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| Course Name | ***Code*** | | ***Type*** | | Semester | | | Credit | | | ***Lecture*** | | | | Recitation | | | ***Laboratory*** | |
| (hour/week) | | | | | | | | |
| ***COMPOSITE MATERIALS*** | UCK 236E | | BS | | 4 | | | 3 | | | 1 | | | | 0 | | | 0 | |
| Department | Aeronautical Engineering | | | | | | | | | | | | | | | | | | |
| ***Lectu & Office Hours & CRN*** | Dr. Hülya CEBECİ – geyikh@itu.edu.tr  Office hours: Thursday 13.00-15.00  20882 | | | | | | | | | | | | | | | | | | |
| ***TA & Office Hours*** |  | | | | | | | | | | | | | | | | | | |
| ***Course Language*** | English | | | | | | | | | | | | | | | | | | |
| ***Compulsory/Elective*** | Elective | | | | | | | | | | | | | | | | | | |
| ***Course Day &Hours*** | Thursday 08:30 – 11:30 | | | | | | | | | | | | | | | | | | |
| ***Content*** | Fibers: glass, carbon, ceramics, organics fibers. Matrix materials: polymers, metal, ceramics, carbon matrix materials. Composite materials: polymers matrix composites, ceramic matrix composites, carbon/carbon composites. Mechanics of composite materials: density, elasticity coefficient, thermal expansion coefficients. Transfer of tensile loading to matrix from fibers. Strength of composite materials. Mechanics of lamina structure. | | | | | | | | | | | | | | | | | | |
| ***Course Objectives*** | To understand the importance of composites in aircraft industry and the sutdents will learn the common used composites for aircrafts with their mechanics as well. The students will be able to solve the problems on the mechanics of composite materials. Also one of the most important part of this class is to design and fabricate a composite material as a project for this course. | | | | | | | | | | | | | | | | | | |
| ***Weekly Topics Covered in this Course*** | |  |  |  | | --- | --- | --- | | Week | Date | Definition | | 1 | 11/02/2013 | Introduction to composite materials & applications of the composite materials | | 2 | 18/02/2013 | Fibers, Matrices, interfaces | | 3 | 25/02/2013 | Composites | | 4 | 04/03/2013 | Anisotropic elasticity | | 5 | 11/03/2013 | Midterm I | | 6 | 18/03/2013 | Micromechanics of composites | | 7 | 25/03/2013 | Project-1 | | 8 | 01/04/2013 | Laminate theory (continued) | | 9 | 08/04/2013 | Laminated beams I: bending and strength | | 10 | 15/04/2013 | Laminated beams II: transverse shearing and buckling | | 11 | 22/04/2013 | Midterm Exam | | 12 | 29/04/2013 | Project-2 | | 13 | 06/05/2013 | Environmental effects and durability, Damage tolerance of fiber composite laminates & airworthiness considerations | | 14 | 13/05/2013 | Next generation composites for aerospace applications | | | | | | | | | | | | | | | | | | | |
| ***Prerequistes*** | Materials Science (MAL201E or MAL201) | | | | | | | | | | | | | | | | | | |
| ***Text book*** | Middleton, D., Composite Materials in Aircraft Stuructures, Burnt Hill, Harlow, Essex-UK, 1990. | | | | | | | | | | | | | | | | | | |
| ***Other References*** | Ronald F. Gibson, *Principles of Composite Material Mechanics*, McGraw-Hill, Inc., 1994.  Jean-Marie Berthelot, *Composite Materials Mechanical Behavior and Structural Analysis*, Springer, 1999.  Isaac M. Daniel and Ori Ishai, *Engineering Mechanics of Composite Materials*, Oxford University Press, 1994.  D. Hull and T. W. Clyne, *An Introduction to Composite Materials*, Cambridge University Press, 1996.  Krishan K. Chawla, *Composite Materials*, Springer-Verlag, 1998.  Stephen W. Tsai and H. Thomas Hahn, *Introduction to Composite Materials*, Technomic Publishing Co., 1980.  Altenbach, H., Altenbach, J., Kissing, W., *Mechanics of Composite Structural Elements,* Springer, 2004.  Autar, K. Kaw, *Mechanics of Composite Materials,* CRC Press, 1997.  Vincent K. S. Choo, *Fundamentals of Composite Materials*, Knowen Academic Press Inc., 1990.  [Kollar, Laszlo P.](http://site.ebrary.com/lib/istanbulteknik/Top?add.x=true&adv.x=true&c=all&d=book&f00=title&frf=author&frm=adv.x&l=all&layout=search&p00=composite&prf=Kollar%2C+Laszlo+P.&sglayout=default" \t "_parent); [Springer, George S.](http://site.ebrary.com/lib/istanbulteknik/Top?add.x=true&adv.x=true&c=all&d=book&f00=title&frf=author&frm=adv.x&l=all&layout=search&p00=composite&prf=Springer%2C+George+S.&sglayout=default" \t "_parent), *Mechanics of Composite Structures,* Cambridge University Press, 2003. (e-book)  [Vinson, Jack R.](http://site.ebrary.com/lib/istanbulteknik/Top?add.x=true&adv.x=true&c=all&d=book&f00=title&frf=author&frm=adv.x&l=all&layout=search&p00=composite&prf=Vinson%2C+Jack+R.&sglayout=default" \t "_parent); [Sierakowski, Robert L.](http://site.ebrary.com/lib/istanbulteknik/Top?add.x=true&adv.x=true&c=all&d=book&f00=title&frf=author&frm=adv.x&l=all&layout=search&p00=composite&prf=Sierakowski%2C+Robert+L.&sglayout=default" \t "_parent), *Behavior of Structures Composed of Composite Materials,* Kluwer Academic Publishers, 2002. (e-book) | | | | | | | | | | | | | | | | | | |
| ***Laboratory Studies*** | Fort he class projects: The students will fabricate a carbon or glass fiber reinforced composite by hand lay-up technique. | | | | | | | | | | | | | | | | | | |
| ***Computer Usage*** | During the class projects | | | | | | | | | | | | | | | | | | |
| ***Other Issues*** |  | | | | | | | | | | | | | | | | | | |
| ***Course Evaluation*** | Midterms | | | | | | **Number** | | | | | | | **Ratio (%)** | | | | | |
| 2 | | | | | | | 40 | | | | | |
| Quizes | | | | | |  | | | | | | |  | | | | | |
| **Homeworks** | | | | | |  | | | | | | |  | | | | | |
| **Projects** | | | | | | 3 | | | | | | | 20 | | | | | |
| **Other Projects** | | | | | |  | | | | | | |  | | | | | |
| **Laboratory** | | | | | |  | | | | | | |  | | | | | |
| **Other (Seminarts)** | | | | | |  | | | | | | |  | | | | | |
| **Finals** | | | | | | 1 | | | | | | | 40 | | | | | |
| Outcomes | **a** | **b** | | **c** | | **d** | | | **E** | **f** | | **g** | **h** | | | **i** | **j** | | **k** |
| 3 | - | | 3 | | - | | | 3 | 2 | | 3 | 1 | | | 1 | - | | 1 |

Prepared By Date

Dr. Hulya Cebeci 04.02.2013