Syllabus Attività Formativa

Anno Offerta	2020
Corso di Studio	SM34 - MATEMATICA
Regolamento Didattico	SM34-18-20
Percorso di Studio	PDS0-2018 - comune
Insegnamento/Modulo	534SM - ADVANCED GEOMETRY 3 - ADVANCED GEOMETRY 3
Attività Formativa Integrata	-
Partizione Studenti	-
Periodo Didattico	S2 - Secondo Semestre
Sede	TRIESTE
Anno Corso	1
Settore	MAT/03 - GEOMETRIA
Tipo attività Formativa	C - Affine/Integrativa
Ambito	20947 - Attività formative affini o integrative
CFU	9.0
Ore Attività Frontali	72.0
AF_ID	291112

Tipo Testo	Codice Tipo Testo	Num. Max. Caratteri	Obbl.	Testo in Italiano	Testo in Inglese
Lingua insegnament	LINGUA_INS	3800	Sì	English	English

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Contenuti (Dipl.Sup.)	CONTENUTI	3800	Sì	Algebraic geometry of affine and projective varieties. Zariski topology on affine and projective varieties. Hilbert Nullstellensatz. Regular and rational maps. Tangent spaces and singular points. Blow-up and outline of the resolution of singularities for curves. Selected topics in commutative algebra (commutative rings and modules).	Algebraic geometry of affine and projective varieties. Zariski topology on affine and projective varieties. Hilbert Nullstellensatz. Regular and rational maps. Tangent spaces and singular points. Blow-up and outline of the resolution of singularities for curves. Selected topics in commutative algebra (commutative rings and modules).
Testi di riferimento	TESTI_RIF	3800	Sì	I.R. Shafarevich: Basic Algebraic Geometry 1: Varieties in Projective Space, Third edition. Springer, Heidelberg, 2013 J. Harris: Algebraic geometry. A first course, Graduate Texts in Mathematics, 133, Springer-Verlag, New York, 1995. R. Hartshorne: Algebraic geometry, Graduate Texts in Mathematics, No. 52. Springer-Verlag, New York-Heidelberg, 1977. (First chapter) E. Kunz, Introduction to Commutative Algebra and Algebraic Geometry, Birkhauser, 1985 M.F. Atiyah - I.G. MacDonald, Introduction	I.R. Shafarevich: Basic Algebraic Geometry 1: Varieties in Projective Space, Third edition. Springer, Heidelberg, 2013 J. Harris: Algebraic geometry. A first course, Graduate Texts in Mathematics, 133, Springer-Verlag, New York, 1995. R. Hartshorne: Algebraic geometry, Graduate Texts in Mathematics, No. 52. Springer-Verlag, New York-Heidelberg, 1977. (first chapter) E. Kunz, Introduction to Commutative Algebra and Algebraic Geometry, Birkhauser, 1985 M.F. Atiyah - I.G. MacDonald, Introduction

				to Commutative Algebra, Addison-Wesley, 1969	to Commutative Algebra, Addison-Wesley, 1969
Obiettivi formativi	OBIETT_FORM	3800	Sì	KNOWLEDGE AND UNDERSTANDING By the end of the course the student is expected to be familiar with the fundamental objects of classical algebraic geometry, both affine and projective, and of basic concepts of commutative algebra. CAPACITY TO APPLY KNOWLEDGE AND UNDERSTANDING By the end of the course the student is expected to be able to apply the notions of basic algebraic geometry acquired to solve problems and exercises of medium difficulty. The exercises can also be proposed as easy theoretical results. JUDGMENT AUTONOMY By the end of the course the student is expected to be able to recognize and apply the most basic techniques of algebraic geometry and also to recognize the situations and problems in which these techniques can be used advantageously. COMMUNICATIVE SKILLS By the end of the course the student is expected to be able to express himself with proficient command of language and exposure security on the topics of the course. LEARNING CAPACITY	KNOWLEDGE AND UNDERSTANDING By the end of the course the student is expected to be familiar with the fundamental objects of classical algebraic geometry, both affine and projective, and of basic concepts of commutative algebra. CAPACITY TO APPLY KNOWLEDGE AND UNDERSTANDING By the end of the course the student is expected to be able to apply the notions of basic algebraic geometry acquired to solve problems and exercises of medium difficulty. The exercises can also be proposed as easy theoretical results. JUDGMENT AUTONOMY By the end of the course the student is expected to be able to recognize and apply the most basic techniques of algebraic geometry and also to recognize the situations and problems in which these techniques can be used advantageously. COMMUNICATIVE SKILLS By the end of the course the student is expected to be able to express himself with proficient command of language and exposure security on the topics of the course. LEARNING CAPACITY

				By the end of the course the student is expected to be able to consult the standard texts of algebraic geometry and commutative algebra.	By the end of the course the student is expected to be able to consult the standard texts of algebraic geometry and commutative algebra.
Prerequisiti	PREREQ	3800	Sì	Linear algebra, affine and projective space and their subspaces; basic notions of general topology; a basic knowledge of plane algebraic curves is useful but not essential.	Linear algebra, affine and projective space and their subspaces; basic notions of general topology; a basic knowledge of plane algebraic curves is useful but not essential.
Metodi didattici	METODI_DID	3800	Sì	Lectures and problem sessions. During the course some exercises will be assigned as homework, to be delivered in written form. The solutions will be discussed in class.	Lectures and problem sessions. During the course some exercises will be assigned as homework, to be delivered in written form. The solutions will be discussed in class.
Altre informazioni	ALTRO	3800	Sì	Information about the progress of the program and teaching materials will be posted on the site http://moodle2.units.it	Information about the progress of the program and teaching materials will be posted on the site http://moodle2.units.it
Modalità di verifica dell'apprendimento	MOD_VER_APPR	3800	Sì	The exam program coincides with the arguments of the lectures. The exam will be held in oral form only, but the students who will not deliver the assigned exercises will have to take a written test, consisting in solving exercises modeled on those assigned during the course. The oral exam aims to carry out an assessment of the student's familiarity with the program, comprehension of the contents (definitions	The exam program coincides with the arguments of the lectures. The exam will be held in oral form only, but the students who will not deliver the assigned exercises will have to take a written test, consisting in solving exercises modeled on those assigned during the course. The oral exam aims to carry out an assessment of the student's familiarity with the program, comprehension of the contents (definitions

				and proofs) and command of language.	and proofs) and command of language.
Programma esteso	PROGR_EST	3800	Sì	Affine and projective spaces and their subspaces. Affine algebraic sets. Zariski topology. Noetherian rings, Hilbert Nullstellensatz theorem, weak and strong form. Noether Normalization Lemma. Projective algebraic sets. Zariski topology on projective space. Projective version of Hilbert Nullstellensatz. Projective closure of an affine algebraic set. Irreducible topological spaces. Noetherian topological spaces, irreducible components. Regular and rational functions. Coordinate ring of an affine variety, field of rational functions, local ring of a point and its maximal ideal. Ring of homogeneous coordinates of a projective variety. Affine varieties, projective and quasi-projective (qp) varieties. Morphisms between qp varieties, pullback and functorial properties. Isomorphisms. Covering of any qp variety with affine open subsets. Segre varieties, products and universal property. Veronese map and intersections of projective varieties with hypersurfaces.	Affine and projective spaces and their subspaces. Affine algebraic sets. Zariski topology. Noetherian rings, Hilbert Nullstellensatz theorem, weak and strong form. Noether Normalization Lemma. Projective algebraic sets. Zariski topology on projective space. Projective version of Hilbert Nullstellensatz. Projective closure of an affine algebraic set. Irreducible topological spaces. Noetherian topological spaces, irreducible components. Regular and rational functions. Coordinate ring of an affine variety, field of rational functions, local ring of a point and its maximal ideal. Ring of homogeneous coordinates of a projective variety. Affine varieties, projective and quasi-projective (qp) varieties. Morphisms between qp varieties, pullback and functorial properties. Isomorphisms. Covering of any qp variety with affine open subsets. Segre varieties, products and universal property. Veronese map and intersections of projective varieties with hypersurfaces.

				Grassmannians. Rational and birational maps between qp varieties. Dimension theory: dimension of the intersection of an affine variety with an affine hypersurface. Projective varieties of codimension one. Dimension of the product of qp varieties, dimension of the affine cone of a projective variety. Dimension of an intersection. Complete intersections and set-theoretic complete intersections. Complete varieties, completeness of projective varieties. Integral elements, integral extensions ad their properties. Finite morphisms. Theorem on the dimension of the fibres of a morphism. Zariski tangent space at a point of a qp variety, its invariance by isomorphism. Smooth and singular points. Regular local rings. The blow up of the affine space at a point.	Grassmannians. Rational and birational maps between qp varieties. Dimension theory: dimension of the intersection of an affine variety with an affine hypersurface. Projective varieties of codimension one. Dimension of the product of qp varieties, dimension of the affine cone of a projective variety. Dimension of an intersection. Complete intersections and set-theoretic complete intersections. Complete varieties, completeness of projective varieties. Integral elements, integral extensions ad their properties. Finite morphisms. Theorem on the dimension of the fibres of a morphism. Zariski tangent space at a point of a qp variety, its invariance by isomorphism. Smooth and singular points. Regular local rings. The blow up of the affine space at a point.