Course title: Composite materials	**Neptun code: GEMTT548a**

Course coordinator: János Lukács, Full Professor, PhD (CSc)

type of lesson: ea. / szem. / gyak. / konz. és száma: **lectures, 28 hours**

method of accountability: (koll. / gyj. / egyéb): **exam**

curriculum location of the subject: (őszi/tavaszi félév): **autumn / spring semester**

pre-study conditions *(ha vannak)*: **Materials science, Continuum mechanics**

The task and purpose of the subject:

Systematic presentation of the composite types, constituent parts, processing methods, basic characteristics and design; review of engineering mechanics of composites; presentation and analysis of the possible failure methods of composite materials and structures.

Course description:

Classification, evolution and importance of the engineering materials. Definition of composites, classification of composites based on matrix materials, reinforcement types and materials characteristics. *Materials and characteristic properties of composite matrices: metals, polymers and ceramics.* Reinforcements of composites: continuous fibers and their characteristics, processing of fibers, fabrics and preforms; discontinuous reinforcements and their characteristics; reinforcements of nano-composites. Engineering mechanics of composites: strength of continuous and short fiber reinforced composites; strength of discontinuous reinforced composites; macromechanical analysis of laminate properties, special laminates and their characteristics. Defect types and failure analysis of different composite structures. *Manufacturing processes of metal, polymer and ceramic matrix composites.* Requirements and methodology of design of composites, the building-block approach. Specificity of mechanical examinations of composite materials and structures. (*The content of some main chapters of the subject may narrow depending on the matrix material.*)

Required literature:

1. F. C. Campbell: Structural Composite Materials. ASM International, Materials Park, Ohio, 2010. (ISBN-13: 978-1-61503-037-8)
2. ASM Handbook, Vol. 21: Composites. ASM International, Materials Park, Ohio, 2001. (ISBN-10: 0-87170-703-9)
3. L. Nicolais; M. Meo; E. Milella (Eds.): Composite Materials – A Vision for the Future. Springer-Verlag London Limited, 2011. (ISBN-13: 978-0-85729-165-3)

Recommended literature:

1. J. K. Wessel (Ed.): Handbook of advanced materials: enabling new designs. John Wiley & Sons, Inc., 2004. (ISBN-10: 0-471-45475-3)
2. 2. K. U. Kainer (Ed.): Metal Matrix Composites. Custom-made Materials for Automotive and Aerospace Engineering. WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim, 2003. (ISBN-13: 978-3-527-31360-0)
3. 3. B. D. Agarwal; L. J. Broutman; K. Chandrashekhara: Analysis and Performance of Fiber Composites. John Wiley and Sons, Inc., Hoboken, New Jersey, 2006. (ISBN-13: 978-0-471-26891-8)
4. 4. A. R. Bunsell; J. Renard:: Fundamentals of Fibre Reinforced Composite Materials. IOP Publishing Ltd., London, 2005. (ISBN-10: 0 7503 0689 0)
5. 5. Krenkel, W. (Ed.): Ceramic Matrix Composites. WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim, 2008. (ISBN-13: 978-3-527-31361-7)