineering. Dr. Qasim Zeezhan received his B.E. Mechanical Degree from National University of Sciences and Technology (NUST), Pakistan. He received his MS and PhD in Flight Vehicle Design from Beihang University (BUAA), China. His research interests include Multidisciplinary Design and Optimization (MDO), Systems Engineering, Industry 4.0, Machine Learning and application of Modern Meta-Heuristic Optimization Techniques.
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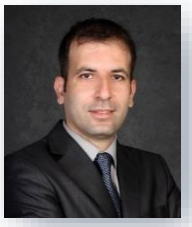

Babak SAFAEI

Assistant Professor of Mechanical Engineering. Dr. Babak Safaei received his Bachelor and Master degree in Mechanical Engineering from Iran. He received his PhD. degree in Mechanical Engineering from Department of Mechanical Engineering at Tsinghua University. His research area is Advanced Manufacturing, Computational Mechanics, Micro and Nano Mechanics, Design of Lightweight Structures, Composite Materials, Finite Element and Mesh-Free Method, Nonlocal, Mechanical Vibration and Testing.
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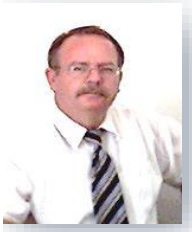

Fuat EGELİOĞLU

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Professor Emeritus of Mechanical Engineering. Prof. Sezai received his B.Sc. and M.Sc. degrees from Middle East Technical University, and second M.Sc. from UMIST, University of Manchester, UK. Furthermore, he received his Ph.D. from Eastern Mediterranean University. Prof. Sezai`s current research interests include Computational Heat and Fluid Flow, Solar Energy, Flow through Porous Media and Crystal Growth.
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RESEARCH AREAS

Energy

- Solar energy applications in buildings
- Solar air heating
- Solar water heating
- Solar desalination
- Solar energy integrated vehicles
- Energy generation systems (nuclear and fossil fuel power plants)
- Building energy performance simulation
- Thermal Energy Storage

Energy management

- Demand-side management
- Integrated resource planning
- Efficient energy utilization
- Energy demand prediction

Thermodynamics

- Advanced power cycles
- Absorption cycles
- Thermo-elasticity
- Computational heat dynamics

Fluids

- Computational fluid dynamics
- Flow simulation on unstructured grids
- Parallel programming in CFD
- Solution methods of fluid flow equations
- Two phase flows (interface tracking methods, and melting and solidification)
- Simulation of turbulent flows (RANS and LES methods)
- Nanofluids and applications

Aerodynamics

- Flow properties behind bluff bodies
- Flow interactions between different cross sections
- Analysis of aero-engine turbine blades

Automotive

- Vehicle dynamics
- Improving combustion process in I.C. engines
- Metallic and ceramic engines
- Simulation studies of different compound engine schemes
- Computer modeling of general thermodynamic systems
- Electrical Vehicle Design

Biomechanics

- Design and development of diarthrodial joint prosthesis
- 6DOF kinematic analysis of joint prosthesis
- Simulation of wear at contact point of prosthesis
- Modelling of human body joints as 6DOF unconstrained joints
- FE analysis of diarthrodial joints
- Predicting injury mechanisms of joints and tissues
- Dynamics of vehicles

Multidisciplinary Design Optimization

- Design Optimization of complex multidisciplinary systems
- Design under uncertainties
- Robust Design & Meta-Modeling
- Multi-Objective & Hybrid Optimization
- Dealing with nonlinear mechanical problems using high performance computing methods

Vibration, acoustics and vibro-acoustics

- Designing of structures
- Self-excited vibrations
- Energy harvesting by piezoelectric
- Optimum vibro-acoustics design of mechanical structures, e.g, mufflers, wind turbines, human hearing implants.

Dynamical systems and control

- Structures under impacts, e.g., airplane landing gears system
- Robotics
- Control of hybrid electric power-trains

Manufacturing systems

- Distributed control/manufacturing systems (IEC 61499)
- Wireless sensor networks and RFID applications in manufacturing
- Modeling framework for organizational competency
- Collaborative networks
- Intelligent manufacturing systems
- Development of computer aided engineering software (CASE tools)
- Process planning and scheduling integration for SMEs

Manufacturing processes

- Incremental sheet forming
- Metal spinning
- Friction stir processing
- Friction stir welding
- Hybrid welding
- High speed milling
- Water jet machining
- Laser cladding
- Analytical modelling of manufacturing processes

Material science and engineering

- Mechanical behavior of materials (fatigue, creep, fracture)
- Film formation and its characterization
- Plastic deformation and micro-structural effects
- Prediction of fracture and forming limits
- Heat treatment
- Surface alloying
- Thermo-magnetic materials and applications

CONTACT INFORMATION

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Online Application: https://www.emu.edu.tr/en/prospective-students/online-application/752

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