Zagazig University
Faculty of Engineering
Materials Engineering Department

Scientific research plan for the Materials Engineering Department (2019-2024)

Research field	Degree research		Promotion research 20%	Funded applied research projects - %		Scientific department	Research specialization	Priority order
	Master's topics 50%	Doctoral topics 30%		Project topic	Budget and funding source			
1- Materials science and engineering 1-1- Behavior of wear resistant alloys under operating different conditions	-Mechanical behavior and fracture resistance of wear-resistant alloys -Study the effect of alloying elements on the mechanical properties and corrosion resistance of wear-resistant alloys in different media. -Friction stir welding as a result of mechanical operation of metal alloys -Surface treatments for metals and their alloys	-Surface treatments for metals and their alloys -Study of surface hardening mechanisms of iron-carbon alloys with an austenitic structure - Improving and developing the performance of wear-resistant alloys in different operating conditions -Using the finite element program (ABAQUS) to predict the mechanical properties and expected collapse of bimetallic castings. - Using the finite element method to study the fracture behavior of engineering materials	-Improving and developing the performance of wear-resistant alloys using bimetallic sections -Study the effect of thermal treatments on the bending resistance and bending resistance of bimetallic castings -Using the finite element method to study the effect of thermal treatments on the mechanical properties of bimetallic castings - Study of the effect of austenite formation temperature on the mechanical properties of iron-carbon-chromium alloys	-Producing bimetallic castings that are resistant to breakage and wear together using mechanical joining methods	100000 University Graduate Fund	Materials Engineering	Materials Engineering	Agriculture and food axis - economic axis

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1.2 Nanomaterials technology and applications	-Improving and developing the performance of engineering materials using nanomaterials technology in different operating conditions -Studying modern applications of nanomaterials technology -Different methods for preparing nanomaterials and studying their various properties -Study of fatigue of metal alloys to which ultrafine materials are added	-Improving and developing the performance of metals and their alloys using nanomaterials technology in various settings. -Improving the surface properties of metals and their alloys using nanomaterials technology Practical applications of nanomaterials technology in the field of: -Vital materials used in the human body (stents, metal plates, and screws used in treating fractures(- Purifying drinking water using gates made of ultrafine materials	- Study of the fracture behavior of engineering materials to which nanomaterials with different properties are added - The effect of adding nanomaterials on the abrasion and abrasion resistance of engineering materials - Optimal use of nanomaterials to improve the properties of biological materials - Natural, mechanical, tribological properties of metal alloys - Study of the mechanical behavior of engineering materials to which nanomaterials are added			Materials Engineering+ Physics or Chemistry	Materials Engineering	The economic axis - agriculture and food axis - renewable energy resources

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1.3 Corrosion of metal materials and their alloys 1.4 Ceramic materials and materials with superior properties and their applications	-Improving and developing the performance of metal alloys in different media -Study of the mechanical properties and corrosion resistance of metal alloys -The effect of surface treatments on Mechanical properties and abrasion resistance of metallic materials -Protection of mineral facilities (Bridges - ships) from Chemical corrosion -Mechanical properties and thermal properties of ceramic materials -Study of the mechanical and thermal properties of super alloys	-The effect of adding alloying elements on the corrosion resistance of metal alloys at high temperatures in different media. -The effect of surface treatments on fracture resistance and corrosion resistance of metal alloys -Protecting metal alloys from corrosion in various media -Improving the fracture resistance of ceramic materials - Oxidation resistance of super alloys at high temperatures	-Mechanical behavior and corrosion resistance of non-metallic materials and their alloys - The effect of thermal treatments on the abrasion resistance and corrosion resistance of aluminum alloys			Materials Engineering	Properties and strength of materials	Environment axis + Economical axis

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2- <u>Composite materials</u> 2-1 Fiber reinforced polymers 2-2 Metals reinforced with fibers or particles 2-3 Cement and fiber-reinforced concrete	1- Mechanical properties of fiber-reinforced polymers. 2- Mechanical properties of fiber-reinforced metal alloys 3- Mechanical properties of cement and fiber-reinforced concrete	1- Improving and developing the performance of composite materials theoretically and practically using nanomaterials technology. 2- Behavior of composite materials under the influence of repeated loads 3- Behavior of composite materials under the influence of dynamic loads 4- The effect of environmental conditions on the mechanical behavior of composite materials	The effect of environmental conditions on the mechanical behavior of composite materials			Materials Engineering	Properties and strength of materials	Environment axis + Economical axis

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3- Recycling waste for use as construction materials	1- Preparation, processing and treatment of waste 2- Physical properties of waste used as construction materials 3- Mechanical properties of construction materials containing waste	1- The effect of environmental conditions on the mechanical behavior of construction materials that contain waste 2 - Fracture behavior of construction materials containing waste	Improving and developing the performance of waste used as building materials			Materials Engineering	Properties and strength of materials	Environment axis Energy axis Economic axis

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4- Using engineering materials in repair and restoration of facilities 4.1- Repair and restoration materials	Evaluating the efficiency of materials used in repair and strengthening operations	The effect of surrounding environmental factors on the behavior of materials used in repair And strengthening	Analysis of the causes of collapse of restoration materials and ways to prevent them			Materials Engineering	Properties and strength of materials	Economic axis + environment axis
4-2. Methods of restoration and repair of materials in engineering facilities	Mechanical behavior of structural materials reinforced in different ways - applications	Numerical analysis of materials reinforced by different methods - applications	The behavior of reinforced elements in different ways under the influence of different types of loading			Materials Engineering	Properties and strength of materials	Economic axis + environment axis

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5- Special concretes	1-Physical properties of special concrete 2-Mechanical properties of special concrete 3 - Comparative economic studies between traditional concrete and special concrete	1-Mechanical behavior of special concretes under different environmental conditions 2 - Behavior of special concrete under the influence of dynamic loads 3 - Applying the concepts of fracture mechanics to study the behavior of special concretes at different formation patterns 4 - Improving the physical and mechanical properties of special concrete	1- The effect of using additives on the properties of special concrete 2- Evaluating the performance of special concretes in different chemical media 3 - Improving the physical and mechanical properties of special concrete			Materials Engineering	Properties and strength of materials	Economic axis + environment axis