

DESCRIPTION OF THE COURSE

Name of the course: Materials Technology	Code: BIE 45	Semester: 5
Type of teaching: Lectures and laboratory work	Lessons per week: L – 2 hours; LW – 1 hour	Number of credits: 3

COURSE STATUS IN THE CURRICULUM: Compulsory for the students of specialty Industrial Engineering B.Eng. program of the English Language Faculty of Engineering.

AIMS AND OBJECTIVES OF THE COURSE: To give knowledge about the modern engineering materials in terms of production, fabrication characteristics and application; the basic manufacturing processes and their effect on material properties; design for manufacture; selection of materials, processes and processing routes.

DESCRIPTION OF THE COURSE: The main topics concern: Objective and structure of manufacturing. Manufacturing process. Production of metals, polymers and ceramics. Casting processes. Crystallization, structure, defects and properties of castings. Casting alloys, castability. Metal forming processes. Strain hardening, annealing, cold and hot working. Metals for forming, defects, formability. Joining. Welding processes. The welded joint: microstructure, defects, residual stresses and distortion, weldability. Soldering and brazing. Adhesive bonding. Metal removal processes. Thermal cutting processes. Heat treatment processes. Kinetics and mechanism of phase transformations, final structures and mechanical properties.. Powder metallurgy. Forming, sintering, secondary finishing, design consideration. Forming and shaping of ceramics and glass, design considerations. Processing of polymers. Coating Processes. Process and processing route selection. Design for manufacture. Indirect and near net shaping. Effect of the processes on mechanical and in service properties of materials.

PREREQUISITES: Physics, Chemistry, Introduction to Manufacturing, Materials Science.

TEACHING METHODS: Lectures, using Power point Presentations, case studies, specialized software and videos. Laboratory exercises based on printed laboratory guidelines and performed in specially equipped laboratories, work in teams, protocols.

METHOD OF ASSESSMENT: Three hours exam at the end end of semester 80% plus laboratories 20%.

INSTRUCTIONAL LANGUAGE: English.

BIBLIOGRAPHY:

1. Kalpakjan, S., Manufacturing Processes for Engineering Materials, 1991;
2. Kalpakjan, S., Manufacturing Engineering and Technology, 1990;
3. Niebel, B.W., R.A. Wysk and A.B. Draper, Modern Manufacturing Processes Engineering, 1990;
4. Amsted, B.H., P.F. Ostwald, and M.L. Bengemin, Manufacturing Processes, 1987;
5. Sharif, D. El W., Processes and design for manufacturing;
6. Dieter, G.E., Mechanical Metallurgy, 1988;
7. Askeland, D.R., The Science and Engineering of Materials, 1990;
8. Ashby, M.F., D.H.R. Jones, Engineering Materials, vol. 2, 1988.