TURIN POLYTHECHNIC UNIVERSITY IN TASHKENT
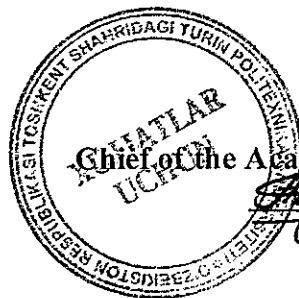
EDUCATIONAL PROGRAM

Academic year 2020-2021

on subject

Mathematics (Preparatory level)

For specialties:

Mechanical Engineering

Energy

Civil and Industrial Engineering

Information Technology

Tashkent 2020

Introduction

In a very brief summary on what is an engineer, one can say that engineers have the knowledge and ability to manipulate and to incorporate technological, scientific and mathematical elements while contributing to run properly a whole lot of society domains and to develop new means of improving performances. This link to a wide spectrum of society areas demands the engineer not only to possess the technical attributes mentioned before but also a set of skills to operate and interact within those areas, meaning that the engineer in the 21st century needs other skills aside from the core competencies which define him/her as an engineer. The activities of engineers have also changed, from developing new technical components, units, and equipment to advanced problem-solving requiring competence in project planning, implementation, and integration of complex systems of hardware and software. Engineering teams follow the so-called product lifecycle: ideation, product conception, product planning, product development and design, production planning, manufacturing, marketing and distribution, maintenance, repair, and overhaul to recycling and demolition. Consequently, engineers must complement their professional and technical expertise with non-technical competencies such as systematic problem solving, communications, management, and leadership skills.

A typical profile of engineers expected by industry covers four main areas:

• Technical and methodical competence (technical knowledge and know-how in natural sciences, engineering sciences, engineering expertise, and the ability to apply modern information and communication technologies);
• Personal competence (flexibility, profound general education background, willingness to perform,
willingness to engage in lifelong learning, mobility, credibility, and readiness to take responsibility);
• Management competence (managerial qualification, ability to assert oneself, decision-making
ability, ability to analyze and to evaluate, strategic thinking, and negotiating skills); and
• Social competence (persistence, intuition, intercultural competence, ability to communicate, ability to
negotiate compromises and trade-offs, and ability to work in teams).

We observe that global engineers need to have a broader set of skills, especially personal and interpersonal skills like oral and written communication, teamwork, ethics etcetera. These demands are now changing the perceptions on engineers and the engineering curricula.

Math preparation module

Section 1:General information

Module Title	Mathematics	
Module code		
Credits		
Year	Year 1	
Study Formats and Hours	**Study Formats**	**Hours**
	Lectures	60
	Practice -Tutorial/Revision	76
	Self Study	280
	Total Hours	416

Section 2: Academic Content

Aims	To enable students to: 1. Understand the basic principles and concepts of basic mathematics; 2. Investigate and understand mathematical content; 3. Make and test conjectures; 4. Formulate counterexamples
Learning Outcomes	At the end of the module participants will be able: 1. Approach problems from multiple perspectives 2. Use and value the connections among areas of mathematics 3. Use and value the connections between mathematics and other disciplines
Pre-requisite	None
Other information	N.A.

Section 3: Delivery of Subject and timetable

This is an introductory study to basic mathematics. Hence it will be taught to the students in the traditional mode weekly lectures and practice/tutorials. The topics covered during the lessons will be as follows:

Session	Topics	Lectures	Practice	Tutorial	Reference to prescribed text
Semester1 (Lectures 30h, Practice/Tutorials 38h)					
1	**Basic notions**				
	Sets. Operations with sets. Subsets, Venn diagrams, universal set, power set, cardinality. *Elements of mathematical logic.* Connectives. Predicates.Quantifiers. *Sets of numbers.* Real numbers. Absolute value. Radicals. The ordering of real numbers. Completeness of **R.** Numerical sequences and limits of sequences.	10	8	4	Lial, Appendix B Claudio Canuto, Anita Tabaco, Ch.1

	Sup and Inf. Cartesian product. Relations in the plane. Functions as relations. Numbers error.				
2	**Algebraic calculus**				
	Monomials and polynomials. Composition. Algebraic fractions. Factorials and binomial coefficients. Permutations. Newton's formula for binomial power. Elements of combinatory.	4		4	Lial,Ch.3 Claudio Canuto, Anita Tabaco, Ch.1
3	**Equations and systems**				
	First-degree equations. Second-degree equations. Equations of degree greater than 2. Irrational equations. Systems of linear equations (degree 1). Matrices. Systems of degree greater than 1.	8		10	Lial, Ch.2,9.
4	**Inequalities**				
	First-degree inequalities. Second -degree inequalities. Systems of inequalities. Inequalities of degree greater than 1. Rational inequalities. Inequalities involving absolute value. Irrational inequalities. Method of mathematical induction. Limits. Limits of sequences.	8		12	Lial, Ch. 1,4,7,8
	Total:	30	8	30	

Semester2 (Lectures 30h, Practice/Tutorials 38h)

5	**Analytic Geometry**				
	Cartesian coordinates. The line. Circumference. Parabola. Ellipse. Hyperbole.	10	10	4	Lial, Ch.6 Larsen, Ch. 6
6	**Functions**				
7	Range and pre-image. Surjective and injective functions. Inverse functions. Monotone functions. Composition of functions. Translations, rescaling, reflections. Elementary functions and properties. Powers. Polynomial and rational functions. Exponential and logarithmic functions. Trigonometric	10	10	4	Claudio Canuto, Anita Tabaco, Ch.2 Larsen, Ch.P

	functions and inverses.				
8	**Exponentials and logarithms**				
	Exponentials, logarithms. Exponential equations. Logarithmic equations. Exponential inequalities. Logarithmic inequalities.	4	4		Claudio Canuto, Anita Tabaco, Ch.2
9	**Trigonometry**				
10	Trigonometric functions (sin, cos, tan, etc.). Associated arcs. Trigonometric formulas. Graphics of trigonometric functions. Inverse trigonometric functions. Trigonometric equations. Trigonometric inequalities.	6	6		Claudio Canuto, Anita Tabaco, Ch.2 Larsen, Ch.1
	Total	30	30	8	

The timing/scheduling of topics may be varied depending on student feedback and progress.

Section 4: Subject Resources

Textbooks required	1. Claudio Canuto, Anita Tabaco. Mathematical Analysis I. Part I.Springer. 2008. 2. Margaret L.Lial, E.John Hornsby,Jr., Charles D. Miller Beginning algebra. Harper Collins College Publishers. 7th -edition. ISNB 0-673-99139-3 3. Ron Larson, Robert Hostetler. Trigonometry, Houghton Mifflin Company USA,2007 4. James Steward. Calculus. 5-th editionThomson Brooks/Cole. ISNB -0-534-39339-X 5. http://dmoz.org/Science/Math/ 6. http://www.math.uni-bonn.de/people/
Supplementary reading	1. Lial, Hugerfold and Holcomb, *Mathematics with Applications,* 9th edition, Pearson Prentice Hall, 2007,ISBN 0-321-44947-9 2. Michael Sullivan, Trigonometry, Chicago State University, 2012. 3. Jerome E. Kaufman, Karen L. Schwitters. Algebra for College Students. Thomson Higher Education 10 Davis Drive Belmont, CA 94002-3098 USA 2007 4. M.L. Keedy, M.L. Bittinger, Developmental Mathematics, Addison-Wesley publishing company, 1990 5. G.F. Simmons, Calculus with analytic geometry, International edition, 1996

Section 5: Assessment/course work

All assessment will comply with the TPU in Tashkent and Turin Polito University Assessment Rules and Regulations. There will be one midterm and one exam in each semester. Remember to take special note of the rules regarding plagiarism. Specific for this Subject are the following requirements per semester:

Item	Due dates	Weighting
Midterm 1	The middle of semester	3.0 (bonus)
Final Examination	The end of semester	30

Head of the
Department Of   D. Tulyaganov
                                                   26.08.20