



TÜRKİYE BİLİMLER AKADEMİSİ
TURKISH ACADEMY OF SCIENCES



SELÇUK
ÜNİVERSİTESİ

VIII. Geleneksel / Traditional SUMMER SCHOOL YAZ OKULU

Summer School on Artificial Intelligence and Energy
Yapay Zekâ ve Enerji Yaz Okulu





VIII. Traditional Summer School • 2026

VIII. Geleneksel Yaz Okulu

Summer School on Artificial Intelligence & Energy

Yapay Zekâ ve Enerji Yaz Okulu

Turkish Academy of Sciences Publications, 2026

Türkiye Bilimler Akademisi Yayınları, 2026

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VIII. TRADITIONAL SUMMER SCHOOL · 2026

Summer School on Artificial Intelligence & Energy

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With the support of



KONYA · 23-30 AĞUSTOS 2026

FOREWORD

Artificial intelligence and energy are the two fields where the transformative power of science is most keenly felt today. They are reshaping not only the technology agenda, but the whole of social life from economic development to environmental sustainability.

The Artificial Intelligence and Energy program of the “8th Traditional Summer School” — organized in cooperation with TÜBA, TİKA, YTB, and Turkish Airlines, supported by Konya Metropolitan Municipality, Karatay Municipality, Meram Municipality, and Selçuklu Municipality, and hosted by Selçuk University in Konya on 23-30 August 2026 — offers young researchers a substantive platform precisely at this intersection.

Over the course of a week, leading scholars in their fields will cover a comprehensive curriculum: from the fundamental principles of thermodynamics to nuclear and renewable energy; from clean hydrogen and energy storage to energy policy; from artificial intelligence, digital twins and machine learning in energy systems to panels on decarbonization and the ethical use of AI.

The Summer School is more than a training programme - it is a scientific gathering built around a shared vision of the future.

I extend my thanks to our partner institutions, our supporting municipalities, our esteemed lecturers, and the administration of Selçuk University, and wish all participants a productive summer school.

Prof. Dr. Muzaffer ŞEKER
President of TÜBA

SUMMER SCHOOL PROGRAMME

Monday, August 24 / 24 Ağustos, Pazartesi

- 09:00-09:40** **Opening Remarks / Açılış Konuşmaları**
- 09:50-10:30** **Prof. Dr. Taylan Yetkin**
Physics of Energy
- 10:40-11:20** **Prof. Dr. İbrahim Dinçer**
Fundamental Principles and Concepts in Thermodynamics
- 11:30-12:10** **Prof. Dr. Arif Hepbaşlı**
Energy Policies and Strategies
- 12:10-13:30** **Lunch Break/ Öğle Arası**
- 13.30-14:10** **Prof. Dr. Mehmet Emin Aydın**
Environment and Sustainability Dimensions of Energy
- 14:20-15:00** **Prof. Dr. Esra Kabaklarlı**
Economic and Social Dimensions of Energy
- 15:10-15:50** **Prof. Dr. Mehmet Aktan**
Energy Logistics and Economic Development
- 16:00-17:30** **Panel: “Decarbonization & Sustainable Development”**
Moderator: Prof. Dr. İbrahim Dinçer,
Panelists: Prof. Dr. Mehmet Emin Aydın, Prof. Dr. Arif Hepbaşlı,
Prof. Dr. Aysel Kanturk Figen,
Prof. Dr. Taylan Yetkin
- 19.00-21.00** **Dinner / Akşam Yemeği**
Konya Metropolitan Municipality – Akyokuş Facilities

Tuesday, August 25 / 25 Ağustos, Salı

- 09:00-09:40** **Prof. Dr. Arif Hepbaşlı**
Renewable and District Energy Systems
- 09:50-10:30** **Prof. Dr. Taylan Yetkin**
Nuclear Energy
- 10:40-11:20** **Prof. Dr. İbrahim Dinçer**
Clean Energy and Clean Hydrogen
- 11:30-12:10** **Asst. Prof. Dr. Engin Eşme**
Electrolyzers and Fuel Cells
- 12:10-13:30** **Lunch Break / Öğle Arası**
- 13.30-14:10** **Asst. Prof. Dr. Engin Eşme**
Electrolyzers and Fuel Cells
- 14:20-15:00** **Asst. Prof. Dr. Şenol Pişkin**
Digital Twins in Energy Systems
- 15:10-15:50** **Asst. Prof. Dr. Şenol Pişkin**
Machine and Deep Learning in Energy Systems
- 16:00-16:40** **Asst. Prof. Dr. Alper Kılıç**
Internet of Things in Energy Systems
- 16:50-17:30** **Prof. Dr. Taylan Yetkin**
Physics-Informed Machine Learning for Energy Applications
- 19.00-21.00** **Dinner / Akşam Yemeği**
Selçuklu Municipality – Municipal Social Facility

Wednesday, August 26 / 26 Ağustos, Çarşamba

- 09:00-09:40** **Prof. Dr. Arif Hepbaşlı**
Energy Conservation and Efficiency Aspects
- 09:50-10:30** **Prof. Dr. Can Özgür Çolpan**
Energy Storage Systems and Applications

- 10:40-11:20 Prof. Dr. Mustafa Ersöz**
Waste to Energy Conversion
- 11:30-12:10 Prof. Dr. Can Özgür Çolpan**
Sustainable Transportation Systems
- 12:10-13:30 Lunch Break / Öğle Arası**
- 13.30-14:10 Prof. Dr. Halit Yanıkkaya**
Economic and Social Dimensions of Artificial Intelligence Technologies
- 14:20-15:00 Prof. Dr. Fatma Bedük**
Smart Cities and Sustainable Development
- 15:10-15:50 Prof. Dr. Can Özgür Çolpan**
Energy Analysis, Modeling and Simulation Packages
- 16:00-16:40 Prof. Dr. Aysel Kantürk Figen**
Sustainable Fuels
- 16:50-17:30 Prof. Dr. İbrahim Dinçer**
(with assistance of Asst. Prof. Dr. Fatih Sorgulu)
Practice Session on Energy Problems
- 19.00-21.00 Dinner & Turkish Sufi Music Concert with Ahmet Çalışır /**
Ahmet Çalışır ile Akşam Yemeği ve Türk Tasavvuf Müziği Konseri
Karatay Municipality – Aziziye Cultural Center

Thursday, August 27 / 27 Ağustos, Perşembe

- 09:00-09:40 Prof. Dr. Aysel Kantürk Figen**
Rare and Energy Materials
- 09:50-10:30 Prof. Dr. Hüseyin Bekir Yıldız**
Bioenergy Systems and Applications
- 10:40-12:10 Panel: “AI and Its Ethical Use in Energy Applications”**
Moderator: Prof. Dr. Halit Yanıkkaya
Panelists: Prof. Dr. Mehmet Aktan, Prof. Dr. Can Özgür Çolpan,
Asst. Prof. Dr. Engin Eşme, Asst. Prof. Dr. Alper Kılıç,
Asst. Prof. Dr. Şenol Pişkin

- 12:10-13:30** **Lunch Break / Öğle Arası**
- 13.30-17:30** **Trip / Gezi**
Konya Science Center & Butterfly Valley
- 19.00-21.00** **Dinner / Akşam Yemeği**
Meram Municipality – Selçuk University Student Dormitory

Friday, August 28 / 28 Ağustos, Cuma

- 09:00-09:40** **Prof. Dr. Yusuf Sinan Akgül**
Computer Vision in Energy Systems
- 09:50-10:30** **Asst. Prof. Dr. Abdulkadir Taşdelen**
From Green Software to Green AI: Building Energy-Efficient
and Sustainable AI Systems
- 10:40-11:20** **Assoc. Prof. Dr. Mürsel Doğrul**
Energy Security in the times of Polycrisis
- 11:30-12:10** **Closing Remarks / Kapanış Konuşması**
- 12:10-13:30** **Lunch Break / Öğle Arası**
- 14.00-18:00** **Trip / Gezi**
Sille Antique City
- 19.00-21.00** **Closing Dinner / Kapanış Yemeği**
TÜBA – Selçuk University

Saturday, August 29 / 29 Ağustos, Cumartesi

- 09:00-13:30** **Trip / Gezi**
City Center

SPEAKERS

In alphabetical order by title and name.



Prof. Dr. Arif Hepbaşlı

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Born in İzmir in 1958, Dr. Arif Hepbaşlı has dedicated his career to the field of energy. His academic journey began in 1982 with simultaneous graduate studies and a Research Assistant role, followed by a decade of professional engagement in İzmir's industrial sector, where his work primarily addressed energy-related challenges. Returning to academia, he contributed to different universities in Türkiye and abroad. Since 2012, he has served at Yaşar University, founding the Department of Energy Systems Engineering and shaping it into a leading program. His research spans energy and exergy analyses/assessments, energy/exergy management, sustainable cities, building performance, ground-source heat pumps, renewable energy, and sustainable energy technologies. Dr. Hepbaşlı holds credentials as a Certified Industrial Energy Manager in Türkiye, along with an ISO/IEC 17024 VET-Trainer Certificate. Dr. Hepbaşlı has authored or co-authored over 750 papers. He has written books and chapters, consulted for industry, and serves on advisory boards of prestigious journals while he is invited as a distinguished speaker at international conferences, symposia, and panels. He was elected Principal Member of TÜBA in 2019 and later Honorary Member in 2026, and has contributed actively to TÜBA's Energy Working Group since 2017.



Prof. Dr. Aysel Kantürk Figen

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Dr. Aysel Kantürk Figen was born in Tolbuhin, Bulgaria, in 1980. She received her BSc degree in Chemical Engineering from Ankara University and subsequently completed her MSc and PhD degrees at Yıldız Technical University (YTU) in 2006 and 2011, respectively. Her doctoral research focused on hydrogen energy storage technologies. She began her academic career in 2005 as a research assistant in the Department of Chemical Engineering at YTU and was awarded the title of professor in 2020.

Her principal research interests encompass hydrogen production and storage, advanced catalyst development, and the design and application of catalytic systems for sustainable and clean energy technologies. In addition to her academic and research activities, she has undertaken several administrative and professional responsibilities. She served as Vice Coordinator of the YTU Science and Technology Application and Research Center between 2020 and 2021 and as Head of the Department of Chemical Engineering from 2021 to 2022. Since August 2022, she has served as the founding director of the YTU Clean Energy Technologies Institute. She has also contributed to the preparation of Türkiye's Carbon Capture, Utilization and Storage Technologies Roadmap.

In 2020, she received the TÜBA Outstanding Young Scientist Award in Engineering and became a member of the Young TÜBA Academy.



Prof. Dr. Can Özgür Çolpan

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Prof. Can Özgür Çolpan is a Full Professor and Vice-Dean of the Faculty of Engineering at Dokuz Eylül University in İzmir, Türkiye. He specializes in fuel cells, hydrogen technologies, and mathematical modeling of integrated energy systems. His research covers PEM and solid oxide fuel cells, electrolyzers, green hydrogen production, membrane reactors, power-to-gas systems, and fuel cell vehicle powertrains. He has co-authored over 200 scientific publications (98+ SCI journal articles, 13 edited books, 15 book chapters) with 5,100+ citations and an h-index of 40 (Google Scholar). He serves as Board Member of the Turkish Hydrogen Technologies Association, a member of the Energy Working Group of the Turkish Academy of Sciences (TÜBA), and as Assistant Subject Editor of the International Journal of Hydrogen Energy. He is the recipient of the Turkish Academy of Sciences Outstanding Young Scientist Award (TÜBA-GEBİP, 2019) and the METU Prof. Dr. Mustafa N. Parlar Foundation Research Encouragement Award (2019).



Prof. Dr. Esra Kabaklarlı

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Prof. Dr. Esra Kabaklarlı is a faculty member in the Department of Economics at Selçuk University, Türkiye. Her research focuses on economic growth, development economics, labour economics, sustainability, green finance, sustainable finance, Green FinTech, and climate-related economic policies. She has published numerous studies on economic development, infrastructure, technology, renewable energy, environmental sustainability, and financial innovation. Her recent research particularly investigates the role of Green FinTech and sustainable financial systems in supporting the green transition, energy transformation, and climate goals. In addition to her contributions to economics and sustainability research, she actively participates in interdisciplinary studies examining the socioeconomic implications of emerging technologies, artificial intelligence, and innovation-driven development. Through her academic work, she seeks to contribute to evidence-based policymaking for inclusive, resilient, and sustainable economic development.



Prof. Dr. Fatma Bedük

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Fatma Bedük graduated from Selçuk University, Department of Environmental Engineering, in 1999 and received her Ph.D. degree in the same department in 2010 in the field of Advanced Oxidation Processes (AOPs). She began her academic career in 2003 as a Research Assistant and was promoted to Associate Professor in 2017 and to Professor in 2023. Since 2010, she has been serving as a faculty member at Necmettin Erbakan University, Faculty of Engineering, Department of Environmental Engineering. She teaches undergraduate courses such as Introduction to Environmental Engineering, Soil Pollution and Control, Water Quality and Control, Wastewater Treatment, and Drinking Water Treatment, as well as graduate courses including Fate and Transport of Pollutants in the Environment, Advanced Oxidation Processes, and Climate Change and Environmental Impacts. Her research interests focus on monitoring and analysis of pollutants in the environment, advanced oxidation processes, water and wastewater treatment processes, and ecotoxicity. She has published 22 international journal articles, 41 international conference papers, 7 national conference papers, and 7 international book chapters. Since 2011, she has also been serving as a Lead Auditor at the Turkish Accreditation Agency, which is responsible for accrediting environmental analysis laboratories in Türkiye.



Prof. Dr. Halit Yanikkaya

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Prof. Dr. Halit Yanikkaya earned his Ph.D. in Economics from the University of Delaware, USA, and currently serves as a full professor of Economics at Gebze Technical University, Türkiye. With over two decades of academic experience, his research spans international economics, global value chains, economic growth and development, and institutional economics. His research has been published in distinguished, internationally respected peer-reviewed journals, including the Journal of Development Economics, World Development, Land Economics, Economic Modelling, World Trade Review, Review of World Economics, and the Pacific-Basin Finance Journal. He is also the author of four books and has contributed numerous chapters to edited volumes. Prof. Yanikkaya's research agenda ranges from the long-run macroeconomic consequences of IMF and World Bank lending to international trade and global value chains, and from economic growth and productivity to innovation, artificial intelligence, and climate economics. His recent work particularly examines how global value chains affect economic and technological upgrading, sectoral growth, productivity, innovation systems, and greenhouse gas emissions, alongside the evolving role of artificial intelligence in global production systems. He received the Turkish Academy of Sciences Outstanding Young Scientist Award in 2007 and was elected an Associate Member of the Turkish Academy of Sciences in 2015, in addition to receiving multiple Best Paper Awards at international conferences. He has served as principal investigator, coordinator, and researcher on numerous national and international research projects, including two supported under the European Union's Horizon programmes. He sits on the editorial boards of several scholarly journals, regularly referees for leading economics publications, and is a member of the Turkish Economic Association, the Canadian Economic Association, the Eastern Economic Association, and the European Economic Association.



Prof. Dr. Hüseyin Bekir Yıldız

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Prof. Dr. Hüseyin Bekir Yıldız is a Professor in the Department of Electrical and Electronics Engineering at KTO Karatay University, Türkiye. He received his B.Sc., M.Sc., and Ph.D. degrees in Chemistry from Middle East Technical University (METU). Throughout his academic career, he has conducted research at internationally renowned institutions, including The Hebrew University of Jerusalem, the University of California Berkeley, Lund University, Linköping University, EPFL, Newcastle University, Ruhr University Bochum, and the Max Planck Institute. His research focuses on biological photovoltaics, solar energy conversion, hydrogen generation, photoelectrochemistry, biosensors, conductive polymers, nanomaterials, and sustainable bioenergy technologies. He has pioneered the development of living biophotovoltaic systems capable of simultaneously producing electricity and hydrogen using cyanobacteria, green algae, thylakoid membranes, and marine microalgae. Prof. Yıldız has authored more than 80 SCI-indexed publications, holds several international patents granted in the United States, Europe, China, Australia, and Türkiye, and has supervised numerous national and international research projects. His innovative work has received multiple prestigious awards, including TEKNOFEST, TET Project Marketplace, and TÜBİTAK-funded projects. His current research integrates advanced functional materials with living photosynthetic microorganisms to develop next-generation renewable energy and environmental sensing technologies.



Prof. Dr. İbrahim Dinçer

Chair, Energy Working Group in Turkish Academy of Sciences

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Dr. İbrahim Dincer has carried out pioneering works in the area of clean energy technologies and been recognized as one of the leading researchers in the field. He has authored/co-authored many books and book chapters, along with many refereed journal and conference papers. Dr. Dincer is an active member of various international scientific organizations and societies and currently serves as President for Hydrogen Technologies Association. He also serves as editor-in-chief, associate editor, regional editor, and editorial board member on various prestigious international journals. Dr. Dincer is a recipient of several research, teaching and service awards, including the Premier's research excellence award in Ontario, Canada.



Prof. Dr. Mehmet Aktan

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Professor Aktan completed his undergraduate education at Boğaziçi University, Department of Industrial Engineering. He received his master's and doctoral degrees in industrial engineering from University of Iowa and University of Wisconsin-Madison, respectively. He conducted postdoctoral research at Penn State University as a member of an NSF project. He worked as a faculty member at Atatürk University, Department of Industrial Engineering. He is currently working as a professor in the Industrial Engineering Department, Necmettin Erbakan University.

Professor Aktan's research interests are productivity, quality improvement, statistical methods and financial engineering. He is the author of many scientific articles and books in his research areas. He worked as an academic consultant at Konya Model Factory, and as a mentor in the Innopark SMEMentor BIGG+ program, related with productivity and competitiveness improvement activities of SMEs.



Prof. Dr. Mehmet Emin Aydın

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Mehmet Emin Aydın studied Civil Engineering at Selçuk University in Konya, Türkiye, and received his PhD in 1993 in Drinking Water Treatment from the Civil Engineering Department of Loughborough University of Technology, England. He was appointed Associate Professor of Environmental Engineering at Selçuk University in 1997. Since 2003, he has served as a full Professor of Environmental Engineering, initially at Selçuk University and, since 2012, at Necmettin Erbakan University in Konya, Türkiye. He has been a full Professor in the Civil Engineering Department at Necmettin Erbakan University since 2018.

His teaching and research interests cover water supply, wastewater disposal, water pollution, water and wastewater treatment, ecotoxicology, and the presence of PAHs, PCBs, pesticides, pharmaceuticals, and illicit drugs in the environment.

Prof. Dr. Aydın has published 235 papers in international peer-reviewed journals and conference proceedings, delivered 82 presentations at national symposiums, and contributed 29 chapters to international books. He has also served as editor or co-editor of 17 books.



Prof. Dr. Mustafa Ersöz

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Prof. Dr. Mustafa Ersöz received his Ph.D. degree in Chemistry from the University of Glasgow, UK, in 1994. He conducted postdoctoral research at the GKSS Research Centre (Germany) in 1997 and was a Visiting Scientist at the Department of Chemistry, University of Hull, UK (2001–2002). He has been a Professor of Physical Chemistry at Selçuk University since 2004. His scientific achievements have been recognised through several awards, including the TÜBİTAK Junior Scientist Award in Natural Sciences (1998).

Throughout his academic career, Prof. Ersöz has undertaken various leadership and administrative responsibilities, including Vice Rector responsible for Research and Development at Selçuk University, Dean of the Faculty of Science, and Founder and Director of the Advanced Technology Research and Application Center. He has also contributed to the development of research infrastructures and innovation ecosystems through major national initiatives, including the establishment of R&D infrastructure at Selçuk University, scientific human resources development programmes, and the establishment of the Konya Science Center. He coordinated the joint Ph.D. programme on liquid/liquid interfaces with the Laboratory of Physical and Analytical Electrochemistry (EPFL), Switzerland.

Prof. Ersöz has extensive experience in international research collaborations, particularly within European Framework Programmes. He has coordinated and contributed to several Horizon Europe, H2020, FP7, and COST projects, including Green-Mem (MSCA-SE), EngSurf-Twin (H2020), Waste2Fresh (H2020), Bio-Acouis (MSCA-SE), Regeneu (Horizon Europe), and several FP7 projects including LAMAND, ChitoClean, EU-SOLARIS, and LignoFood. He has also served as a COST Scientific Committee Member (2015–2021) and Vice-Chair of the COST Scientific Committee (2017–2019), contributing to the strategic development of European research networks.

He is a Full Member of the Turkish Academy of Sciences (TÜBA) and served on its Academic Council (2018–2024). His research focuses on physical chemistry, membrane science and technology, nanostructured materials, surface chemistry, electrochemistry, photocatalysis, and sustainable energy and environmental applications. His research has resulted in more than 160 scientific publications in international peer-reviewed journals, including invited contributions, and he has authored scientific book chapters and review articles in the fields of membranes, interfaces, nanomaterials, and environmental technologies.



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Prof. Dr. Taylan Yetkin is a faculty member in the Department of Basic Sciences at Istinye University. He received his Ph.D. in Physics from ukurova University, following his M.Sc. and B.Sc. degrees in Physics from Mersin University. His academic career includes appointments at Yıldız Technical University, Mimar Sinan Fine Arts University, the University of Iowa, CERN, and Fermilab. His research focuses on experimental particle and nuclear physics, detector systems, calorimetry, radiation detection, silicon photomultipliers, medical imaging technologies, and data analysis methods. He has contributed to the CERN CMS Experiment since 2003 and has held coordination and service roles in CMS HCAL operations, integration, commissioning, and upgrade activities. He has taken part in national and international research projects supported by TÜBİTAK, TENMAK, TÜSEB, and university research programs. He currently serves as Türkiye's representative to the CERN Knowledge Transfer Forum and as a Board Member of the Turkish Accelerator and Radiation Laboratory. He previously served as a member of the Presidential Science, Technology and Innovation Policy Council Working Group on Next-Generation Nuclear Technologies.



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Yusuf Sinan Akgül is a Professor of Computer Engineering at Gebze Technical University (GTÜ), Türkiye, where he also served as Dean of the Faculty of Engineering (2022–2026). He holds a Ph.D. from the University of Delaware and previously worked as a Senior R&D Engineer at Cognex Corporation in the United States, developing machine vision systems for industrial quality control. His research spans computer vision, medical image analysis, deep learning, and rehabilitation technology, and he is a founding partner of BeCure Global, a company building AI-based virtual reality solutions for physical and cognitive rehabilitation. He has authored over 100 international journal and conference papers and holds several patents in computer vision and biometrics.



Assoc. Prof. Dr. Mürsel Doğrul

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Associate Professor Dr Mürsel Doğrul is a faculty member at the National Defence University, specialising in security studies, international relations theory and Asia-Pacific geopolitics. His scholarly work focuses on the decision-making dynamics of Japanese foreign policy, the political economy of Japan's energy security strategies and the structural dimensions of regional strategic competition. For his master's and doctoral research, he examined Japan's counterterrorism approach and the political economy of its energy policies. As a postdoctoral researcher at Meiji University and the University of Tokyo in Japan, Dr. Doğrul conducted fieldwork and archival research. Alongside his teaching duties at the National Defence University, he provides expert-level training in security studies, energy policy and global risk analysis at various international institutions. His primary research interests include international security, economic security, critical security studies and science diplomacy. Since 2019, he has represented the Turkish Young Academy on national and international platforms. As a member of the Turkish Academy of Sciences (TÜBA) International Relations Working Group, he actively contributes to the science diplomacy ecosystem. He also represents Türkiye in several global networks, including the International Science Council (ISC), the All European Academies (ALLEA), the InterAcademy Partnership (IAP) and the Global Young Academy (GYA). He was elected President of the Turkish Young Academy by the TÜBA Academy Council in November 2025.



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Dr. Abdulkadir TAŞDELEN received his Ph.D. in Computer Engineering from the Institute of Natural and Applied Sciences at Ankara Yıldırım Beyazıt University. He has authored numerous publications in the fields of computer science and bioinformatics. His research primarily focuses on artificial intelligence and deep learning applications, particularly in areas such as pre-miRNA classification and COVID-19 analysis. In addition, he has presented his work at various international conferences and contributed to several funded research projects. His recent studies also explore blockchain technologies and green computing. Dr. TAŞDELEN has previously worked as a postdoctoral researcher at the Faculty of Engineering, International Islamic University Malaysia (IIUM). Alongside his academic career, he has held various administrative positions, including serving as the Deputy Dean of the Faculty of Engineering and Natural Sciences at Ankara Yıldırım Beyazıt University. He has also worked as an advisor at the Council of Higher Education (YÖK) and continues to serve as an advisor to the Turkish Academy of Sciences (TÜBA).



Asst. Prof. Dr. Alper Kılıç

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Alper Kılıç, Ph.D., is the Director of the Defense, Space and Aviation Technologies Application and Research Center at Konya Technical University and a faculty member in the Department of Computer Engineering, Faculty of Computer and Information Sciences. He began his academic career at Firat University in 2000 and subsequently worked at Middle East Technical University from 2003 to 2012 and Selçuk University from 2012 to 2018. Since 2018, he has continued his academic and research activities at Konya Technical University. His research interests include mission-critical systems software, distributed systems, Edge AI, Cyber Security, and the Internet of Things (IoT). He has participated as a researcher and project leader in numerous R&D projects conducted with industrial partners, particularly in the defense sector. His current academic research focuses on the role of IoT systems within the artificial intelligence ecosystem, with particular emphasis on distributed intelligence, edge data processing, and reliable intelligent system architectures.



Asst. Prof. Dr. Engin Eşme

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Dr. Engin Eşme serves in the Software Engineering Department at Konya Technical University, where he has also held administrative roles as Department Chair and within the AI Application and Research Center. He has successfully completed his postdoctoral research at the University of the West of England.

His primary research areas include artificial intelligence, deep learning, continual learning architectures, and machine learning optimization strategies. His studies specifically focus on feature extraction in sensor-based datasets, sensor fusion, image classification, and ensemble deep learning approaches. The data-driven and innovative algorithms he develops provide high accuracy across a broad range of applications, including signal processing, security, and smart system designs. His ongoing research is heavily centered on developing adaptive systems that enable deep learning models to dynamically adjust to shifting data distributions without catastrophic forgetting.



Asst. Prof. Dr. Şenol Pişkin

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Dr. Şenol Pişkin is an academic leader and researcher at Istinye University's Faculty of Engineering and Natural Sciences in Istanbul, Türkiye. As a Marie Skłodowska-Curie Fellow and the Co-founder of the innovative healthcare IT startup Hemodyn, Dr. Şenol Pişkin has established a strong expertise for bridging the gap between advanced academic research and practical industry applications. Dr. Şenol Pişkin also leads the CARE Labs Modeling, Simulation, and Extended Reality Research Group, which successfully operates as the ISU XR Lab and Human Computer Interaction Lab. Throughout his career, Dr. Pişkin has run many national and international grants, securing critical funding for multidisciplinary research initiatives. His extensive research portfolio focuses on computational modeling, biomechanics, digital twins, robotics, wearable devices and artificial intelligence. Utilizing machine learning, deep learning, computer vision, and high-performance computing, Dr. Pişkin addresses complex challenges across clinical image processing, cardiovascular fluid dynamics, and energy system optimization. Furthermore, Dr. Pişkin develops advanced applications that combine immersive technologies, including Extended Reality (XR), haptic devices, and robotics, pushing the boundaries of what is possible in both medical and engineering domains. His recent work emphasizes integrating digital twins and predictive AI models to accurately simulate, monitor, and optimize physical assets and energy consumption in real-world scenarios. Collaborating closely with a diverse network of engineering professionals, clinical specialists, and game designers, Dr. Pişkin bridges advanced computational methodologies with real-world technological, medical, and sustainable frameworks. His dedication to innovation continues to drive significant advancements in translational healthcare technologies and sustainable energy efficiency solutions.



Ahmet alıřır

Turkish Sufi Music Artist

www.ahmetcalisir.com

Ahmet alıřır, born on December 18, 1966, is a distinguished Turkish musician who has devoted many years to Turkish Sufi music, Mevlevi culture, and Classical Turkish Music. His artistic journey began with Qur'an memorization training between 1977 and 1980. He graduated from Konya Imam Hatip High School and subsequently completed his undergraduate studies in Music Education at Seluk University Faculty of Education. He also earned a master's degree in Sociology at Seluk University.

alıřır began his professional career as a muezzin at Konya Selimiye Mosque in 1988. In 1991, he joined the Konya Turkish Sufi Music Ensemble of the Ministry of Culture and Tourism as a vocal artist. In 1996, he became the ensemble's General Artistic Director. In 1998, he continued his artistic career as a vocal artist with the Istanbul State Turkish Music Ensemble. From 2014 onward, he served as Deputy General Artistic Director of the Konya Turkish Sufi Music Ensemble. Since 2023, he has served as Head of the Department of Culture, Arts and Social Affairs of Konya Metropolitan Municipality.

As a composer, alıřır has produced numerous works in forms including Mevlevi ayins, ilahis, tevsihis, salat u selams, peřrevs, saz semais, nefes and classical songs. His compositions include works in various makam traditions such as Hicazkâr, Hisarbuselik, řivenüma, řevkefza, Kürdilihicazkâr and Neveser.

Throughout his career, he has participated in concerts, festivals and cultural programs in numerous countries, including the United States, Germany, France, Japan, Australia, India, Pakistan, China, the United Kingdom, Spain, Italy, the Vatican and Canada. Through these international engagements, he has contributed to the promotion of Turkish Sufi music and Mevlevi culture worldwide.

alıřır has also contributed to cultural and artistic activities through MUSEMMA, an organization dedicated to music, Sema and Mevlevi culture. He has been honored with honorary membership by MUSIAD. He won first place in Qur'an recitation competitions in 1985, 1986 and 1987, and was named "Cultural and Artistic Figure of the Year in Konya" by MUSIAD in 1996.

COURSE ABSTRACTS

Physics of Energy

Prof. Dr. Taylan Yetkin

Abstract

This lecture introduces the physical constraints that shape every energy technology before economics, policy, or optimization enter the discussion. Starting from the question “If energy is conserved, why do we have an energy problem?”, we will distinguish energy, power, useful work, efficiency, capacity factor, energy density, and storage. The central idea is that energy quantity alone is not enough: useful energy depends on gradients, rates, conversion pathways, entropy production, materials, time scales, and controllability. Through order-of-magnitude estimates and simple physical models, participants will learn how to compare energy sources and technologies using common axes rather than isolated claims. The lecture will connect heat engines, renewable flows, batteries, fuels, and electricity demand into a unified source-to-service picture. The goal is to give participants a physics-based language for evaluating energy systems and for understanding where artificial intelligence can help manage complexity, and where it cannot remove physical limits.

Keywords

Energy conversion and useful work, thermodynamic efficiency, entropy production, energy density and storage, order-of-magnitude estimation

Fundamental Principles and Concepts in Thermodynamics

Prof. Dr. İbrahim Dincer

Abstract

Whenever we need to design, analyse, evaluate, improve and optimize energy systems and manage their applications and operations, thermodynamics is badly needed as a key prerequisite. That's why it is recognized as a core course in many engineering disciplines. The fundamental principles and concepts of thermodynamics are required for educating and training engineers, technologists, researchers and scientists to be tomorrow's experts for better design, analyze, evaluate, improve and optimize energy systems for more efficient and effective operation and management. In this regard, there are two critical laws of thermodynamics playing constitutional roles in it, such as first law of thermodynamics (leading to conservation of energy principle) and second law of thermodynamics (leading to non-conservation of exergy principle). In this particular lecture, the fundamental principles and concepts in thermodynamics will be introduced; both first and second laws of thermodynamics will be discussed; the specific balance equations for mass, energy, entropy and exergy will be written in system analysis; and both energy and exergy efficiencies along with other energetic and exergetic performance criteria will be defined to show how to assess the energy systems and their specific performance. In this regard, numerous systems and system components will be considered for analysis and assessment.

Keywords

First and second laws of thermodynamics, energy and exergy analysis, balance equations for mass, energy, entropy and exergy, energetic and exergetic efficiency, energy system assessment

Energy Policies and Strategies

Prof. Dr. Arif Hepbaşlı

Abstract

Energy policies and strategies are central to modern life. They affect how stable economies are, how well we protect the environment, and how fairly resources are shared. With global challenges growing-such as climate change and political tensions-the need for clear and forward-thinking energy planning is more important than ever. This lecture addresses the critical role of energy governance in shaping sustainable development, economic resilience, and social equity. It explores the historical evolution of energy policy from the oil crises of the 1970s to contemporary climate agreements, highlighting lessons learned in diversification, cooperation, and innovation. Core dimensions-security of supply, sustainability, affordability, and technological advancement-are examined through comparative case studies. Special emphasis is placed on policy instruments such as regulatory frameworks, carbon pricing, and ISO 50001 energy management systems, alongside the emerging influence of digitalization and artificial intelligence in optimizing energy systems. By integrating historical insights, policy analysis, and forward-looking strategies, the presentation aims to foster a holistic understanding of how coherent energy policies can drive sustainable development and resilience in an increasingly interconnected world. To consolidate this understanding, multi-choice study questions are treated as an essential component of the lecture. They not only reinforce factual knowledge but also sharpen analytical skills, encourage reflection on historical lessons, and highlight the transformative role of emerging technologies. By engaging with these structured questions, students strengthen their ability to connect theory with practice in energy governance.

Keywords

Energy governance, security of supply and affordability, carbon pricing and regulatory frameworks, ISO 50001 energy management systems, digitalization in energy policy

Environment and Sustainability Dimensions of Energy

Prof. Dr. Mehmet Emin Aydın

Abstract

This presentation examines the environmental and sustainability dimensions of global energy production and consumption. It begins by framing the conceptual relationship between energy and sustainability, defining energy as the capacity to perform work and sustainability as meeting present needs without compromising future generations' ability to meet their own. Building on this foundation, the work systematically evaluates the environmental impact of major energy sources, including coal, oil, natural gas, nuclear, hydro, wind, solar, geothermal, and biomass in terms of CO₂ emissions, land use, water consumption, biodiversity impact, and hazardous waste generation, drawing on IEA and IRENA data. Türkiye's 2025 electricity generation mix is presented as a case example, showing a near-even split between renewable (~51.6%) and fossil (~48.4%) sources.

The second part of the presentation shifts to climate change, reviewing key indicators (global temperature rise, sea-level rise, polar ice loss, ocean acidification), the global carbon cycle, and the historical CO₂-temperature relationship over 800,000 years. It presents Representative Concentration Pathway (RCP) scenarios to illustrate projected radiative forcing, atmospheric CO₂ concentrations, and temperature outcomes through 2100, alongside data on methane emissions, NOAA's Annual Greenhouse Gas Index, and soil degradation as a significant carbon source. The discussion extends to planetary boundaries and climate tipping points, referencing Earth-system resilience research.

In conclusion it is suggested that fossil fuel dependence, land-use change, pollution, and climate change are progressing rapidly, straining planetary boundaries and weakening ecosystem services. The following steps should be taken in order to keep climate change in moderate range: Transition to renewable energy with net-zero greenhouse gas emissions by 2050, protection of agricultural land through sustainable practices, a shift from linear to circular economic models with zero-waste principles, improved efficiency and cost reduction in renewable technologies, expanded energy storage solutions, smart grid deployment, and strengthened international cooperation to address global energy challenges.

Keywords

Energy sustainability, greenhouse gas emissions, climate change, renewable energy, carbon budget, planetary boundaries

Economic and Social Dimensions of Energy

Prof. Dr. Esra Kabaklarlı

Abstract

Energy is a fundamental driver of economic development, social welfare, and technological progress. This presentation examines the economic and social dimensions of energy systems and evaluates their implications for sustainable development. The discussion focuses on how energy availability, affordability, and security influence economic growth, productivity, employment, and competitiveness. Particular attention is given to decarbonization processes and the transition toward renewable and low-carbon energy systems. The presentation also highlights the growing role of sustainable finance and Green FinTech in mobilizing investments for renewable energy projects, energy efficiency initiatives, and clean technologies. Financial innovation and digital technologies are increasingly contributing to sustainable energy transitions by supporting efficient allocation of resources and green investment strategies. Furthermore, the social dimensions of energy transitions, including energy poverty, inequality, environmental sustainability, and regional development disparities, are examined from a policy perspective. The session concludes with an assessment of how artificial intelligence, digitalization, and innovation can support sustainable energy management and long-term economic resilience. .

Keywords

Energy economics, energy poverty and inequality, sustainable finance and Green FinTech, decarbonization and energy transition, economic resilience

Energy Logistics and Economic Development

Prof. Dr. Mehmet Aktan

Abstract

Energy logistics is witnessing a paradigm shift fueled by technological advancements, evolving consumer preferences, and robust demand across diverse industrial sectors. In today's dynamic global economy, Energy logistics has transformed from a supporting industry into a central pillar of innovation and economic influence. Increasing digitization, environmental awareness, and performance optimization are driving this transformation. From healthcare and automotive to electronics, packaging, and construction, the applications of energy logistics have become global, making it an essential contributor to industrial competitiveness and consumer value.

Integration of digital technologies like IoT, AI, machine learning, and blockchain is revolutionizing how products and services are developed, distributed, and consumed within the energy logistics domain. As industries aim to reduce inefficiencies while improving service delivery, energy logistics solutions offer a strategic pathway to achieving these goals. This expanding ecosystem presents substantial growth opportunities, especially for players that embrace agile business models, strategic collaborations, and sustainability-focused innovations.

The growing need for resilient, adaptive, and scalable solutions has made the energy logistics attractive to investors seeking long-term value creation. Over the next decade, the market is expected to experience exponential growth characterized by accelerated product development cycles and regional expansions.

Keywords

*Green AI, Green Software Engineering, Sustainability,
Energy Efficiency, AI Lifecycle*

Renewable and District Energy Systems

Prof. Dr. Arif Hepbaşlı

Abstract

Energy systems are at the heart of the global transition toward sustainability, requiring innovative approaches that combine renewable sources with efficient infrastructure. This lecture introduces how renewable energy sources can be integrated into centralized heating and cooling networks to support sustainable urban transitions. It highlights optimization strategies for district energy systems, electrification pathways for multi-energy networks, and hybrid co-simulation approaches that improve renewable and thermal storage integration. Advanced concepts such as fifth-generation district heating and cooling are introduced, emphasizing digital system optimization and life-cycle perspectives. The session also reviews long-term decarbonization trajectories and examines some case studies to illustrate diverse policy frameworks and practical applications. Key challenges-including intermittency, infrastructure costs, and regulatory barriers-are discussed alongside opportunities in artificial intelligence, smart grids, and energy storage. The lecture concludes by outlining pathways toward net-zero energy systems, showing how district energy can balance efficiency, sustainability, and security in the clean energy transition. Finally, study questions are provided to encourage reflection, discussion, and deeper understanding of the material.

Keywords

District heating and cooling, renewable energy integration, thermal energy storage, smart grids and system optimization, net zero pathways

Nuclear Energy

Prof. Dr. Taylan Yetkin

Abstract

This lecture examines nuclear energy as a case study in extreme energy density, controlled energy release, and system-level responsibility. We begin with the question: how can a small amount of nuclear fuel contain energy comparable to enormous quantities of chemical fuel, and why does that not make nuclear energy simple? The lecture explains fission through nuclear binding energy, mass defect, and the characteristic energy scale of about 200 MeV per fission. It then connects microscopic nuclear events to macroscopic reactor power through neutron multiplication, criticality, moderation, delayed neutrons, feedback, heat removal, shielding, and containment. Rather than treating nuclear energy only as a technical or political issue, the lecture frames it as a physical system where energy density solves some constraints while intensifying others, including cooling, safety, waste, regulation, and long-term accountability. Participants will leave able to explain what makes nuclear energy distinct from chemical and renewable energy sources, and how to evaluate its role in low-carbon energy systems using consistent physical criteria.

Keywords

Nuclear fission, binding energy and mass defect, neutron multiplication and criticality, reactor safety and containment, low-carbon energy systems

Clean Energy and Clean Hydrogen

Prof. Dr. İbrahim Dinçer

Abstract

It is evident that an increased rate of carbon dioxide emissions due to a heavy use of fossil fuels since industrial revolution has caused catastrophic damages to the environment, resulting in global warming (greenhouse effect) and climate change locally and globally. The global energy equation is now considering renewables as clean energy sources, including renewable energy and nuclear options. Having such clean energy sources we need to consider clean hydrogen option. It is equally important for hydrogen economy to consider renewable energy sources and nuclear options to generate clean hydrogen which will help achieve sustainable development due to its role as a carbon-free fuel, a unique energy carrier and more importantly a significant feedstock. In this specific lecture, it is aimed at considering renewable energy sources for clean hydrogen production, covering conventional electrolysis methods, thermochemical cycles, photonic processes, sonic arrangements, microwave approaches, bio-options accordingly and discussing the current developments, challenges and opportunities and future directions. The presentation will also discuss how to develop economic activities and create a unique a uniquely designed clean hydrogen ecosystem by considering various domains, including education, energy, environment, policy development, sustainability, etc. A clear outline will then be given about what specific technologies will play a crucial role in local and global economies in achieving better sustainable development.

Keywords

Clean hydrogen production, renewable and nuclear energy sources, water electrolysis and thermochemical cycles, carbon-free energy carriers, sustainable development

Electrolyzers and Fuel Cells

Asst. Prof. Dr. Engin Eşme

Abstract

The increasing role of artificial intelligence technologies in the management, modeling, and optimization of modern energy systems is discussed within the framework of theoretical foundations and current research trends. The impact of data-driven approaches on efficiency and sustainability is examined across a wide spectrum, ranging from traditional power grids to off-grid micro-systems and complex battery configurations.

Given the dynamic and highly variable nature of energy production and consumption data, it is essential to move beyond standard machine learning approaches. In this context, the focus will be on the critical function of deep learning models, hypernetworks, and particularly continual learning architectures in adapting to changing conditions. How advanced algorithms can be utilized in solving fundamental problems such as load forecasting, ensuring instantaneous production-consumption balance, and optimizing battery life will be discussed within a methodological framework.

Designed for the participants, this content aims to present a comprehensive vision of how artificial intelligence algorithms can be seamlessly integrated into real-world energy problems and to establish a solid foundation for new interdisciplinary research directions.

Keywords

*Green AI, Green Software Engineering, Sustainability,
Energy Efficiency, AI Lifecycle*

Digital Twins in Energy Systems

Asst. Prof. Dr. Şenol Pişkin

Abstract

As global energy demands escalate, optimizing complex energy infrastructures requires innovative solutions that extend far beyond traditional monitoring. This presentation introduces the paradigm of digital twins—dynamic, high-fidelity virtual replicas of physical systems. Leveraging high-performance computing (HPC) and advanced computational modeling, digital twins facilitate continuous data synchronization between physical assets and their virtual counterparts. This session will explore how these virtual environments enable real-time operational monitoring, predictive maintenance, and the safe simulation of diverse demand scenarios without risking physical service disruption. By utilizing advanced computational simulations, energy providers can identify systemic inefficiencies, enhance grid resilience, and drastically reduce energy waste across large-scale operations. Participants will learn the foundational architecture of digital twins and discover practical methodologies for bridging the gap between physical hardware and digital simulation frameworks. Ultimately, this presentation will demonstrate how integrating digital twin technology is a cornerstone of building smarter, highly optimized, and sustainable energy ecosystems.

Keywords

Digital twins, virtual replication and data synchronization, predictive maintenance, scenario simulation, grid resilience

Machine and Deep Learning in Energy Systems

Asst. Prof. Dr. Şenol Pişkin

Abstract

The rapid integration of artificial intelligence into the energy sector presents unprecedented opportunities for automated management and data-driven optimization. This presentation explores the strategic deployment of machine learning (ML) and deep learning (DL) algorithms to modernize energy generation, distribution, and consumption networks. The session will examine how robust predictive models can forecast energy demand, streamline renewable energy integration, and detect infrastructure anomalies in real time. Drawing upon advanced computer vision and image processing methodologies, the presentation will also highlight automated analytical tools utilized for the structural health monitoring of critical energy assets. Crucially, the session will address a frequently overlooked challenge: the inherent computational and energy costs associated with training complex AI models. By analyzing the algorithm lifecycle within high-performance computing (HPC) frameworks, participants will learn practical strategies to balance high predictive accuracy with sustainable, energy-efficient computational practices. This presentation equips attendees with the insights needed to harness intelligent algorithms to build resilient, optimized, and forward-looking energy grids.

Keywords

Machine and deep learning, energy demand forecasting, anomaly detection, structural health monitoring, energy-efficient computing

Internet of Things in Energy Systems

Asst. Prof. Dr. Alper Kılıç

Abstract

Energy systems are transforming from a centralized structure to a distributed, dynamic, and multifaceted ecosystem in recent years, driven by the increasing number of active consumers. In this transformation, the Internet of Things (IoT) creates a critical bridge between physical energy assets and AI-based decision-making mechanisms by establishing a sensing, communication, and data collection infrastructure.

Current applications of IoT in smart grids, microgrids, smart buildings, renewable energy facilities, and demand-side management are extensively discussed in the literature. The discussion focuses on how data obtained from smart meters and distributed sensors can be processed using edge computing and artificial intelligence methods for short-term load forecasting, fault detection, predictive maintenance, energy optimization, and demand resilience. Furthermore, IoT-supported digital twins, energy communities, interaction of electric vehicles with the grid, and privacy-protecting federated learning approaches are evaluated.

This study will also address technological status, interoperability, latency, scalability, and cybersecurity issues in critical energy infrastructures. Finally, research trends and open problems for IoT-AI architectures will be presented.

Keywords

Internet of Things, smart meters and distributed sensing, edge computing, demand-side management, cybersecurity in critical infrastructure

Physics-Informed Machine Learning for Energy Applications

Prof. Dr. Taylan Yetkin

Abstract

This lecture explores how physical knowledge can make machine learning models for energy systems more reliable, interpretable, and useful under real operating conditions. Energy applications often involve limited data, noisy sensors, rare faults, changing weather, safety constraints, conservation laws, and decisions with physical consequences. Starting from the question “Can a model trained on yesterday’s energy system be trusted tomorrow?”, the lecture contrasts purely data-driven models, physics-based simulations, and hybrid physics-informed approaches. We will discuss how physics can enter an ML workflow through input features, model architecture, conservation constraints, loss functions, graph structure, differentiable simulators, digital twins, uncertainty estimation, and feasibility checks. Examples will include renewable forecasting, microgrid energy balance, building thermal systems, battery state estimation, grid state estimation, and energy materials discovery. The central message is that physics-informed ML is not merely adding equations to neural networks; it is a disciplined way to restrict learning so that predictions remain compatible with known laws, operational limits, and engineering decisions.

Keywords

Physics-informed machine learning, hybrid modelling, conservation constraints, digital twins, uncertainty quantification

Energy Conservation and Efficiency Aspects

Prof. Dr. Arif Hepbaşlı

Abstract

Energy conservation and efficiency are not only technical imperatives but also educational challenges that demand innovative pedagogical approaches. By integrating linguistic creativity with structured learning, this lecture demonstrates how acrostics can serve as powerful tools for bridging theory and practice, enhancing both comprehension and retention in energy systems education. Beginning with acknowledgements, the session explains the rationale for adopting an acrostic framework as a creative and memorable tool for engaging learners. Key terms and definitions are clarified to establish a common foundation, followed by a structured exploration of acrostics specifically designed around “Energy Conservation/Efficiency Aspects”. Each acrostic serves as a thematic entry point, guiding participants through essential concepts in energy management while reinforcing retention through linguistic association. The lecture then systematically examines the subject acrostics, highlighting their relevance to both technical and practical dimensions of energy efficiency. Concluding remarks synthesize the insights gained, emphasizing the value of acrostics as a teaching and communication strategy. To extend this learning, carefully designed multi-choice study questions are incorporated, serving not only to test factual recall but also to stimulate reflection, structured discussion, and deeper conceptual understanding of the material.

Keywords

Energy conservation, energy efficiency, energy management, acrostics as a learning tool, engineering education

Energy Storage Systems and Applications

Prof. Dr. Can Özgür Çolpan

Abstract

Energy storage has become an indispensable component of modern energy infrastructures, driven by the growing integration of variable renewable sources into electricity grids. The mismatch between solar generation peaking at midday and demand rising in the evening—captured by the well-known “duck curve”—illustrates the critical role of storage in balancing supply and demand, securing uninterrupted use of renewables, and reducing the need for additional generation capacity. This presentation offers an overview of energy storage technologies organized into six categories: mechanical (pumped hydro, compressed and liquid air, flywheels), thermal (sensible heat, phase-change materials, thermochemical), chemical (hydrogen and Power-to-X), electrochemical (lithium-ion and flow batteries), electrical (supercapacitors, superconducting magnetic energy storage), and biological storage. For each category, working principles, key technical indicators—specific energy and power, energy and power density, round-trip efficiency, response time, and cycle life—and representative real-world applications are examined and compared. The Ragone diagram is introduced as a tool for matching technologies to application needs, ranging from short-discharge, high-power services provided by supercapacitors and flywheels to long-duration, high-capacity applications served by pumped hydro, compressed air, and hydrogen systems. Comparative evaluations highlight the trade-offs among efficiency, cost, scalability, and lifetime that guide technology selection for grid, mobility, and sector-coupling applications.

Keywords

Energy storage technologies, mechanical, thermal and electrochemical storage, round-trip efficiency and cycle life, Ragone diagram, renewable integration and grid balancing

Waste-to-Energy Conversion: Advanced Materials and Circular Technologies for Sustainable Resource Recovery

Prof. Dr. Mustafa Ersöz

Abstract

Waste management is increasingly expected to move beyond its traditional role of disposal and become a source of materials, energy, and valuable resources. Modern waste-to-energy approaches view waste streams not as end products, but as alternative feedstocks for fuels, functional materials, and recovered water. This shift requires integrated systems that combine resource recovery, environmental remediation, and energy generation within a single circular process chain.

This lecture will present recent advances in waste valorisation through the development and application of advanced materials, membrane technologies, photocatalytic systems, and nanostructured platforms. Particular attention will be given to the design of functional materials, including two-dimensional materials and hybrid nanocomposites, for challenging applications such as wastewater treatment, pollutant removal, and green hydrogen production. The role of advanced membrane processes and sustainable material design strategies will be discussed as key enabling technologies for addressing the interconnected challenges of water security, energy sustainability, and environmental protection.

Two European initiatives highlight how interdisciplinary research can transform sustainability challenges into practical solutions. Green-Mem develops a new generation of bio-based and recyclable membrane technologies by integrating green chemistry, advanced materials, machine learning, and sustainability assessment to establish circular approaches for water treatment and environmental applications. Bio-Acouis, addressing a different technological field, applies sustainable material innovation to develop environmentally friendly acoustic solutions using natural materials, nanofibres, and recycled fibres. By combining materials science, engineering, design, and life-cycle assessment, both initiatives demonstrate that sustainable technologies emerge from collaboration across disciplines. Such interdisciplinary approaches are essential for developing circular, resource-efficient, and environmentally responsible solutions capable of addressing complex societal challenges.

Keywords

Waste-to-energy, circular economy, green hydrogen, advanced membranes, nanomaterials, photocatalysis, wastewater treatment, sustainable technologies.

Sustainable Transportation Systems

Prof. Dr. Can Özgür Çolpan

Abstract

The transition toward sustainable transportation is a critical component of global efforts to reduce greenhouse gas emissions, improve energy security, and achieve long-term climate and sustainability targets. However, decarbonizing the transport sector requires more than replacing conventional internal combustion engine vehicles with electric alternatives; it demands a comprehensive transformation of energy carriers, vehicle technologies, infrastructure, and the broader energy system. This presentation provides an overview of current and emerging pathways for sustainable transportation, covering battery electric vehicles, hydrogen and fuel-cell technologies, biofuels, sustainable aviation fuels, and synthetic fuels such as e-methanol, e-ammonia, and e-kerosene. The suitability of these alternatives for road transport, heavy-duty vehicles, aviation, maritime transport, and rail applications is discussed from technical, environmental, and economic perspectives. Particular attention is given to renewable energy integration, hydrogen and Power-to-X pathways, life-cycle emissions, energy efficiencies, infrastructure requirements, and techno-economic performance. Current technological barriers, research gaps, and future opportunities toward net-zero transportation are highlighted, providing a research-oriented perspective for researchers working across energy, transportation, and sustainability disciplines..

Keywords

Sustainable transportation, battery electric and fuel-cell vehicles, hydrogen and Power-to-X, synthetic and sustainable aviation fuels, life-cycle emissions

Economic and Social Dimensions of Artificial Intelligence Technologies

Prof. Dr. Halit Yanikkaya

Abstract

I examine four major waves of technological disruption - the First and Second Industrial Revolutions, the Digital Revolution, and the emerging AI era - to identify recurring patterns in how transformative technologies reshape economies, societies, and daily life. Drawing on historical evidence and contemporary data, it argues that each wave has expanded aggregate economic output while distributing its gains unevenly, and that each has moved the frontier of automation progressively closer to distinctly human capacities: from physical labor to mechanical complexity, to routine information processing, and now to cognitive judgment and creative work. It traces these transformations across three dimensions. First, it analyzes the divergent experiences, showing how industrial revolutions successively locked poorer nations into raw-material dependency, how the Digital Revolution offered a partial opening through services-based leapfrogging, and how AI now threatens to close that opening by automating the very labor that powered it. Second, it uses several case studies to illustrate how a country's historical timing, state capacity, and starting position shape its trajectory across each wave. Third, it traces changes in the texture of ordinary daily life - from task-oriented pre-industrial rhythms, through the clock-disciplined factory shift, to the always-on digital era, and toward an emerging AI-mediated workflow. I argue that the AI era's distinguishing feature is not its disruptive pattern, which history shows to be consistent, but its target: for the first time, automation is reaching toward capabilities - reasoning, creativity, and complex decision-making - that were long considered the most distinctively human. How its gains are distributed will depend, as in every prior revolution, on institutional and political choices rather than on the technology alone.

Keywords

Technological disruption and industrial revolutions, automation of cognitive work, labour market transformation, global economic divergence, institutions and distribution of gains

Smart Cities and Sustainable Development

Prof. Dr. Fatma Bedük

Abstract

A smart city is an urban area that integrates information and communication technologies (ICT), digital infrastructure, and data-driven solutions to improve the efficiency, sustainability, and quality of urban services. By utilizing technologies such as the Internet of Things (IoT), artificial intelligence (AI), big data analytics, and sensor networks, smart cities optimize transportation, energy, water management, waste collection, public safety, and governance. Beyond technological innovation, the smart city concept emphasizes citizen-centered governance, environmental sustainability, economic resilience, and social well-being. As a result, smart cities play a vital role in achieving the United Nations Sustainable Development Goals (SDGs), particularly SDG 11, which focuses on creating inclusive, safe, resilient, and sustainable cities.

Several cities have become global benchmarks for smart city development. Singapore is internationally recognized for its Smart Nation initiative, which integrates AI, IoT, and digital government services. An extensive sensor network enables efficient traffic management, environmental monitoring, improved healthcare, and seamless access to public services through digital platforms. Barcelona has pioneered IoT-based urban infrastructure by implementing adaptive street lighting, sensor-equipped waste bins that optimize collection routes, and intelligent irrigation systems that reduce water consumption in public spaces, improving resource efficiency while lowering operational costs and carbon emissions. Tokyo demonstrates how advanced technologies enhance urban resilience and mobility through one of the world's most sophisticated intelligent transportation systems, featuring real-time traffic management and digital disaster preparedness technologies, including earthquake early warning systems. In Türkiye, Konya has emerged as a leading smart city by promoting environmental sustainability through smart waste management, energy-efficient LED street lighting, and bicycle-friendly public transportation that allows passengers to carry bicycles on designated tram services, encouraging sustainable and multimodal urban mobility. These technologies have significantly improved resource efficiency while lowering operational costs and carbon emissions.

Keywords

Smart cities, ICT and urban digital infrastructure, intelligent transportation and mobility, resource efficiency in urban services, Sustainable Development Goals

Energy Analysis, Modeling and Simulation Packages

Prof. Dr. Can Özgür Çolpan

Abstract

Mathematical modeling and simulation have become central to the design, analysis, and optimization of modern energy systems, enabling researchers to evaluate performance, cost, and environmental impact before physical implementation. This presentation provides a systematic overview of software platforms widely used across energy engineering, spanning more than forty tools organized into eight categories: integrated energy system modeling and simulation (e.g., TRNSYS, HOMER, EnergyPLAN); thermodynamic cycle and system analysis; process simulation and chemical systems; dynamic system modeling and physical simulation platforms; computational fluid dynamics and multiphysics-based simulation; resource-specific tools for renewable energy; thermophysical property and database tools; and energy planning, scenario, and policy tools. For each category, the technical characteristics, typical application areas, licensing structures, and comparative strengths and limitations of representative tools are discussed. Case studies illustrate how each platform is applied in practice—from building energy simulation, solar thermal and photovoltaic design, and microgrid optimization to process-scale modeling of hydrogen and Power-to-X systems, CFD analysis of fuel cells and electrolyzers, and national-scale energy planning. Particular attention is given to selecting the appropriate tool for a given problem based on required fidelity, spatial and temporal scale, data availability, and integration needs. Emerging trends—including open-source Python frameworks, co-simulation, and the coupling of physics-based models with data-driven and artificial-intelligence methods—are also highlighted.

Keywords

Energy system modelling, simulation software platforms, computational fluid dynamics, techno-economic and scenario analysis, co-simulation and open-source frameworks

Sustainable Fuels

Prof. Dr. Aysel Kantürk Figen

Abstract

Sustainable fuels are low-emission liquid and gaseous energy carriers that support the transition toward cleaner, more secure, and resilient energy systems. They include liquid biofuels, biogases, low-emission hydrogen, and hydrogen-derived fuels such as ammonia, methanol, and synthetic hydrocarbons. These fuels complement electrification and energy-efficiency measures, particularly in sectors where direct electrification remains technically or economically challenging, including aviation, maritime transport, heavy-duty transportation, and energy-intensive industries. In addition to reducing greenhouse-gas emissions, sustainable fuels can enhance energy security by diversifying energy resources and decreasing dependence on imported fossil fuels. They can also act as a catalyst for economic development, particularly in emerging and developing economies, by stimulating investment, creating skilled employment, supporting domestic energy industries, and strengthening regional value chains based on locally available biomass, renewable energy resources, and industrial feedstocks.

Within the scope of this course, emphasis will be placed on the general definitions and classification of sustainable fuels, their fundamental physicochemical and energetic properties, and the principal technologies employed in their production. Biofuels, biogases, low-emission hydrogen, ammonia, methanol, and synthetic hydrocarbons will be examined with particular attention to feedstock characteristics, conversion pathways, process conditions, energy efficiency, and environmental performance. Conventional and emerging biological, thermochemical, electrochemical, and catalytic production technologies will also be discussed together with their current applications, advantages, limitations, and potential contribution to the clean energy transition.

Keywords

*Green AI, Green Software Engineering, Sustainability,
Energy Efficiency, AI Lifecycle*

Practice Session on Energy Problems

Prof. Dr. İbrahim Dinçer (with assistance of Asst. Prof. Dr. Fatih Sorgulu)

Abstract

This particular lecture will cover the thermodynamic concepts related to energy systems and applications, particularly including energy and exergy analyses and energy and exergy efficiency assessments. In this regard, the key thermodynamic laws, such as first law and second law will be introduced in addition to the balance equations written based on mass, energy, entropy and exergy. Participants will work through representative problems drawn from thermodynamic analysis, energy and exergy balances, efficiency assessment, and the evaluation of specific energy systems. Each problem is treated as a complete analysis: defining the system boundary, writing the relevant balance equations, identifying reasonable assumptions, carrying out the calculations which will be performed through the Engineering Equation Solver (EES) software package, and interpreting what the result implies for design and operation. By working through some specific problems the participants will also learn about system design, analysis, assessment and improvement details.

Keywords

Keywords: Energy, Exergy, Efficiency, Energy Systems, Thermodynamics, System Analysis

Rare and Energy Materials

Prof. Dr. Aysel Kantürk Figen

Abstract

Rare and energy materials play a central role in the development of sustainable energy technologies, including hydrogen production, fuel cells, batteries, carbon dioxide conversion, and renewable fuel synthesis. Their unique electronic, structural, magnetic, and surface properties enable the design of advanced functional materials with high activity, selectivity, conductivity, and stability. However, the increasing demand for rare, critical, and strategically important elements also raises significant concerns regarding resource availability, supply security, environmental impact, and economic sustainability.

Catalysts constitute one of the most important application areas of rare and energy materials. Catalytic materials reduce activation barriers and control reaction pathways, thereby improving energy efficiency and product selectivity in chemical and electrochemical processes. Noble metals, rare-earth elements, transition metals, and their oxides, sulfides, phosphides, and composite structures are widely used in reactions such as hydrogen evolution, oxygen evolution, oxygen reduction, carbon dioxide hydrogenation, and ammonia conversion. Their catalytic performance is strongly governed by composition, oxidation state, crystal structure, defect chemistry, surface area, and interactions between active phases and supports.

This lecture discusses the relationship between rare materials, catalyst design, and clean energy conversion. Attention is given to strategies for reducing dependence on scarce elements through alloying, doping, nano structuring, support engineering, and the development of earth-abundant alternatives. The importance of recycling, recovery, life-cycle assessment, and data-driven materials discovery is also highlighted. These approaches connect materials science directly with global energy-transition objectives. Overall, the sustainable management and rational design of rare and energy materials are essential for achieving efficient, resilient, and low-carbon energy systems.

Keywords

*Green AI, Green Software Engineering, Sustainability,
Energy Efficiency, AI Lifecycle*

Bioenergy Systems and Applications

Prof. Dr. Hüseyin Bekir Yıldız

Abstract

The transition toward carbon-neutral energy systems requires innovative technologies capable of converting abundant renewable resources into clean and sustainable energy. Among emerging bioenergy technologies, biological photovoltaic (BPV) systems have attracted considerable attention because they directly exploit the photosynthetic activity of living microorganisms to generate electricity while simultaneously producing valuable energy carriers such as hydrogen. This lecture introduces the fundamental principles of bioenergy systems with a particular emphasis on biological photovoltaics. The presentation will explain the mechanisms of photosynthetic electron transfer, extracellular electron transport, and bioelectrochemical energy conversion in cyanobacteria, green algae, thylakoid membranes, and marine microalgae. Recent advances in conductive polymers, graphene-based biocomposites, electrospun nanofibers, and digitally printable bioelectronic materials will be discussed as effective strategies for improving charge transfer, stability, and overall device performance.

The lecture will also present recent research achievements on high-performance living BPV systems capable of simultaneous photocurrent and hydrogen generation, including conductive polymer-based photoanodes, graphene-biopolymer composite electrodes, marine mucilage-derived microalgae, and paper- and textile-based biodegradable biological photovoltaic devices. In addition, the integration of BPV technology with environmental monitoring through photoelectrochemical biosensors for pesticide detection will be highlighted as an example of multifunctional bioenergy applications. Future perspectives for scalable, low-cost, environmentally friendly biological photovoltaic technologies will be discussed, together with their potential applications in sustainable power generation, green hydrogen production, wearable electronics, smart buildings, environmental monitoring, and next-generation biohybrid energy systems. The lecture aims to provide participants with a comprehensive understanding of state-of-the-art bioenergy systems and emerging research opportunities in this rapidly evolving interdisciplinary field.

Keywords

Biological photovoltaics, photosynthetic and extracellular electron transfer, bioelectrochemical energy conversion, conductive polymer and graphene-based bioelectrodes, biohydrogen production

Computer Vision in Energy Systems

Prof. Dr. Yusuf Sinan Akgül

Abstract

Computer vision is the field of teaching computers to make sense of images and video the way humans do — spotting objects, tracking movement, reading patterns, and catching things that look wrong, all automatically and often faster and more consistently than a person watching a screen could. This talk walks through how that technology now touches almost every stage of the energy system. At the generation end, cameras and drones inspect solar panels, wind turbine blades, and power plant equipment to catch cracks, dirt, or damage before they cause failures, and vision systems track things like cloud cover or panel output in real time. In transmission and distribution, computer vision is used to monitor power lines and substations from the air, detect vegetation growing too close to lines, spot corroded or damaged equipment, and even help predict outages before they happen. On the consumption side, vision-based systems help monitor factories and buildings for energy waste, support smart metering, and can analyze how spaces are used to make heating, cooling, and lighting more efficient.

The talk will use simple, real-world examples throughout — no technical or college-level background will be assumed — with the goal of giving the audience an intuitive sense of what computer vision actually does and why it's becoming a quiet but essential tool across the whole energy pipeline, from the power plant to the wall socket.

Keywords

Computer vision, visual inspection of energy assets, drone- and camera-based monitoring, automated fault and anomaly detection, predictive maintenance

From Green Software to Green AI: Building Energy-Efficient and Sustainable AI Systems

Asst. Prof. Dr. Abdulkadir Taşdelen

Abstract

Software and artificial intelligence are not weightless: every training run, every inference call, and every data center draws real electricity, and this demand is growing faster than efficiency gains can offset. This lecture introduces the principles of Green Software Engineering, energy efficiency, hardware efficiency, carbon awareness, and measurement, and extends them into the domain of Green AI, where model training and inference introduce a distinct and rapidly escalating energy burden.

Rather than treating sustainability as a single-stage concern, the lecture walks through energy-aware practices across the full AI lifecycle, illustrated with three real-world case studies. At the design stage, energy-aware architecture and hyperparameter search is shown to cut search cost dramatically by ranking candidates from early training signals instead of training every option to convergence. At the training stage, early stopping is shown to reduce training time substantially across multiple deep learning architectures with negligible accuracy loss. At the deployment stage, quantized language models running on edge hardware demonstrate major energy and latency savings with only modest, task-dependent accuracy trade-offs.

Students will leave with a practical checklist for building energy-efficient AI systems and a clear understanding of how these principles connect to the energy-sector applications central to this summer school, including digital twins, IoT sensing, load forecasting, and smart grids. The session balances conceptual grounding with concrete, data-backed examples, encouraging participants to treat sustainability as a design requirement rather than an afterthought.

Keywords

*Green AI, Green Software Engineering, Sustainability,
Energy Efficiency, AI Lifecycle*

Energy Security in the times of Polycrisis

Assoc. Prof. Dr. Mürsel Doğrul

Abstract

Energy security is often considered either a technical issue or a geopolitical question. However, in the age of polycrisis, it has become an interdisciplinary field, connecting engineering, international relations, economics, environmental studies, climate policy, and public health. This presentation begins with the energy security paradox. While energy must be available, continuous and affordable, the systems that produce, transport and consume it must also be safe for people, the climate and the environment. Therefore, policies that strengthen short-term supply may increase long-term ecological risks, while poorly managed transitions may create new dependencies.

The term ‘polycrisis’ refers to several interacting crises, such as war, sanctions, economic instability, climate shocks, pandemics and technological disruption, which produce cascading effects. Since global energy flows are concentrated along a small number of routes, disruptions to these, such as at the Strait of Hormuz, Bab el-Mandeb or the Strait of Malacca, can quickly impact prices, shipping, electricity, industry, food systems and human security. The Sakhalin region further illustrates how production centres can become strategic assets within the energy relations of Russia, Japan and China. Japan and China demonstrate different responses through diversification, infrastructure investment, LNG, nuclear power, hydrogen, renewables and international partnerships.

The presentation argues that energy security should be understood as a dynamic system involving flows, bottlenecks, dependencies and trade-offs. The central hypothesis is that greater concentration creates greater vulnerability, and that lasting resilience requires supply security, environmental sustainability and human security to be addressed together. Consequently, engineers and social scientists must collaborate to monitor infrastructure, maritime routes, markets, critical materials, ecological costs and political decisions.

Keywords

*Energy Security, Polycrisis, Maritime Chokepoints,
Energy Transition, Indo-Pacific*

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Sedef Bayram is a Research Assistant in the Department of Environmental Engineering at Istanbul University-Cerrahpaşa, where she began her Ph.D. in 2026. She holds a B.Sc. from Istanbul University and an M.Sc. from Istanbul Technical University, with a thesis evaluating ground-level ozone using TROPOMI HCHO and NO2 retrievals in the Aegean region. She works on a TÜBİTAK project identifying ammonia sources and secondary particulate matter formation, focusing on the waste sector. Her work appears in Atmospheric Environment and has been presented at EGU and international remote sensing symposia.

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Simge Özdemir graduated in Chemistry from Middle East Technical University in 2023 and completed her M.Sc. in the same department in 2026. She is currently a Ph.D. student in the Micro and Nanotechnology programme. Between 2024 and 2026 she worked as a TÜBİTAK scholarship holder at the METU Center for Solar Energy Research and Applications, and she continues her work within a project conducted by its module development and reliability unit. She has designed and synthesised organic ammonium salts for interface engineering to improve the durability and performance of perovskite solar cells, and now studies carbon paste electrodes.

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Sümeyya Ayça received her Ph.D. in Mechanical Engineering (Energy) from Yıldız Technical University, where her doctoral research addressed sustainable hydrogen production through photoelectrochemical systems combining piezoelectric materials, ultrasonic stimulation, and rotational electrode technologies. Her interests include green hydrogen production, photoelectrochemical water splitting, electrochemical energy conversion, life cycle assessment, and energy and exergy analyses. She has published in SCI/SCI-E indexed journals and presented at international conferences on hydrogen and renewable energy technologies. She received the Second Prize in the 2026 Yıldız Technical University Ph.D. Thesis Awards in the engineering category.

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Sümeyye Kılıç completed both undergraduate and graduate studies in Mechanical Engineering at Selçuk University, with production and organisation internships at ASELSAN and SRC Machinery. This was followed by two years of research and development experience on diesel fuel cells at Karatay Sanayi. SÜmeyye Kılıç is currently a Ph.D. student in the Nanoscience and Nanoengineering programme at Istanbul Technical University, pursuing academic work on PEM fuel cells, and has served since 2023 as a Research Assistant at the Institute of Energy Technologies of Gebze Technical University.

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Şule Şahin completed her undergraduate studies in Chemical Engineering at Yıldız Technical University. She works as a Research Assistant at the university's Clean Energy Technologies Institute, where she is also pursuing her master's degree. Her academic work addresses clean energy technologies, alternative and sustainable energy sources, system design, and innovative energy conversion systems. She conducts research on photoelectrochemical water splitting and hydrogen production, contributing to the scientific development of sustainable energy technologies and to the wider effort to establish reliable, low-carbon routes for renewable hydrogen.

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Tuba Arıdil Ayten has served as a Research Assistant in the Department of Environmental Engineering at Bursa Technical University since 2020, where she is completing her Ph.D. She holds a B.Sc. from Istanbul Technical University and M.Sc. degrees from Gebze Technical University and Bursa Technical University, with a thesis on the accumulation of aged p,p'-DDE in mosses. Her work addresses persistent organic pollutants, phytoremediation, soil contamination risk assessment, municipal solid waste management, life cycle assessment, and optimisation modelling. She has contributed to four TÜBİTAK projects and publishes in international peer-reviewed journals.

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Zeynep Gözükara Karabağ completed her bachelor's, master's, and doctoral degrees in the Department of Chemistry at Middle East Technical University, carrying out her doctoral research at the laboratories of EPFL in Switzerland and METU-GÜNAM. Her work centres on material design and interface engineering for high-efficiency, long-lifetime perovskite solar cells. Since 2023 she has served as an expert researcher in next-generation photovoltaics at METU-GÜNAM, contributing to research projects funded by the European Union and TÜBİTAK. She has presented her work through oral and poster presentations at conferences including PVCON, NanoTR, and EU PVSEC.

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KONYA HAKKINDA

ABOUT KONYA



Konya is an important city in Central Anatolia, Türkiye, famous for its rich history and cultural heritage. With thousands of years of history, the city has been home to civilizations such as the Hittites, Romans, Byzantines, Seljuks, and Ottomans. Konya is internationally known for Mevlana Jalaluddin Rumi and the Mevlevi tradition. The Mevlana Museum and Green Dome are among its most important landmarks. Alaeddin Hill, Karatay Madrasa, and the Ince Minaret Madrasa reflect the city's Seljuk heritage. Nearby Çatalhöyük, dating back approximately 9,000 years, is a UNESCO World Heritage Site. Sille, the Tropical Butterfly Garden, and the Science Center are also popular attractions.

Konya, Türkiye'nin İç Anadolu Bölgesi'nde bulunan, zengin tarihi ve kültürel mirasıyla önemli bir şehirdir. Binlerce yıllık geçmişe sahip olan şehir; Hitit, Roma, Bizans, Selçuklu ve Osmanlı gibi birçok medeniyete ev sahipliği yapmıştır. Konya, özellikle Mevlânâ Celâleddîn-i Rûmî ve Mevlevîlik geleneğiyle dünyaca tanınır. Mevlânâ Müzesi ve Yeşil Kubbe şehrin en önemli simgelerindendir. Alaeddin Tepesi, Karatay Medresesi ve İnce Minareli Medrese, Selçuklu döneminin önemli eserleridir. Konya yakınlarındaki yaklaşık 9.000 yıllık Çatalhöyük UNESCO Dünya Mirası Listesi'ndedir. Sille, Tropikal Kelebek Bahçesi ve Bilim Merkezi de önemli ziyaret noktalarıdır.

MEVLANA MUSEUM



The Mevlana Museum is one of Konya's most important landmarks and one of Türkiye's most visited cultural sites. It is home to the tomb of Mevlana Jalaluddin Rumi, the famous 13th-century Sufi mystic and poet. The building was once a Mevlevi lodge. Today, visitors can see manuscripts, artworks, historical objects, and belongings connected with Mevlana and the Mevlevi tradition. The Green Dome is the most recognizable part of the museum. Mevlana's teachings of love, tolerance, peace, and humanity have an important place in Konya's cultural identity. Visitors from many countries come to the museum every year to learn about his life, philosophy, and spiritual legacy.

Mevlana Müzesi, Konya'nın en önemli simgelerinden ve Türkiye'nin en çok ziyaret edilen kültürel mekânlarından biridir. 13. yüzyılda yaşamış büyük mutasavvıf ve şair Mevlânâ Celâleddîn-i Rûmî'nin türbesi burada bulunmaktadır. Müze, geçmişte Mevlevî Dergâhı olarak kullanılmıştır. İçerisinde Mevlânâ'nın ve Mevlevîlerin yaşamına ilişkin el yazmaları, sanat eserleri, tarihi objeler ve çeşitli eşyalar sergilenmektedir. Yeşil Kubbe, müzenin en dikkat çekici bölümüdür. Mevlânâ'nın sevgi, hoşgörü, barış ve insanlık mesajları, Konya'nın kültürel kimliğinde önemli bir yere sahiptir. Her yıl dünyanın farklı ülkelerinden gelen ziyaretçiler, Mevlânâ'nın hayatını ve düşüncelerini tanımak için müzeyi ziyaret etmektedir.

ALAEDDIN HILL



Alaeddin Hill is an important historic site located in the center of Konya. Built on a historic mound, the hill played an important role in the political and social life of Konya, especially during the Seljuk period. The Alaeddin Mosque, one of the most significant Seljuk monuments in the city, stands on the hill. The surrounding historic area provides valuable insight into Konya's past and its importance during the Seljuk era. Today, Alaeddin Hill is also a peaceful green area in the heart of the city. Visitors can explore historical architecture, relax in the surrounding open spaces, and experience the atmosphere of central Konya while discovering an important part of the city's history.

Alaeddin Tepesi, Konya şehir merkezinde bulunan ve şehrin tarihine tanıklık eden önemli bir noktadır. Tarihi bir höyük üzerinde yer alan tepe, özellikle Anadolu Selçuklu Devleti döneminde Konya'nın siyasi ve sosyal hayatında önemli bir yere sahip olmuştur. Tepede bulunan Alaeddin Camii, Selçuklu döneminin en önemli mimari eserlerinden biridir. Caminin çevresindeki tarihi alan, Konya'nın geçmişini anlamak için değerli bilgiler sunmaktadır. Günümüzde Alaeddin Tepesi, tarihi dokusunun yanı sıra yeşil alanları ve dinlenme imkânlarıyla şehir merkezinde sakin bir ortam sunar. Ziyaretçiler burada hem tarihi yapıları görebilir hem de Konya'nın şehir atmosferini yakından deneyimleyebilir.

KARATAY MADRASA



Karatay Madrasa was built in 1251 during the Seljuk period and was an important educational and architectural institution. It was commissioned by Celaleddin Karatay, a prominent Seljuk statesman, and served as a center of education and knowledge. Today, the building functions as a museum. It displays beautiful examples of Seljuk and Ottoman tiles, ceramics, and decorative art. The colorful geometric patterns and elegant designs demonstrate the high artistic quality of Seljuk craftsmanship. The madrasa is also famous for its magnificent stone entrance portal, which is richly decorated with traditional motifs. Karatay Madrasa is an important cultural attraction for visitors who want to explore Konya's Seljuk heritage, architecture, and artistic traditions.

Karatay Medresesi, 1251 yılında Anadolu Selçuklu Devleti döneminde inşa edilmiş önemli bir eğitim ve mimari yapıdır. Selçuklu veziri Celâleddin Karatay tarafından yaptırılan medrese, döneminin önemli bilim ve eğitim merkezlerinden biri olmuştur. Günümüzde Karatay Medresesi, müze olarak ziyaret edilmektedir. Yapının içerisinde Selçuklu ve Osmanlı dönemlerine ait çini, seramik ve süsleme örnekleri sergilenmektedir. Özellikle geometrik desenleri ve zarif süslemeleriyle dikkat çeken çiniler, Selçuklu sanatının gelişmişliğini göstermektedir. Medresenin taş işçiliğiyle süslü taş kapısı da mimari açıdan büyük önem taşır. Karatay Medresesi, Konya'nın Selçuklu mirasını tanımak isteyen ziyaretçiler için önemli bir kültür durağıdır. de önemli ziyaret noktalarıdır.

INCE MINARET MADRASA



The Ince Minaret Madrasa is an important historic monument built in the 13th century during the Seljuk period. It was commissioned by the Seljuk vizier Sahip Ata Fahreddin Ali and served as an educational and cultural institution. The building is particularly famous for its magnificent stone entrance portal and detailed stonework. Today, it houses the Museum of Stone and Wooden Artifacts, where visitors can see various examples of Seljuk art and craftsmanship. The madrasa takes its name from its former tall and slender minaret. With its impressive architecture and historical collections, the Ince Minaret Madrasa is an important destination for visitors interested in Seljuk history, architecture, and traditional Anatolian art.

İnce Minareli Medrese, 13. yüzyılda Anadolu Selçuklu Devleti döneminde inşa edilmiş önemli bir tarihi eserdir. Selçuklu veziri Sahip Ata Fahreddin Ali tarafından yaptırılan yapı, dönemin eğitim ve kültür merkezlerinden biri olarak kullanılmıştır. Medrese, özellikle taş işçiliği ve görkemli taç kapısıyla dikkat çekmektedir. Günümüzde Taş ve Ahşap Eserler Müzesi olarak hizmet veren yapıda Selçuklu dönemine ait çeşitli sanat eserleri sergilenmektedir. Medresenin adı, geçmişte yapının yanında bulunan ve oldukça yüksek olan minaresinden gelmektedir. İnce Minareli Medrese, Selçuklu mimarisini ve sanatını yakından görmek isteyen ziyaretçiler için Konya'nın en önemli tarihi duraklarından biridir.

TROPICAL BUTTERFLY GARDEN



Konya Tropical Butterfly Garden is one of the city's modern and fascinating tourist attractions. It features a specially designed tropical environment where visitors can observe different butterfly species and a variety of tropical plants. Butterflies fly freely in conditions designed to resemble their natural habitats. Educational displays provide information about butterfly life cycles, development stages, and natural environments. The combination of colorful butterflies, tropical vegetation, and a unique atmosphere creates an enjoyable nature experience. The garden is particularly popular with families and children because it offers both entertainment and education.

Konya Tropikal Kelebek Bahçesi, şehrin modern ve ilgi çekici turistik merkezlerinden biridir. Tropikal iklim koşullarının oluşturulduğu özel alanda farklı kelebek türleri ve çeşitli tropikal bitkiler bulunmaktadır. Ziyaretçiler, kelebeklerin doğal ortamlarına yakın koşullarda uçuşunu yakından gözlemleyebilir. Bahçede kelebeklerin yaşam döngüsü, gelişim aşamaları ve doğal yaşam alanları hakkında eğitici bilgiler de sunulmaktadır. Tropikal bitkiler, renkli kelebekler ve özel atmosfer ziyaretçilere farklı bir doğa deneyimi yaşatır. Özellikle çocuklar ve aileler için eğlenceli ve öğretici bir gezi noktasıdır. Konya Tropikal Kelebek Bahçesi, doğa, eğitim ve görsel güzelliği bir araya getiren önemli bir ziyaret merkezidir.

ÇATALHÖYÜK NEOLITHIC SITE



Çatalhöyük is an important Neolithic settlement near Çumra in Konya Province, dating back approximately 9,000 years. Considered one of the world's earliest settlements, it is highly significant for understanding the transition to settled life. The site is known for its closely connected houses, wall paintings, figurines, and everyday objects, which provide valuable information about the lives of Neolithic communities. Çatalhöyük was added to the UNESCO World Heritage List in 2012. The archaeological site offers a unique opportunity for visitors interested in history, archaeology, and early human civilization. Exploring Çatalhöyük helps visitors understand how people lived, organized their communities, and developed new ways of life during the Neolithic period.

Çatalhöyük, Konya'nın Çumra ilçesi yakınlarında bulunan ve yaklaşık 9.000 yıllık geçmişe sahip önemli bir Neolitik yerleşim alanıdır. Dünyanın en eski yerleşimlerinden biri olarak kabul edilen Çatalhöyük, insanlık tarihinin yerleşik hayata geçiş sürecini anlamak açısından büyük önem taşır. Evlerin birbirine bitişik şekilde inşa edilmesi, duvar resimleri, heykelcikler ve günlük yaşamda kullanılan çeşitli eşyalar dönemin insanları hakkında önemli bilgiler vermektedir. Arkeolojik alan, 2012 yılında UNESCO Dünya Mirası Listesi'ne alınmıştır. Çatalhöyük, tarih, arkeoloji ve insanlık geçmişine ilgi duyan ziyaretçiler için eşsiz bir keşif alanıdır. Burada Neolitik dönemde insanların nasıl yaşadığı ve toplumların nasıl geliştiği hakkında bilgi edinilebilir.

AZİZİYE MOSQUE



Aziziye Mosque is an important Ottoman-era monument located in the center of Konya, close to the Mevlana Museum. Built in the 19th century, the mosque reflects a combination of traditional Ottoman architecture and Western Baroque influences. Its elegant minarets, large windows, and richly decorated exterior are among its most distinctive features. The interior also contains decorative details reflecting the artistic style of its period. Because of its central location, the mosque is easily accessible to visitors exploring the Mevlana Museum and surrounding historic area. Aziziye Mosque is significant not only as a place of worship but also as an example of Konya's architectural and cultural development during the Ottoman period.

Aziziye Camii, Konya şehir merkezinde, Mevlana Müzesi'ne yakın konumda bulunan önemli bir Osmanlı dönemi eseridir. 19. yüzyılda inşa edilen cami, Osmanlı mimarisi ile Batı etkisindeki Barok üslubun birleşimini yansıtır. Caminin dikkat çekici özellikleri arasında zarif minareleri, geniş pencereleri ve süslü dış cephesi bulunmaktadır. İç mekânda da dönemin sanat anlayışını yansıtan çeşitli dekoratif ayrıntılar görülmektedir. Merkezi konumu sayesinde Mevlana Müzesi'ni ziyaret eden turistlerin kolaylıkla görebileceği tarihi yapılardan biridir. Aziziye Camii, yalnızca ibadet açısından değil, Konya'nın Osmanlı dönemindeki mimari ve kültürel gelişimini anlamak açısından da önemli bir yapıdır.

SILLE VILLAGE



Sille is an ancient settlement located approximately 8 kilometers northwest of central Konya. With a history spanning thousands of years, it has been a place where different cultures and religious communities lived together. Its stone houses, narrow streets, historic mosques, and churches preserve the unique character of the village. Aya Elenia Church is one of Sille's most important historical landmarks. The traditional architecture and peaceful natural surroundings provide visitors with a pleasant and relaxing experience. Visitors can walk through the historic streets, explore old buildings, and discover the traditional character of the settlement. Sille offers a different perspective on Konya by combining history, culture, architecture, and traditional village life in one memorable destination.

Sille, Konya şehir merkezinin yaklaşık 8 kilometre kuzeybatısında yer alan, tarihi ve kültürel zenginliğiyle dikkat çeken eski bir yerleşimdir. Binlerce yıllık geçmişe sahip olan Sille, farklı dönemlerde çeşitli kültürlerin ve inançların bir arada yaşadığı önemli bir merkez olmuştur. Taş evleri, dar sokakları, tarihi camileri ve kiliseleri bölgenin özgün atmosferini günümüze taşımaktadır. Aya Elenia Kilisesi, Sille'nin en önemli tarihi yapılarından biridir. Geleneksel mimarisi ve doğal çevresi, ziyaretçilere sakin ve keyifli bir gezi deneyimi sunar. Sille'de yürüyüş yapmak, tarihi yapıları keşfetmek ve geleneksel yerleşim dokusunu görmek mümkündür. Sille, Konya gezisine tarih ve kültür açısından farklı bir boyut kazandırmaktadır.

KONYA BİLİM MERKEZİ

KONYA SCIENCE CENTER



Konya Science Center is an important educational and discovery center designed to encourage interest in science and technology. Supported by TÜBİTAK, the center features interactive exhibitions covering astronomy, space, technology, energy, natural sciences, and everyday life. Visitors can learn about scientific concepts through hands-on experiments and interactive activities rather than simply reading information. It provides an enjoyable and educational environment, especially for families and students, while encouraging curiosity, creativity, and scientific thinking. Konya Science Center is a modern attraction where visitors can explore science, education, and technology through engaging and interactive experiences.

Konya Bilim Merkezi, bilim ve teknolojiye olan ilgiyi artırmak amacıyla kurulmuş önemli bir eğitim ve keşif merkezidir. TÜBİTAK destekli merkezde astronomi, uzay, teknoloji, enerji, doğa bilimleri ve günlük yaşamla ilgili çeşitli interaktif sergiler bulunmaktadır. Ziyaretçiler, yalnızca bilgi edinmekle kalmaz; deney düzenekleri ve uygulamalı etkinliklerle bilimi doğrudan deneyimleyebilir. Özellikle aileler ve öğrenciler için eğlenceli ve öğretici bir ortam sunan Konya Bilim Merkezi, merak duygusunu ve araştırma isteğini desteklemektedir. Konya'yı ziyaret edenler için bilim, eğitim ve teknolojiyi bir arada keşfetme fırsatı sunan modern bir duraktır.

TÜBA YAZ OKULU PROGRAMLARI

TÜBA SUMMER SCHOOL PROGRAMS



"TÜBA-TÜBİTAK Summer School on Alternative Energy Sources and the Future of Energy," Mersin University, July 20-25, 2025



*"Energy" and Turkology Summer School"
Qoja Ahmet Yassawi International Kazakh-Turkish University, August 18-25, 2024*

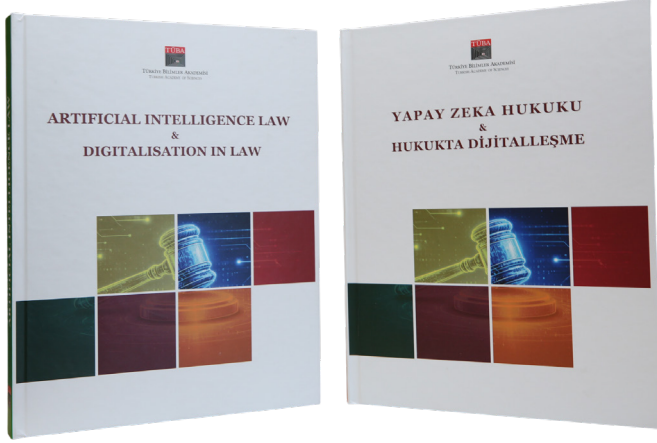


*“Young Turkologists Summer School”
Kyrgyz-Turkish Manas University Campus, June 18–26, 2023*



*“Basic Sciences and the Requirements of Academic Life Summer School”
TÜBA Istanbul Rabi Madrasa, September 26–30, 2022*

From TÜBA Publications



ARTIFICIAL INTELLIGENCE LAW AND DIGITALISATION IN LAW

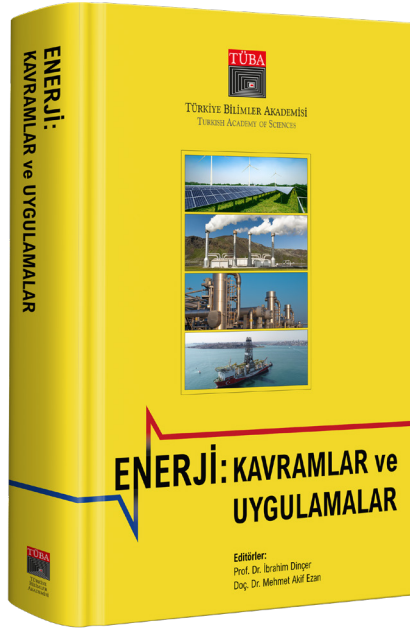
This volume brings together a distinguished group of internationally recognised scholars and practitioners working at the intersection of law, technology, and artificial intelligence. The contributors—drawn from diverse legal traditions and academic institutions across Europe and beyond—offer rigorous and forward-looking analyses on some of the most pressing questions raised by the digital transformation of law. Through contributions addressing topics such as AI liability, high-risk AI certification, intellectual property, digital civil procedure, financial regulation, and the evolving relationship between artificial intelligence and judicial decision-making, the book provides a comprehensive and interdisciplinary perspective on the legal governance of AI systems. Benefiting from the authors' extensive academic expertise and practical experience in fields including private law, technology regulation, and European legal frameworks, this collection aims to contribute meaningfully to the international scholarly debate on artificial intelligence and the future of law.



NEW ENERGY TECHNOLOGIES REPORT

The report, prepared by the TÜBA Energy Working Group, examines the history, current and future trends in energy technologies. The study is based on scientific presentations given at the New Energy Technologies Summer School held at Ahmet Yesevi University in Turkistan, Kazakhstan, on August 18-23, 2024.

The report covers topics such as basic energy knowledge, traditional energy sources, nuclear energy, renewable energy sources, hydrogen energy, economic, environmental and social dimensions of energy, energy storage systems, smart grids and district energy systems, and alternative fuels. It provides a comprehensive reference for scientists, policy makers and practitioners working in the field of energy, while promoting international cooperation on sustainable and innovative energy solutions.



ENERGY: CONCEPTS AND APPLICATIONS

This book aims to present energy in a broad spectrum and covers all aspects of it, ranging from its history and importance to fundamental thermodynamic concepts and from the dimensions of energy systems to the role of innovation in these systems. The topics covered in the book are extensive with basic thermodynamic concepts and methods, traditional fossil fuels, renewable energy resources, nuclear energy, biofuels and alternative fuels, hydrogen energy, waste-to-energy, energy conservation and efficiency, energy storage, energy materials, smart grids, energy policies and strategies, the economics of energy systems, energy-environment-sustainability as well as energy innovation.



ADVANCED ENERGY SYSTEMS AND ENVIRONMENT

Energy needs are increasing in all countries, especially in developing countries. Those working in the energy sector strive to provide high energy efficiency in energy systems, to reduce investment costs, and to reduce emissions that are thrown into the environment, which are very harmful to human health and cause climate changes. Even the most modern fossil fuel power plants, as will be explained later, can increase their thermal efficiency to 47-62% with combined power plants.

The aim of this book is to examine all existing Energy Production Systems (including nuclear energy systems), to be useful to undergraduate/graduate engineering students and practitioners working in the field of energy, who want to advance their knowledge on energy. This book is planned as eight chapters.

In each chapter of this book, how theoretical knowledge is used in practice and performance analysis are explained with example solutions. On the other hand, problems and reference sources are given at the end of each chapter. We believe that this book will be useful for Mechanical Engineering and Energy Engineering undergraduate and graduate students; At the same time, we think that it will be useful as a reference book for engineers and researchers who operate and design power plants.



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