The Faculty of Engineering offers (4) postgraduate programmes: list the programmes:

Academic Programmes:

Master of Science (M.Sc.), Advanced Materials Engineering, Dual degree

Professional Programmes:

Master of Engineering (M.Eng.), Advanced Materials Engineering, Dual degree.

Name of the Programme:

Advanced Materials Engineering:

1.Bachelor's degree required for each programme / Required overall grade or GPA.

Overall grade:
M.Sc.: Grade of “C” (Good) or Post Graduate Diploma from Faculty of Engineering if the Graduate grade is lower than”C”.
M.Eng.: Grade of “D” (Pass).

GPA to graduate is 2.70 (B-)

2.Total number of credits for the programme is 40 credits

3.Programme structure

Professional Information

1 Aims of the programme

The programme of engineering materials aims at equipping engineering graduates from different backgrounds with a thorough working knowledge on materials science and engineering and its technologies, with special reference on the new materials for structural and energy applications including renewable energy materials needs. The programme will produce graduates who will be able to: analyse, develop and design materials for conventional and advanced contemporary applications, and conduct research and development activities in the field of materials science and engineering.

Graduate attributes

The following are the aimed graduate attributes:

a) Demonstrate knowledge of conceptual engineering issues, informed by the forefront of both the academic and professional elements of the material engineering discipline that enables the student to evaluate critically current research and methodologies.
b) Use the fundamental laws and basic theorems of material engineering and embedding it with relevant knowledge in his professional practice.
c) Show awareness of the contemporary research problems and Conduct research and development activities in the field of materials engineering showing originality in the application and integration of knowledge, together with a practical understanding of how established techniques of research and enquiry are used to create and interpret knowledge in the discipline.
d) Apply the basic principles and different methodologies of scientific research and analytical approaches and use its tools to design and conduct experiments as well as analyze and interpret data in the area of specialisations.
e) Propose solutions to defined professional problems that could lead to making decisions to it in areas relevant to material engineering, showing capacity in a proper range of specialized professional skills and ability to use appropriate technological means, examples: define failures in metals and materials or methods and techniques and suggest protection, prevention or mitigation techniques.
f) Communicate with groups and effectively communicate and report results to scientific community and demonstrate ability to lead teams.
g) Apply advanced science and engineering principles to material systems to analyse, develop and design materials, processes and techniques for conventional and advanced contemporary applications considering economic aspects of materials engineering elements, and utilizing available resources to maximize their benefit and keep resources maintained.
h) Display awareness of his/her role in community development and environmental conservation in light of global and regional variations, reflecting the commitment to integrity, credibility and in accordance with the rules of the profession.
i) Develop him/herself academically and professionally and carry out continuous education by engaging in self- and life- long learning.

Career opportunities:

The MEng programme provides better options for students with BSc degrees to develop their fundamental and conceptual knowledge and to be engaged in professional activities.

2 Intended Learning Outcomes (ILOs)

A. Knowledge and Understanding:

On successful completion of this programme, students should be able to demonstrate a knowledge and understanding of:

A.1 conceptual engineering topics related to the discipline and structure and thermodynamics of materials,

A.2 requirements for materials' development and performance in various engineering professions and applications, including analysis, properties, economic and environmental issues,

A.3 ethical and quality issues in research conduction and reporting.

2.1 Skills and other attributes:

B. Subject-specific cognitive skills:

On successful completion of this programme, students should be able to:

B1. devise experimental and mathematical evidence for materials performance to conduct development in the field,
B2. analyse experimental and mathematical evidence to reach conclusions to problems, and decision making in different professional,
B3. analyse experimental and mathematical evidence to reach conclusions to problems, and decision making in different professional.

C. Subject-specific practical skills:

On successful completion of this programme, students should be able to:

C1. Use advanced methods and skills in areas related to materials development and testing,
C2. Compare results from different sources to make judgements related to materials development and testing for conventional and advanced applications,
C3. Use appropriate mathematical methods for modelling and analysing engineering problems relevant to materials applications,
C4. Search for and retrieve information, ideas and data from a variety of sources, needed for innovative ideas for analysis and development of evidence based solutions to materials problems.
C5. Report results professionally and ethically.

D. Key/transferable skills:

On successful completion of this programme, students should be able to:

D1. Collect data from a range of sources independently and correlate findings with concepts from various multi-disciplinary areas to reach solutions for materials design, development, and applications,
D2. Adopt and integrate scientific methods with engineering approach to reach open ended solutions to problems related to materials applications,
D3. Use evidence based methods in the solution of complex problems, work and lead a team in different professional contexts, time management skills and continuing self-learning,
D4. work with uncertainty on limited, incomplete and/or contradictory information in the solution of unfamiliar problems and monitor, plan and reflect upon personal, educational and career development,

D5. Communicate effectively orally, visually and in writing at an appropriate level.

3 Teaching, learning and assessment strategies to enable outcomes to be achieved and demonstrated:

3.1.1 Learning and Teaching Methods:

ILOs are acquired continually throughout the programme from a combination of lectures, ad hoc tutorials, problem-solving classes, laboratory exercises, coursework exercises and self-study of pre-delivered resources. All elements are developed and reinforced throughout the programme but particularly through project work.

Throughout the programme students are encouraged to undertake independent reading both to supplement and consolidate what is being taught and to broaden their individual knowledge and understanding of the subject.

3.1.2 Assessment:

ILOs are tested and assessed throughout the programme. The assessment is based, predominantly, on conventional written coursework assignments and unseen written examinations but includes group coursework exercises, viva-voce examinations on project work, written project reports and/or papers, project logbooks and oral and visual presentations. In addition, informal testing is undertaken in tutorials and seminars.

4 Admission Criteria

To join this programme, the student should hold an undergraduate B.Sc. degree. Further details of the admission criteria are outlined in the internal postgraduate prospectus for the Faculty of Engineering, issued 2014-2015.

5 Academic standards

External references for standards (Benchmarks)

The external references for standards considered in the development of this programme were the Academic Reference Standards (ARS) prepared by the engineering education sector of the supreme council of universities in Egypt and those of the Framework for Higher Education Qualifications in England, Wales and Northern Island (Qualification Descriptors), Aug 2008.

6 What makes the programme distinctive:

The BUE Master Degree in Advanced Materials Science and Engineering is a programme designed to allow graduates to develop their knowledge on new and emerging materials science and engineering. The programme includes optional choice of subject matter whilst still allowing the possibility of some specialisation. The programme is intended to produce engineers who will be the designers and developers of the next generation of advanced engineering materials for contemporary applications.

Teaching staff are active and involved in materials research related topics, which includes the established Centre of Advanced Materials at the BUE, which influences the delivery and assessment methods used.

The programme is distinctive through its partnership with London South Bank University, which is a British University fully accredited and recognised as Highly Trusted Sponsor by the UK Border Agency.
http://www.studylondon.ac.uk/universities?gclid=CMqkkcv88MYCFa3MtAodEsQGWQ

The programme is also distinguished by the university's nationally recognised activities in the area of research led by the Centre for Advanced Materials (CAM), which makes its teaching led and flavored by research.

7 Curriculum Structure and Contents

No. of credit hours for MEng programme: 40 credit hrs.

16	hrs.	Compulsory
18	hrs.	Elective
6	hrs.	Research project

8 Progression criteria

Progression Criteria:

- To join this programme the student may be required to study up to 9 credit hours of subjects, at the 500 level which he/she did not study before, as per the recommendation of the programme director and the students' engineering background, with a grade point average not less than (C+).
- Alternatively, the student may join this programme if he/she holds a postgraduate diploma grade point average not less than (C+).
- To progress the student should complete a total number of 34 credit hours with a grade point average not less than (B). The studied subjects should be at the 600 level. After completing 34 credit hours of taught modules, the student should complete 6 credit hours for his research project work and report writing.

Research Project Requirements**:**

A research report (6 credit hours) is equivalent to a project showing the student's ability to investigate a point related more to industry or field studies following the basic steps of data collection, analysis and results discussion.

Coding System

#	Programme	Code
1	Materials Science and Engineering	MAT

مسلسل	القسم أو الشعبة: برنامج بينى	الرمز
1	علوم و هندسة المواد	مواد

Programme Description

The MEng. degree in Advanced Materials Science and Engineering consists of 40 credit hours distributed over a minimum of two years as follows:

Mandatory modules	16 hrs.	6 modules	25%
Elective module	18 hrs.	6 modules	58.3%
Research Project	6 hrs.	1 module	16.7%
Total	40 hrs.	12 modules	100%

List of compulsory modules

Code No.		Module Title	No. of Credit	No. of hours / week			
			hrs.	Lec.	Tut.	Total	
MAT	601	Advanced Mechanics of Materials	3	2	1	3	
MAT	602	Materials Applications and Selection Criteria	3	2	1	3	
MAT	603	Thermodynamics of Materials	3	2	1	3	
MAT	609	Design of Experiments and Measurement Methods	3	2	1	3	
MAT	620	Fundamentals of Finite Element	2	2		2	
MAT	621	Technical Writing	2	2		2	
		Total	16				

10.2 List of Elective modules

Code No.		Module Title	No. of Credit hrs.	No. of hours / week		
				Lec.	Total	
MAT	604	Advanced Materials Science	3	3	3	
MAT	605	Material Modelling	3	3	3	
MAT	606	Advanced Materials for Energy Applications	3	3	3	
MAT	607	Materials Degradation and Protection Methods	3	3	3	
MAT	608	Fracture Mechanics and Failure Analysis	3	3	3	
MAT	610	Composite Materials and Structures	3	3	3	
MAT	611	Polymer Structure Properties & Applications	3	3	3	
MAT	612	Advanced Finite Element Analysis	3	3	3	
MAT	613	Advanced Materials Characterization Techniques	3	3	3	
MAT	614	Advanced Manufacturing Methods	3	3	3	
MAT	615	Special Readings	3	3	3	

		Compulsory for M.Eng. Students				
MAT	616	Research Project	6	6		

Professional Information

1 Aims of the programme:

The programme of engineering materials aims at equipping engineering graduates from different backgrounds with a thorough working knowledge on materials science and engineering and its technologies, with special reference on the new materials for structural and energy applications including renewable energy materials needs. The programme will produce graduates who will be able to: analyse, develop and design materials for conventional and advanced contemporary applications, and conduct research and development activities in the field of materials science and engineering.

Graduate attributes

The following are the aimed graduate attributes:

a) Demonstrate knowledge of conceptual engineering issues, informed by the forefront of both the academic and professional elements of the material engineering discipline that enables the student to evaluate critically current research and methodologies.
b) Use the fundamental laws and basic theorems of material engineering and embedding it with relevant knowledge in his professional practice.
c) Show awareness of the contemporary research problems and Conduct research and development activities in the field of materials engineering showing originality in the application and integration of knowledge, together with a practical understanding of how established techniques of research and enquiry are used to create and interpret knowledge in the discipline.
d) Apply the basic principles and different methodologies of scientific research and analytical approaches and use its tools to design and conduct experiments as well as analyse and interpret data in the area of specialisation.
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g) Apply advanced science and engineering principles to material systems to analyse, develop and design materials, processes and techniques for conventional and advanced contemporary applications considering economic aspects of materials engineering elements, and utilizing available resources to maximize their benefit and keep resources maintained.
h) Display awareness of his/her role in community development and environmental conservation in light of global and regional variations, reflecting the commitment to integrity, credibility and in accordance with the rules of the profession.
i) Develop him/herself academically and professionally and carry out continuous education by engaging in self- and life- long learning.

Career opportunities

The MSc programme equips the graduates with skills required for a provisional researcher who is capable of following research and writing academic papers, including managerial and ethical skills.

2 Intended Learning Outcomes (ILOs)

A. Knowledge and Understanding:

On successful completion of this programme, students should be able to demonstrate a knowledge and understanding of:

A.1 conceptual engineering topics related to the discipline and structure and thermodynamics of materials,

A.2 requirements for materials' development and performance in various engineering professions and applications, including analysis, properties, economic and environmental issues,

A.3 ethical and quality issues in research conduction and reporting.

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B. Subject-specific cognitive skills:

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B3. analyse experimental and mathematical evidence to reach conclusions to problems, and decision making in different professional.

C. Subject-specific practical skills:

On successful completion of this programme, students should be able to:

C1. Use advanced methods and skills in areas related to materials development and testing,
C2. Compare results from different sources to make judgements related to materials development and testing for conventional and advanced applications,
C3. Use appropriate mathematical methods for modelling and analysing engineering problems relevant to materials applications,
C4. Search for and retrieve information, ideas and data from a variety of sources, needed for innovative ideas for analysis and development of evidence based solutions to materials problems.
C5. Report results professionally and ethically.

D. Key/transferable skills:

On successful completion of this programme, students should be able to:

D1. Collect data from a range of sources independently and correlate findings with concepts from various multi-disciplinary areas to reach solutions for materials design, development, and applications,
D2. Adopt and integrate scientific methods with engineering approach to reach open ended solutions to problems related to materials applications,
D3. Use evidence based methods in the solution of complex problems, work and lead a team in different professional contexts, time management skills and continuing self-learning,
D4. work with uncertainty on limited, incomplete and/or contradictory information in the solution of unfamiliar problems and monitor, plan and reflect upon personal, Educational and career development.

D5. Communicate effectively orally, visually and in writing at an appropriate level.

3 Teaching, learning and assessment strategies to enable outcomes to be achieved and demonstrated:

3.1.1 Learning and Teaching Methods:

ILOs are acquired continually throughout the programme from a combination of lectures, ad hoc tutorials, problem-solving classes, laboratory exercises, coursework exercises and self-study of pre-delivered resources. All elements are developed and reinforced throughout the programme but particularly through project work.

Throughout the programme students are encouraged to undertake independent reading both to supplement and consolidate what is being taught and to broaden their individual knowledge and understanding of the subject.

3.1.2 Assessments:

ILOs are tested and assessed throughout the programme. The assessment is based, predominantly, on conventional written coursework assignments and unseen written examinations but includes group coursework exercises, viva-voce examinations on project work, written project reports and/or papers, project logbooks and oral and visual presentations. In addition, informal testing is undertaken in tutorials and seminars.

4 Admission Criteria

To join this programme, the student should hold an undergraduate B.Sc. degree with a minimum grade of Good. Alternatively, the student may join the MSc. programme if he/she holds a postgraduate Diploma or MEng degree from an Egyptian University. Further details of the admission criteria are outlined in the internal postgraduate prospectus for the Faculty of Engineering, issued 2014-2015.

5 Academic standards

External references for standards (Benchmarks)

The external references for standards considered in the development of this programme were the Academic Reference Standards (ARS) prepared by the engineering education sector of the supreme council of universities in Egypt and those of the Framework for Higher Education Qualifications in England, Wales and Northern Island (Qualification Descriptors), Aug 2008.

6 What makes the programme distinctive:

The BUE Master Degree in Advanced Materials Science and Engineering is a programme designed to allow graduates to develop their knowledge on new and emerging materials science and engineering. The programme includes optional choice of subject matter whilst still allowing the possibility of some specialisation. The programme is intended to produce engineers who will be the designers and developers of the next generation of advanced engineering materials for contemporary applications.

Teaching staff are active and involved in materials research related topics, which includes the established Centre of Advanced Materials at the BUE, which influences the delivery and assessment methods used.

The programme is distinctive through its partnership with London South Bank University, which is a British University fully accredited and recognised as Highly Trusted Sponsor by the UK Border Agency.

http://www.studylondon.ac.uk/universities?gclid=CMqkkcv88MYCFa3MtAodEsQGWQ

The programme is also distinguished by the university's nationally recognised activities in the area of research led by the Centre for Advanced Materials (CAM), which makes its teaching led and flavored by research.

7 Curriculum Structure and Contents

No. of credit hours for MSc program: 40 credit hrs.

16	hrs. Compulsory
6	hrs. Elective
18	hrs. Thesis

8 Progression criteria.

Progression Criteria:

- To join this programme the student may be required to study up to 9 credit hours of modules, at the 500 level which he/she did not study before, as per the recommendation of the programme director and the students' engineering background, with a grade point average not less than (C+).
- Alternatively, the student may join this programme if he/she holds a postgraduate diploma with a grade point average not less than (C+).
- To progress the student should complete a total number of 22 credit hours with a grade point average not less than (B), at the 600 level.
- After completing 22 credit hours of taught modules, the student should complete 18 credit hours for his research work and thesis writing.

Thesis Requirements:

An MSc thesis (18 credit hours) should reflect that the student is capable of collecting and integrating data from a number of sources relevant to the state of the art, followed by critical review of previous studies. Hence the student is expected to define and state the problem of investigation, deduce a plan of work for the thesis, defining and describing the methodology of research.

A written thesis is required which shows the basic elements of state of the art, methodology of research and results and discussion sections, in addition to a conclusion.

9 Coding System

#	Program	Code
1	Materials Science and Engineering	MAT

مسلسل	القسم أو الشعبة: برنامج بينى	الرمز
1	علوم و هندسة المواد	مواد

10 Programme Description

The M.Sc. degree in Materials Science and Engineering consists of total 40 credit hours distributed over a minimum of 2 years as follows:

Compulsory modules	16 hrs	6 modules	25 %
Elective modules	6 hrs	2 modules	25 %
Thesis	18 hrs		50 %
Total	40 hrs	8 modules	100 %

10.1 List of compulsory modules

Code No.		Module Title	No. of Credit	No. of hours / week			
			hrs.	Lec.	Tut.	Total	
MAT	601	Advanced Mechanics of Materials	3	2	1	3	
MAT	602	Materials Applications and Selection Criteria	3	2	1	3	
MAT	603	Thermodynamics of Materials	3	2	1	3	
MAT	609	Design of Experiments and Measurement Methods	3	2	1	3	
MAT	620	Fundamentals of Finite Element	2	2		2	
MAT	621	Technical Writing	2	2		2	
		Total	16				

10.2 List of Elective modules

Code No.		Module Title	No. of Credit hrs.	No. of hours / week		
				Lec.	Total	
MAT	604	Advanced Materials Science	3	3	3	
MAT	605	Material Modelling	3	3	3	
MAT	606	Advanced Materials for Energy Applications	3	3	3	
MAT	607	Materials Degradation and Protection Methods	3	3	3	
MAT	608	Fracture Mechanics and Failure Analysis	3	3	3	
MAT	610	Composite Materials and Structures	3	3	3	
MAT	611	Polymer Structure Properties & Applications	3	3	3	
MAT	612	Advanced Finite Element Analysis	3	3	3	
MAT	613	Advanced Materials Characterization Techniques	3	3	3	
MAT	614	Advanced Manufacturing Methods	3	3	3	
MAT	615	Special Readings	3	3	3	

		Compulsory for M.Sc. Students				
MAT	617	Research Thesis	18	18		

4.Small brief of each module

MAT 501 **Fundamentals of Materials Science and Engineering**

Review of atomic theory and bonding – Introduction to quantum theory of solids and alloys – Brillioun zones and crystal symmetry – acoustic attenuation in metals – Green's functions and applications to solid state physics - An introduction to the properties and applications of a wide variety of materials: metals, polymers, ceramics, and composites. Crystalline structures – crystal defects – diffusion - electrical and magnetic properties of materials – mechanical properties of materials – metal, alloys and ceramics phase equilibrium concepts of thermodynamics and kinetics of transformations – polymer structures and properties – polymerization – polymer chains – structure property relationships – concepts of composite materials.

MAT 502 **Basic Materials Testing and Characterization**

Mechanical testing techniques and data analysis: tensile testing - hardness testing - impact testing - fatigue testing - creep testing - fracture toughness testing – microscopic investigation – x-ray analysis.

The course will be supported by laboratory sessions in professional labs.

MAT 503 **Stress Analysis**

Stress, Strain, and Axial loading - Analysis of beams - Bending Stresses - Transverse Shear stresses -Torsional Stresses - Combined Stresses -Stress and strain transformation - Deflection of Beams

MAT 504 **Foundations of Metal Forming and Casting**

Casting and solidification of metallic engineering alloys and composites – metal-forming methods: rolling, forging, sheet metal forming – joining techniques – casting and forming defects - effect of Metal Forming Processes on Materials Properties.

MAT 601 **Advanced Mechanics of Materials**

Review of stress strain concepts and relations- transformations of stress and strain – plane stresses – tensors - applications of finite element method - yield criteria - applications on yield criteria.

MAT 602 **Materials Applications and Selection Criteria**

This course is designed to facilitate sensible materials choices to avoid catastrophic failures leac to the loss of life and property. Design and the role of materials selection. Life cycle analysis, materials extraction and resource implications, Environmental impacts of processing, design for sustainability, use of sustainable materials, materials for green energy, end-of-life issues. Selecti criteria based on mechanical behavior of materials: yield phenomena, ductile and brittle fracture cracks and fracture toughness, fatigue, creep, corrosion and high temperature oxidation, and coa technology. Selection criteria and design, Ashby maps, data basis for materials properties.

MAT 603 Thermodynamics of Materials

. First law of thermodynamics and its applications to the calculations of heat involved in various materials processes such as chemical reactions and phase transformations - second law of thermodynamics and the concept of entropy - the application of maximum work theorem to engine efficiency - the equilibrium of a system under various thermodynamic conditions, with an emphasis on the Gibbs free energy functions at constant temperature and pressure conditions - the relationships among thermodynamic properties using the Maxwell relations - construction of Phase diagrams of single component systems from the Gibbs free energy function - applications of the Clapeyron equation to describe the phase boundaries - applications of thermodynamics to the determination of chemical equilibrium and to the calculation of the voltages of electrochemical reactions - the solution thermodynamics and its application to binary phase-diagrams.

MAT 620 Fundamentals of Finite Element Method

Basic concepts and field equations of interest. Variational Formulation & Approximation, Finite Elements Analysis of One-Dimensional and Two-Dimensional Problems

MAT 621 Research and Report Writing

Research methods – writing techniques - general form of a research paper - general style; Title Page; Abstract; Introduction; Literature Review; Materials and Methods (Methodology); Results; Discussion; Conclusion, Recommendation and Future Work

MAT 609 Design of Experiments and Measurement Methods

Review of statistics and hypothesis testing; Experiments of evaluation - Experiments of comparison - Experiments with single factors (ANOVA); factorial designs; fractional factorial; Fitting regression models; response surface methods and designs. Basic concepts and definitions. Theory of laser measurements. Ultra Sonic measurements - applications of 3D measurements. Techniques for measuring flow rate, temperature, pressure, fluid viscosity, level, etc.…- testing of materials (tension, compression, bending, torsion and hardness). Introduction to computer-based data acquisition. Basic concepts of data analysis. Introduction to probability and statistics, random variables, probability distributions, hypothesis testing, goodness-of-fit. Uncertainty analysis.

MAT 604 Advanced Materials Science

Structure–property inter-relationships – strengthening mechanisms –thermal and mechanical treatments (dislocation theory - hardening and thermo-mechanical treatment of steels and precipitation hardening of Al alloys) – all topics focusing on structure control. Composite material types (PMC, MMC, CMC), matrices- reinforcement- processing techniques of nano structured materials and composites- concepts of nano-structured materials – processing methods, materials and composites – (metals, polymers and ceramics) – multifunctional materials.

MAT 605 **Material Modeling**

Modeling of the thermodynamic behavior of materials, phase equilibrium, calculation using thermodynamic software – modeling of mechanical behavior of materials using finite element analysis-based programs –

MAT 606 **Advanced Materials for Energy Applications**

Motivations for new materials for energy applications (higher efficiency, reduced costs – enhanced lifetimes – lighter weights – reduced emissions – improved transmission, distribution and storage). Advanced materials for fossil fuel power plants – advanced materials for gas turbines and wind turbines – carbon capture transport and storage materials – advanced materials for hydrogen storage and transportation materials – materials for photovoltaics, solar cells, fuel cells and improved life management and reliability of materials. The course will be supported by necessary background in respective areas to cover needed basics in materials related topics. Fundamentals of materials for fusion and fission power plants.

MAT 607 **Material Degradation and Protection Methods**

Surface properties of materials - corrosion, friction and wear; introduction to surface engineering.

Corrosion, its economic effect, environmental and metallurgical aspects - mechanisms of corrosion - Types of cells responsible for corrosion - thermodynamics of corrosion - forms of corrosion - corrosion Protection: coating, Inhibitors, cathodic protection, anodic protection - material selection for construction - design for corrosion resistance.

Wear process, modes, and types. Wear measurement. Lubrication modes, types, applications. Metalworking fluids, solid lubricants, surface coating and surface treatments.

MAT 608 **Fracture Mechanics and Failure Analysis**

Ductile and brittle fracture - fast fracture and an introduction to fracture mechanics. Fatigue failure - high and low cycle fatigue, fatigue testing and lifetime predictions. Creep deformation and rupture. fracture mechanics - failure modes in engineering materials - failure analysis methods -nondestructive testing and evaluation – life estimation and materials selection for enhanced life. Failure modes, fault diagnosis, root cause analysis, failure analysis methods, nondestructive evaluation, fault diagnosis tree.

MAT 610 **Composite Materials and Structures**

Physical and mechanical properties of composite materials - Material models - Failure theories - Analysis of composite laminates and sandwich structures - Testing methods - nanocomposites.

MAT 611 **Polymer Structure Properties & Applications**

Relationships between polymer structure (chemical composition, molecular weight and flexibility, intermolecular order and bonding, super-molecular structure) and practical properties (processability, mechanical, acoustic, thermal, electrical, optical, and chemical) and applications.

The preparation, characterization, behavior and properties of polymer nano-composites-the major preparation routes - true thermodynamic compatibility in these systems. Case studies of specific systems will serve as opportunities to gain deeper understanding, and the safety issues surrounding nano-particle handling will also be presented.

MAT 612 Advanced Finite Element Analysis

Formulation for beam elements, plates and shells - Modeling of Composites laminates - Material nonlinearities - large deformations - Contact problems - Dynamic analysis.

MAT 613 Advanced Materials Characterization Techniques

Diffraction of x-rays by crystals – determination of crystal structures - X- ray methods – Electron microscopy: scanning electron microscopy (SEM), transmission electron microscopy (TEM) – atomic force microscopy (AFM) – Applications. The course will be supported by laboratory sessions in professional labs.

MAT 614 Advanced Manufacturing Methods

Advanced casting techniques: foam casting, rheo-casting, squeeze casting, thixo-forming – new joining techniques: friction stir welding – advanced machining – thermo-mechanical treatments – powder metallurgy – modern composites and nano-composites manufacturing techniques. All topics focusing on structure control.

MAT 615 Special readings in Engineering

Prerequisite: departmental approval. Given when interest develops. Topics may include analysis and/or design of energy or mechanical systems of current interest to material’s engineers.

MAT 616 Research Project

To be proposed by academic advisor and approved by research committee. Results submitted by student in a research report.

MAT 617 Thesis

To be proposed by academic advisor and approved by research committee Results submitted by student in a research thesis.

The BRITISH UNIVERSITY IN EGYPT

Contact information

E-mail: Weam.Ghaleb@bue.edu.eg **Ext. :2433**

For more information

1. Required documents: https://www.bue.edu.eg/general-requirements
2. English Level: https://www.bue.edu.eg/uploads/editor/PG%20English%20Level_Web%20site.pdf
3. PG Tuition Fees: https://www.bue.edu.eg/tuition-feess
4. PG Scholarship Scheme: https://www.bue.edu.eg/postgraduate-scholarships
5. Application link: https://pgs.bue.edu.eg/registration/Default.aspx