İstanbul Technical University – Department of Architecture

# MIM 246E - Environmental Control Studio, 22213

Course Syllabus | 2019-2020 Spring Semester

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| Course Day and Hour : Tuesday 13:30-17:30<br>Thursday 8:30-12:30 |
| Course Room : |
| Course Credit : 5 |
| Course Web Site : https://ninova.itu.edu.tr/Ders/937 |


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| Course Instructor: Prof. Dr. Alpin Köknel Yener |
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## Project Studio Description

Physical environmental factors affecting built environment design are introduced. Information on climate, light, sound, fire protection parameters, clean water supply and sewage disposal systems aiming at user comfort and efficient use of energy is provided. Turkey's current national environmental standards and regulations (fire, noise, heat protection) related substances are discussed. In the studio applications, a project that is aimed to be designed integrated with the environment in terms of passive and active systems included, which performs optimum in climatically, visual and aural ways, protected against fire and equipped with sanitary installation is conducted.

## Project Studio Structure and Plan

Course Plan

| WEEK | DATE | TOPIC |
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| 1 | 11.02.2020<br>13.02.2020 | PASSIVE CLIMATISATION<br>• Introduction, Sustainable and climatic design, Design parameters: site, orientation, distance between buildings<br>• Room organization |
| 2 | 18.02.2020<br>20.02.2020 | PASSIVE CLIMATISATION<br>• Design parameters: Building form, Orientation, Building envelope, Natural ventilation, Solar control systems<br>• Site plan |
| 3 | 25.02.2020<br>27.02.2020 | LIGHTING<br>• Introduction to lighting, Basic information, Visual comfort, Daylighting system design<br>• Determination of transparency ratios and window design, solar control |
| 4 | 03.03.2020<br>05.03.2020 | FIRE SAFETY<br>• Passive fire safety systems in building, Active fire safety systems in buildings<br>• Design of building façades and control of distances between buildings for fire safety |
| 5 | 10.03.2020<br>12.03.2020 | ACTIVE CLIMATISATION<br>• Definition of heating systems and calculation of the heating load, Definition of components of the HVAC systems<br>• Design of the building envelope related to thermal comfort |
| 6 | 17.03.2020<br>19.03.2020 | ARCHITECTURAL ACOUSTICS<br>• Basic definitions, Environmental noise and control, Sound transmission, Sound insulation and criteria<br>• Calculation of sound transmission through building envelope |
| 7 | 24.03.2020<br>26.03.2020 | • Midterm-1<br>• Calculation of the heating load for the building |
| 8 | 07.04.2020<br>09.04.2020 | • Guest Speaker: Active Climatisation<br>• Designing the heating center, installation of heaters and other system components |
| 9 | 14.04.2020<br>16.04.2020 | SANITARY INSTALLATION<br>• Water supply into the building, water demand and storage for water, Plumbing and sanitary appliances<br>• Water supply into the building, design of wet spaces, design of water installation system in the building, sewage disposal from the building (1/50) |
| 10 | 21.04.2020<br>23.04.2020 | SANITARY INSTALLATION<br>• Designing wet spaces and wastewater-removal systems<br>• Preparation of 1/20 architectural drawings for a typical wet space (plan, sections and elevations |

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| 11 | 28.04.2020<br>30.04.2020 | ARCHITECTURAL ACOUSTICS<br>• Absorptive materials, Room acoustic criteria-reverberation time design<br>• Acoustical design of a given space |
| 12 | 05.05.2020<br>07.05.2020 | LIGHTING<br>• Description of artificial lighting system elements and fundamentals of lighting design<br>• Design of the artificial lighting system for a given space |
| 13 | 12.05.2020<br>14.05.2020 | • Midterm-2<br>• Design of HVAC system for a given space with respect to comfort conditions, placement of automatic fire detection and extinguishing equipment |
| 14 | 19.05.2020<br>21.05.2020 | • Public Holiday<br>• A3 poster design |

## Recommended Readings


- Stein, B., Reynolds, J.S., Mechanical and Electrical Equipment for Buildings, John Wiley and Sons, Canada, 2000.
- Heerwagen, D., Passive and Active Environmental Controls, McGrawHill, 2004.
- Brown, G.Z., De Kay, M., Sun. Wind & Light, Wiley and Sons, New York, 2001.
- Hegger, M., Energy Manual Sustainable Architecture, Birkhauser Verlag, 2008.
- Hawkes, D., Forster, W., Energy Efficient Buildings: Architecture, Engineering and Environment, W. W. Norton&Company, New York, 2002.
- Enerji Ekonomisi, Isısan Çalışmaları No.351, 2005.
- Berköz, E., Küçükdoğu, M., Yılmaz, Z., vd., Enerji Etkin Konut ve Yerleşme Tasarımı, TÜBİTAK INTAG 201 nolu araştırma projesi, 1995, İstanbul.
- Carter, C., Villiers, J., Passive Solar Building Design, Pergamon Press, 1987.
- Legg, R., Calby, B.T., Air Conditioning Systems Design Commissioning and Maintenence, Botsford Ltd., London, 1991.
- Cottom, W.M., Environmental Design: The Best of Architecture and Technology, PBC Glenlove, 1990.
- John, R., Energy Conscious Design, Goulding, Luxemburg, 1992.
- Raiss, W., Isıtma Havalandırma ve İklimlendirme Tekniği, Çeviren: Köktürk, Uğur, Arı Kitapevi, İstanbul, 1974.
- Özkaya, M., (1994). Aydınlatma Tekniği, Birsen Yayınevi, İstanbul.
- EN 12464-1, Light and lighting — Lighting of work places — Part 1: Indoor work places, CEN/TC 169,European Committee for Standardisation, 2002.
- IESNA (Illuminating Engineering Society of North America), (2011). Lighting Handbook: Reference and Application, 10th ed. IESNA, New York.
- Society of Lighting and Lighting (SLL), The SLL lighting handbook. London: Chartered Institution of Building Services Engineers, 2009.
- BS 8206-2, (2008). Lighting for Buildings Part 2: Code of practise for Daylighting.
- Littlefair, P., (1999). Daylighting and Solar Control in the Building Regulations, BRE, Watford.
- Littlefair, P., (2011). Site Layout Planning for Daylight and Sunlight, BRE, Watford.
- Yılmaz Demirkale, S., Çevre ve Yapı Akustiği, Birsen Yayınevi, İstanbul, 2007.
- Harris, M., Noise Control in Buildings, Mc Graw-Hill Book, New York, 1994.
- Crocker, M.J., Handbook of Acoustics , Wiley-Interscience, 1998.
- Maekawa, Z., Rindel, J.H., Lord, P., Environmental and Architectural Acoustics, CRC Press, 2011.
- Barron, M., Auditorium Acoustics and Architectural Design, Spon Press, 2009.
- Everest, F.A., Pohlmann, K., Master Handbook of Acoustics, McGraw-Hill, 2009.
- Long, M., Architectural Acoustics, Academic Press, 2013.
- Cavanaugh , W.J., Tocci, G.C., Wilkes, J.A., Architectural Acoustics: Principles and Practice, Wiley, 2009.
- Egan, M.D., Architectural Acoustics, J. Ross Publishing, 2007.
- Beranek, L.L., Concert Halls and Opera Houses: Music, Acoustics and Architecture, Springer, 2010.
- Mehta, M., Johnson, J., Rocafort, J., Architectural Acoustics: Principles and Design, Prentice Hall, 1998.
- T.C. Çevre ve Orman Bakanlığı, Çevresel Gürültünün Değerlendirilmesi ve Yönetimi Yönetmeliği, Resmi Gazete Sayı 27601, 04.06.2010.
- Wise, A.F.E., Swaffield, J.A., Water, Sanitary & Waste Services for Buildings, 2006.
- Turkey's Regulation on Fire Protection, TÜYAK: Technical books series number:05, July 2012.
- Drysdale, D., An introduction to fire dynamics, Hoboken, N.J. : Wiley, c2011.
- Quintiere, James G., Fundamentals of Fire Phenomena, Chichester : John Wiley, c2006.
- Rasbash, D. J., Kandola, B., Law, M., Ramachandran, G., Watts, J., Evaluation of Fire Safety, West Sussex, England ; Hoboken, N.J. : J. Wiley & Sons, c2004.
- Grosse, L., Fire safety in buildings, Washington, DC: National Council of Architectural Registration Boards, 2003.
- Klinoff, Robert W., Introduction to fire protection, Clifton Park, NY : Thomson/Delmar Learning, c2003

## Project Studio Assessment

Homeworks are delivered during the course term. At the end of the term, delivery of the homeworks as a project is expected.

Effects on Grading: Midterm Exams – 20%
Homeworks – 40%
Term Project – 40%

## Contributors

Specialist engineers are expected to contribute to the studio and give seminars within the scope of the Project.