Private University of Tacna (UPT)

Faculty of Architecture and Urban Planning

School of Architecture



Book of short descriptions by course

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Equipo de Trabajo

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1.1 AR1B1. Introduction to BIM

Introduction to BIM opens the ten-course BIM I-X sequence (AR1B1 to AR4B1) that runs obligatorily alongside the Design Studio and Representation lines across the whole program. As the first course in the sequence, it has no prerequisite: it introduces students to Building Information Modeling as an object-based, data-centric way of working, teaches them to produce a complete construction documentation set directly from a BIM model instead of drafting it separately, and establishes the file-organization and worksharing habits that every later, team-based BIM course in the sequence depends on. The course's transversal Practicum unit – a hands-on software-lab component that recurs, unchanged in structure, across all ten courses of the sequence – gives students graded, guided exercises in the authoring tool itself, building the baseline software fluency the rest of the sequence (coordination, scheduling, cost estimation, structural and MEP integration) will build upon.

This course includes the following topics: **1:** BIM Fundamentals and Authoring **2:** BIM-Based Construction Documentation **3:** BIM Model Organization and Worksharing **4:** BIM Software Practicum

1.2 AR1D1. Design Studio I

Design Studio I: Foundations is the student's first encounter with the studio culture that defines architectural education: short, intensive design exercises, physical model-making, pin-up and desk-crit critique, and iterative revision. Starting from purely abstract explorations of space, form, and light, the course progressively scales up these operations into the student's first habitable proposal – a minimal pavilion or similar small object-to-space exercise – while introducing the orthographic and three-dimensional drawing conventions needed to communicate spatial ideas. This course has no prerequisite within the Design Studio sequence and is the foundation for Design Studio II (AR1D2).

This course includes the following topics: **1:** Foundations of Architectural Design **2:** Design Process and Creative Methods **3:** Orthographic Drawing and Conventions

1.3 AR1R1. Geometry and Analog Drawing

Geometry and Analog Drawing is the entry point of the Representation sequence (Analog Drawing I – Digital Drafting II – 3D Modeling and Animation III), which escalates from hand drawing to CAD/BIM to parametric 3D/XR over the first three semesters. Before any digital tool is introduced, students must master the underlying descriptive- geometry logic (projection, axonometry, perspective) and the drafting conventions (line weights, dimensioning, symbology) that every later digital workflow still encodes. The course grounds this in real urban elements – street sections, lots, public-space plans – rather than abstract solids, so the representational skill is immediately usable in the urbanism studio sequence.

This course includes the following topics: **1:** Euclidean and Projective Geometry **2:** Orthographic Drawing and Conventions **3:** Graphic Symbols and Drafting Conventions

1.4 MA100. Basic Mathematics

The Basic Mathematics course is mandatory and provides the conceptual tools necessary for logical reasoning and problem solving. The course ranges from propositional logic and set theory to the study of real numbers, complex numbers, polynomials, and matrices. These concepts are fundamental for developing the abstraction and mathematical formalization skills required in the later stages of the Computer Science program.

This course includes the following topics: **1:** Logic and Sets **2:** Number Systems **3:** Polynomials and Matrices **4:** Statistics and Probability

1.5 MA111. Calculus I

This course introduces the fundamental concepts of differential calculus of single-variable real functions. It provides the mathematical foundations necessary for analyzing change and motion in science and engineering, developing logical reasoning through the study of limits, continuity, and derivatives.

This course includes the following topics: **1:** Limits and Continuity **2:** Differential Calculus **3:** Integral Calculus

1.6 EG163. Communication I

Comunicación I es el primer curso de la línea de comunicación del Área de Estudios Generales, de naturaleza teórico-práctica y carácter obligatorio. Desarrolla la competencia comunicativa del estudiante para que sea capaz de aplicar técnicas y herramientas de expresión oral, enfatizando en la lectura y comprensión de textos literarios y no literarios, así como en habilidades esenciales para la escritura y producción de textos sencillos, aplicando la normatividad vigente del español. Cubre la comunicación humana y sus elementos, las técnicas y estrategias de expresión oral en disertaciones breves y el discurso, la determinación y el análisis personal del nivel de comprensión de lectura, y la producción de textos sencillos y cotidianos, ensayos breves y documentos administrativos de uso común.

This course includes the following topics: **1:** **2:** **3:**

1.7 EG164. Digital Competencies Development

Desarrollo de Competencias Digitales pertenece al Área de Estudios Generales, es de carácter obligatorio y de naturaleza teórico-práctica. Tiene como propósito desarrollar las competencias digitales de los estudiantes en las dimensiones de información, comunicación y creación de contenido, de modo que puedan utilizar de manera más efectiva los recursos que ofrecen las tecnologías de información y comunicación y aplicarlas en sus tareas académicas. Cubre la búsqueda, organización y almacenamiento de información; el uso de herramientas de comunicación y trabajo colaborativo en línea; y la creación de contenido mediante procesadores de texto, presentaciones y hojas de cálculo, con énfasis en la ética informática.

This course includes the following topics: **1:** **2:** **3:**

1.8 EG165. Strategies for Autonomous Learning

Estrategias para el Aprendizaje Autónomo pertenece al Área de Estudios Generales, es de carácter obligatorio y de naturaleza teórica. Tiene como propósito que los estudiantes desarrollen habilidades y estrategias de aprendizaje que les permitan desempeñarse como aprendices autónomos, haciendo uso eficiente del tiempo y de los recursos de información disponibles para mejorar los resultados de aprendizaje en los cursos de su carrera y lograr una adaptación exitosa a la vida universitaria. Cubre el autodiagnóstico de estrategias de aprendizaje y habilidades para el estudio, los enfoques y estilos de aprendizaje, las estrategias de aprendizaje (cognitivas, afectivas, metacognitivas) y las herramientas y técnicas para mejorarlas.

This course includes the following topics: **1:** **2:** **3:**

1.9 EG166. Basic Mathematics

Matemática Básica pertenece al Área de Estudios Generales, es de carácter obligatorio y de naturaleza teórico-práctica. Tiene como propósito desarrollar el pensamiento lógico, la conexión matemática y la resolución de problemas en situaciones del contexto real y aplicado a la arquitectura. Comprende la teoría de conjuntos y sus operaciones, el sistema de números reales, ecuaciones lineales y cuadráticas con dos y tres variables, inecuaciones lineales y cuadráticas, funciones, proporcionalidad, semejanza de triángulos, área de figuras planas y su ubicación en el plano cartesiano, lógica proposicional y esquemas lógicos.

This course includes the following topics: **1:** **2:** **3:**

2.1 AR1B2. Parametric Modeling and Generative Design

Parametric Modeling and Generative Design is the second course of the obligatory BIM I-X sequence, requiring Introduction to BIM (AR1B1) as a prerequisite. Where AR1B1 establishes object-based authoring, LOD, and model-derived documentation, this course extends that authoring skillset into parametric and generative territory: building custom parametric families and components, driving them with visual scripting (Dynamo, Grasshopper-to-Revit), and coupling a parametric model to a performance metric to generate and compare design options (generative design/optioneering). A third unit grounds this computational work physically, taking a digital model through CNC, laser-cutting, 3D-printing, or robotic-fabrication workflows to produce a prototype – the KU this course is the first to actually use. The recurring software-practicum unit anchors all of this in guided, certification-aligned exercises specific to the course's parametric/generative tool focus, preparing students for the multidisciplinary model coordination they will take on next in Multidisciplinary Coordination (AR2B1).

This course includes the following topics: **1:** Parametric Modeling and Visual Scripting for BIM **2:** Generative Design and Optioneering **3:** Digital Fabrication Output and CNC Toolpaths **4:** BIM Software Practicum

2.2 AR1D2. Design Studio II

Design Studio II: Single-Family Housing is the student's first complete, habitable design project, building on the spatial, formal, and representational foundations developed in Design Studio I (AR1D1, prerequisite). Students design a single-family house on a real lot, resolving a full domestic program – living, sleeping, service, and outdoor spaces – while responding to accessibility requirements, daylight and thermal comfort, and the specific conditions of the site. The studio introduces the residential structural systems – confined masonry, timber framing, and reinforced adobe – most commonly used to build a single-family house in Peru. It continues the pin-up/desk-crit critique culture and introduces the communication skills (design boards, physical models, verbal presentation) needed to defend a complete design proposal. This course is the foundation for Design Studio III (AR1D3).

This course includes the following topics: **1:** Human-Centered and Inclusive Design **2:** Residential and Vernacular Structural Systems **3:** Housing and Residential Environments **4:** Daylighting and Visual Comfort **5:** Thermal Comfort and Passive Systems **6:** Design Process and Creative Methods **7:** Architectural Communication and Presentation

2.3 AR2R1. Digital Drafting

Digital Drafting is the second step of the Representation sequence, building directly on the orthogonal-projection and drafting-convention foundations from Geometry and Analog Drawing I (ARC1R1) and translating them into professional CAD/BIM software (Civil 3D, BricsCAD BIM). It introduces layer management, parametric/visual scripting, and generative-AI-assisted ideation – the production pipeline every later urbanism studio and the Topography course (ARC1T1) will assume students already have. Dedicated BIM authoring is left to the BIM course sequence (AR1B1 onward), which this course precedes.

This course includes the following topics: **1:** Computer-Aided Drafting (CAD) **2:** Parametric Design and Visual Programming **3:** Generative AI for Architectural Design

2.4 ID101. Technical and professional English I

English is the primary language of science, engineering, and technology worldwide. For computing and engineering students, mastering English means gaining direct access to technical documentation, research papers, and professional collaboration without translation barriers. This course builds foundational English skills using contexts drawn from computing systems, hardware, and the everyday work of engineers and scientists.

This course includes the following topics: **1:** Welcome to Computing **2:** Parts and Systems **3:** How It Works **4:** What Engineers Do **5:** Inside a Computer **6:** Can Computers Think? **7:** Computing History **8:** My Professional Goals in Computing

2.5 EG263. Communication II

Comunicación II es el segundo curso de la línea de comunicación del Área de Estudios Generales, de naturaleza teórico-práctica y carácter obligatorio. Tiene como propósito el fortalecimiento de la competencia comunicativa de los estudiantes mediante la comprensión, producción y comunicación oral y escrita de discursos académicos de acuerdo con su especialidad. Comprende el texto lingüístico (estructura y redacción), los documentos académicos y el artículo académico, los principios básicos de la redacción (coherencia y cohesión), el proceso de producción escrita (planificación, textualización y revisión), el ensayo académico y las normas APA para citas y referencias.

This course includes the following topics: **1: 2: 3:**

2.6 EG264. Philosophy

Filosofía pertenece al Área de Estudios Generales, es de carácter obligatorio y de naturaleza teórica. Tiene como propósito desarrollar la reflexión y el juicio crítico, así como el interés ante los diversos problemas del mundo, del hombre y de la vida que se han presentado al pensamiento humano, mediante el análisis de las posiciones y teorías de los filósofos a través del tiempo y la expresión de puntos de vista propios. Comprende el origen de la filosofía, sus disciplinas, la filosofía griega y sus filósofos, la filosofía cristiana y la escolástica, el problema del conocimiento en la edad moderna (racionalismo, empirismo, criticismo), la filosofía política moderna, y la filosofía contemporánea, latinoamericana y peruana.

This course includes the following topics: **1: 2: 3:**

2.7 EG265. Peruvian Territory. National Defense and Security

Territorio Peruano. Defensa y Seguridad Nacional pertenece al Área de Estudios Generales, es de carácter obligatorio y de naturaleza teórica. Tiene como propósito la comprensión de la realidad geográfica del Perú, reconociendo sus particularidades, así como el sistema de seguridad y defensa nacional, de modo que el estudiante adquiera conocimientos sobre la realidad socioeconómica y sociocultural de su comunidad, región y del ámbito nacional. Comprende la geografía del Perú y sus pisos ecológicos, el Estado peruano y la constitución política, los principios y valores de la persona humana, la responsabilidad social, la corrupción y sus causas, y el sistema de defensa nacional y defensa civil.

This course includes the following topics: **1: 2: 3:**

3.1 AR1D3. Design Studio III

Design Studio III: Collective Housing moves the student from the single dwelling designed in Design Studio II (AR1D2, prerequisite) to medium-density collective housing. Students explore housing typologies – blocks, duplexes, row houses –

and the relationship between the individual unit, the building, and shared community space. The studio places particular emphasis on the lateral structural systems that medium-density housing requires, and on designing equitably for the social diversity of a collective housing community. This course is the foundation for Design Studio IV (AR2D1), which introduces the program's first public building typology.

This course includes the following topics: **1:** Housing and Residential Environments **2:** Urban Form and Morphology **3:** Human-Centered and Inclusive Design **4:** Lateral Load-Resisting Systems **5:** Social Equity and Inclusive Urbanism

3.2 AR2B1. Multidisciplinary Coordination

Multidisciplinary Coordination is the third course of the ten-course BIM I-X sequence, building directly on the parametric modeling and generative design skills developed in Parametric Modeling and Generative Design (AR1B2). It shifts the sequence's focus from single-author model authoring to the federated, multidisciplinary practice that defines real BIM projects: assembling and coordinating models from multiple disciplines, resolving clashes through a Common Data Environment, collaborating in real time on cloud-based platforms, and tracking design and construction issues through model-linked BCF and RFI workflows. This course precedes BIM Execution Planning (AR2B2), which formalizes these practices into standards and delivery-method requirements.

This course includes the following topics: **1:** Multidisciplinary Model Coordination **2:** Collaborative BIM Workflows **3:** Model-Based Issue and RFI Management **4:** BIM Software Practicum

3.3 AR3R1. 3D Modeling and Virtual Animation

3D Modeling and Virtual Animation closes the Representation sequence, building on the CAD/BIM production pipeline from Digital Drafting (ARC2R1) and extending it into real-time 3D, simulation, and immersive media (SketchUp/V-Ray/Blender, Unreal Engine/Twinmotion). It is the course that equips students to actually communicate the territorial and urban proposals developed in the Taller de Urbanismo sequence to authorities, investors, and affected communities – the course's own emphasis on storytelling and citizen participation makes this an explicit communication, not just a visualization, skill.

This course includes the following topics: **1:** Three-Dimensional Modeling **2:** Simulation and Performance Analysis **3:** Augmented, Virtual, and Mixed Reality (XR) **4:** Architectural Communication and Presentation

3.4 ID102. Technical and professional English II

Building on foundational English skills, this course develops the student's ability to communicate in technical and scientific contexts with greater fluency. Grammar structures are practiced through reading and producing descriptions of technological systems, scientific phenomena, and engineering processes. Students gain vocabulary relevant to computing, data, and the physical sciences.

This course includes the following topics: **1:** Breakthroughs and Discoveries **2:** Data and Variables **3:** Future of Technology **4:** Comparing Technologies **5:** Running Processes **6:** Software Milestones **7:** Technical Challenges **8:** English for Technology II

3.5 EG364. Ethics

Ética pertenece al Área de Estudios Generales, es de carácter obligatorio y de naturaleza teórica. Tiene como propósito capacitar al estudiante en el conocimiento y aplicación de los principios éticos que deben regir su conducta y que le permitan asumir un compromiso ético en su trabajo y en la sociedad. Comprende la ética y la moral, el acto y la persona moral, la conciencia y responsabilidad moral, las teorías éticas y los dilemas morales, el Código de Ética del Colegio de Arquitectos del Perú, los casos de corrupción y falta de ética en la arquitectura, y la ética en proyectos arquitectónicos, licitaciones y ejecución de obras.

This course includes the following topics: **1:** **2:** **3:**

3.6 EG366. Personal Development and Leadership

Desarrollo Personal y Liderazgo pertenece al Área de Estudios Generales, es de carácter obligatorio y de naturaleza teórica. Tiene como propósito desarrollar habilidades personales y sociales de los estudiantes, potenciando el avance de actitudes de comunicación asertiva, liderazgo y sana convivencia e inclusión con personas con discapacidad, favoreciendo su crecimiento personal y profesional. Comprende la inteligencia emocional, la inteligencia intrapersonal e interpersonal, el proyecto de vida, el liderazgo, la discapacidad, la persona con discapacidad, los tipos de discapacidad y los derechos de la persona con discapacidad.

This course includes the following topics: **1:** **2:** **3:**

4.1 AR1T1. Digital Topography

Digital Topography gives students the territorial-measurement and geospatial-data foundation – scale, coordinate systems, cartography, GIS, remote sensing – that every subsequent territorial-analysis and urban-planning studio course assumes. Unlike a classic surveying course centered on field instruments, this one is built on Territorial Analysis and Urban Information Systems (TAN), the Urbanism BOK's own knowledge area for exactly this content, so its digital/GIS emphasis matches how terrain and cadastral data are actually produced and consumed in contemporary urban planning practice.

This course includes the following topics: **1:** Territorial Concepts, Scales, and Spatial Reference **2:** Cartography and Spatial Representation **3:** Geographic Information Systems **4:** Remote Sensing and Earth Observation

4.2 AR2B2. BIM Execution Planning

BIM Execution Planning is the fourth course of the ten-course BIM I-X sequence (AR1B1 to AR4B1), following Multidisciplinary Coordination (AR2B1, prerequisite). Having learned to author, document, organize, coordinate, and collaborate on a shared BIM model in the first three courses, students now step back to the project-management layer that governs how BIM itself is planned, mandated, and contracted: drafting a BIM Execution Plan (BEP) and information-delivery requirements under ISO 19650, identifying the national and jurisdictional BIM mandates and contractual provisions (model authorship, liability, intellectual property) that apply to a given project, and matching a project's delivery method – Design-Bid-Build, Design-Build, Construction Management at Risk, or Integrated Project Delivery – to the BIM maturity level it actually requires. The course's transversal Practicum unit continues the hands-on software-lab component that recurs, unchanged in structure, across all ten courses of the sequence.

This course includes the following topics: **1:** BIM Execution Planning and Standards **2:** BIM Standards, Policy, and Contracts **3:** BIM Across Project Delivery Methods **4:** BIM Software Practicum

4.3 AR2D1. Design Studio IV

Design Studio IV: Neighborhood Facilities is the student's first public-building project, following Design Studio III (AR1D3, prerequisite). Working at the scale of a neighborhood library or a community health post, students design a medium-scale public facility and, for the first time in the sequence, develop its structural system explicitly as part of the architectural proposal – selecting and sizing the vertical and lateral load-resisting elements, and coordinating them with construction assemblies, natural ventilation strategies, and the applicable building codes. This course is the foundation for Design Studio V (AR2D2).

This course includes the following topics: **1:** Structural Principles and Mechanics **2:** Vertical Load Path and Foundations **3:** Natural Ventilation and Indoor Air Quality **4:** Building Systems and Assemblies **5:** Building Codes, Accessibility, and Zoning

4.4 ID201. Technical and professional English III

At this level, students engage with English as the primary medium for accessing and producing technical content in computing, engineering, and the sciences. Grammar structures are applied to reading scientific articles, writing technical reports, describing engineering processes, and participating in professional discussions. The course bridges everyday English fluency with the demands of technical communication.

This course includes the following topics: **1:** Technical Communication **2:** Comparing Architectures **3:** Then and Now in Computing **4:** Engineering Standards and Protocols **5:** How Systems Are Built **6:** Debugging and Analysis **7:** Research and Innovation **8:** Technical English III

4.5 EG363. Ecology and Sustainable Development

Ecología y Desarrollo Sostenible pertenece al Área de Estudios Generales, es de carácter obligatorio y de naturaleza teórica. Tiene como propósito la comprensión de la interrelación entre los seres vivos y el medio ambiente, así como la repercusión de la problemática ambiental del mundo actual con el desarrollo de la vida y con el desarrollo económico y social, enfatizando en la comprensión de la responsabilidad del estudiante como persona y como profesional. Comprende los principios y conceptos de la ecología, los ecosistemas y la biodiversidad, la problemática ambiental y el cambio climático, la contaminación y los recursos naturales, y el desarrollo sostenible aplicado a la arquitectura.

This course includes the following topics: **1:** **2:** **3:**

4.6 EG365. Peru's Problems and Challenges in a Global World

Problemas y Desafíos del Perú en un Mundo Global pertenece al Área de Estudios Generales, es de carácter obligatorio y de naturaleza teórica. Tiene como propósito la comprensión de los problemas sociopolíticos que enfrenta el Perú y que son desafíos para su desarrollo y progreso, en el contexto de la sociedad global del siglo XXI. Comprende el Estado peruano y la gobernabilidad, el desarrollo político y la democracia, los regímenes políticos, el Estado y la crisis de representatividad, la economía social de mercado y la corrupción, la diversidad social y las brechas y desigualdades, y los procesos de producción, inflación, globalización y comercio internacional.

This course includes the following topics: **1:** **2:** **3:**

5.1 AR2B3. BIM Scheduling and Cost

BIM Scheduling and Cost is the fifth course of the mandatory BIM I-X sequence, building directly on the authoring and multidisciplinary coordination skills developed through AR2B2. It moves the student from a purely geometric and coordination-oriented use of the BIM model into its project-controls dimension: linking the model to time (4D scheduling) and cost (5D estimating), and then overlaying Lean Construction management principles – the Last Planner System and pull planning – onto that linked model to improve the reliability of construction sequencing. This course is what equips students to use BIM not just to design and coordinate a building, but to plan, cost, and manage its actual construction, preparing them for the professional-practice and construction-administration content later in the curriculum.

This course includes the following topics: **1:** 4D BIM and Construction Scheduling **2:** 5D BIM and Cost Estimation **3:** Lean Construction and 4D BIM Integration **4:** BIM Software Practicum

5.2 AR2D2. Design Studio V

Design Studio V: Educational/Cultural Building develops a medium-scale building with a markedly more complex program than Design Studio IV (AR2D1,

prerequisite) – a school, library, or small cultural center – in which an explicit long-span structural system and a deliberately performance-driven design process generate, rather than merely accommodate, the architectural proposal. The studio asks students to resolve daylight, acoustic, and mechanical comfort criteria for spaces with specific performance requirements (classrooms, auditoria, galleries), and to detail a high-performance building envelope that supports those criteria. This course is the foundation for Design Studio VI (AR2D3).

This course includes the following topics: **1:** Long-Span and Special Structures **2:** Performance-Driven Design **3:** Daylighting and Visual Comfort **4:** Acoustics and Noise Control **5:** Mechanical Systems (HVAC) **6:** Facade and Building Envelope Technology

5.3 ID202. Technical and professional English IV

At the intermediate level, students apply English to the full range of technical communication required in computing and engineering practice: reading research papers, writing structured technical documents, analyzing case studies, and engaging in professional dialogue. Grammar structures are taught through authentic computing and engineering contexts, reinforcing both linguistic competence and disciplinary knowledge.

This course includes the following topics: **1:** Best Practices and Ethics **2:** Failures and Root Causes **3:** If-Then Logic **4:** Ongoing Research **5:** Manufacturing and Deployment **6:** Tech Roadmaps **7:** Technical Teams **8:** Technical English IV: Networks and Security

6.1 AR2D3. Design Studio VI

Design Studio VI: Mixed-Use Building raises the program and scale complexity introduced in Design Studio V (AR2D2, prerequisite) to a taller, mixed-use building that stacks residential, commercial, and/or civic uses and requires explicit coordination with building systems (structural, envelope, and MEP). Students design a building whose viability depends as much on development feasibility as on architectural resolution, and practice the project-management skills needed to carry a complex proposal from concept through a coordinated construction-ready design. This course is the foundation for the Urban Design Studio sequence that begins with Design Studio VII (AR3D1).

This course includes the following topics: **1:** Large-Scale and Complex Buildings **2:** Building Systems and Assemblies **3:** Seismic Design for Architecture **4:** Development Process and Feasibility **5:** Project Management and Construction Economics

6.2 AR3B1. Structural and MEP Coordination

Structural and MEP Coordination is the sixth course of the ten-course BIM I-X sequence (AR1B1 to AR4B1), following BIM Scheduling and Cost (AR2B3, prerequisite). Having established scheduling, cost, and lean-construction habits on the federated model, students now turn the coordination skills built earlier in the sequence (Multidisciplinary Coordination, AR2B1) toward the structural

and MEP disciplines specifically: exchanging models with structural analysis and MEP routing software, resolving the spatial conflicts that generate RFIs on real projects, and developing those coordinated models to fabrication-level detail (LOD 400) for shop drawings and prefabrication. The course also introduces systematic model quality control – auditing and parameter validation – as the discipline that makes every later coordination and federation step on the sequence's models trustworthy. As in every course of the sequence, the transversal Practicum unit gives students graded, guided exercises in the structural/MEP and fabrication-detailing software this course's theme requires, preparing them for the course that follows, Sustainability and Circular Economy (AR3B2).

This course includes the following topics: **1:** BIM for Structural and MEP Coordination **2:** Fabrication-Level BIM Detailing **3:** BIM Model Quality Control and Auditing **4:** BIM Software Practicum

6.3 ID203. Technical and professional English V

A fundamental part of the integral formation of a professional is the ability to communicate in a foreign language in addition to the native language itself. In the engineering and computing career, technical English is the most critical tool for accessing the forefront of knowledge and research, writing scientific papers, participating in international conferences, and collaborating in global teams. This course brings students to the level of autonomous technical communicators capable of producing and critically evaluating academic and professional content.

This course includes the following topics: **1:** Scientific Argumentation **2:** Research Methodology **3:** Case Studies **4:** Research Proposals **5:** Technical Documentation **6:** Long-term Projects **7:** Advanced Technical Writing **8:** English for Software Engineering

7.1 AR3B2. Sustainability and Circular Economy

Sustainability and Circular Economy is the seventh course of the ten-course BIM I-X sequence (AR1B1 to AR4B1) that runs obligatorily alongside the Design Studio and Representation lines across the whole program. Building on Structural and MEP Coordination (AR3B1, prerequisite), where students consolidated model-based coordination and delivery practice, this course turns the BIM model into the data source for a building's environmental performance: exporting model geometry and materials to energy and daylight analysis tools, tagging model elements for circular-economy strategies such as design-for-disassembly and material passports, and tracking a project's compliance with green-building certification systems (LEED, EDGE, BREEAM) directly from model data and generating the corresponding documentation. The course's transversal Practicum unit – a hands-on software-lab component that recurs, unchanged in structure, across all ten courses of the sequence – shifts its guided exercises and certification-aligned practice to the sustainability-analysis and certification-tracking tools relevant to this course's theme.

This course includes the following topics: **1:** BIM for Sustainability Analysis **2:** BIM for Circular Economy and Material Reuse **3:** BIM-Supported Green

Building Certification **4:** BIM Software Practicum

7.2 AR3D1. Design Studio VII

Urban Design Studio VII: Public Space and Landscape shifts the sequence's scale of operation from the single building, the focus of Design Studio VI (AR2D3, prerequisite), to the city: streets, blocks, public space, and the urban tissue that frames every building the students have designed so far. Students analyze the morphology of an existing urban fabric and the planning frameworks (zoning, master-planning, contemporary urban theory) that shape it, then propose an urban design and landscape intervention at the scale of a public space, a street, or a neighborhood. The course is the foundation for Design Studio VIII (AR3D2), the first of the two more specialized, higher-complexity studios that close the sequence.

This course includes the following topics: **1:** Urban Form and Morphology **2:** Contemporary Planning Methods and Theory **3:** Urban Design at Multiple Scales **4:** Landscape and Open Space Design **5:** Landscape Design Principles and Process **6:** Urban Landscape and Green Infrastructure

7.3 AR400. Scientific Research Methodology

Scientific Research Methodology opens the research track of the specialization (Methodology – Statistics – Research Workshop – Research Work, ARC400-ARC403), giving every student the common, topic-independent toolkit – epistemology, research design, core quantitative and qualitative methods, theoretical-framework construction – before Research Workshop (ARC402) applies it to each student's own thesis topic and Statistics (ARC401) deepens the quantitative/instrument side. It differs in emphasis from the existing Architecture Research Methodology course (AR400), which focuses on evidence-based design and post-occupancy evaluation specific to buildings; this course instead targets territorial and urban-scale research problems.

This course includes the following topics: **1:** Research Design and Methodologies **2:** Theoretical Framework and Literature Review **3:** Quantitative Methods in Architectural Research **4:** Qualitative and Ethnographic Methods

8.1 AR3B3. Facilities Management

Facilities Management is the eighth course in the obligatory BIM I-X sequence, building directly on Sustainability and Circular Economy (AR3B2, prerequisite). Where the first seven courses in the sequence progressively build, coordinate, schedule, cost, and environmentally evaluate a BIM model through design and construction, this course moves the model across the handover threshold into building operations: preparing COBie asset data and as-built models for facilities management, evolving that handover model into a live operational digital twin through IoT sensor integration and predictive-maintenance workflows, and structuring the underlying asset data with industry classification standards (Uniclass, OmniClass) and the COBie schema. A dedicated software practicum, common to every course in the sequence, grounds this theoretical

content in guided, certification-aligned exercises. The course prepares students for Heritage and Infrastructure (AR3B4), which extends BIM into heritage documentation, infrastructure, and reality capture.

This course includes the following topics: **1:** BIM for Facilities Management **2:** Operational Digital Twins from BIM **3:** Asset Classification and Data Standards for FM **4:** BIM Software Practicum

8.2 AR3D2. Design Studio VIII

Design Studio VIII: Heritage and Complex Project follows the urban scale of Urban Design Studio VII (AR3D1, prerequisite) with a return to the building scale, now at a markedly higher level of complexity: students choose between the adaptive reuse of a historic building, or a large institutional project, as the specialization axis of this studio. The heritage track introduces the philosophical foundations and documentation methods of architectural conservation, the structural assessment of existing historic fabric, and the design strategies for adapting a historic building to new uses, including circular-economy principles for material reuse. This course is the foundation for Design Studio IX (AR3D3).

This course includes the following topics: **1:** Theory and Philosophy of Conservation **2:** Adaptive Reuse and Building Transformation **3:** Historic Documentation and Digital Survey **4:** Structural Assessment of Historic Buildings **5:** Large-Scale and Complex Buildings **6:** Circular and Recycled Materials

8.3 AR401. Statistics and Research Instruments

Statistics and Research Instruments is the second course of the research track, taking the research-design foundation from Scientific Research Methodology (ARC400) and adding the quantitative-analysis and instrument-design toolkit – descriptive statistics, estimation, hypothesis testing, simple regression – that Research Workshop (ARC402) will assume students can apply unsupervised to their own thesis data.

This course includes the following topics: **1:** Numerical Summaries: Location, Spread, and Shape **2:** Point Estimation **3:** Interval Estimation and Confidence Intervals **4:** Hypothesis Testing Foundations **5:** Simple Linear Regression **6:** Research Hypotheses and Variables

9.1 AR3B4. Heritage and Infrastructure

Heritage and Infrastructure is the ninth course of the ten-course BIM I-X sequence, building on the authoring, coordination, scheduling, cost, sustainability, and facilities-management workflows developed through Facilities Management (AR3B3, prerequisite). It takes BIM methods beyond the conventional new-build vertical building: Heritage BIM (HBIM) for documenting and monitoring historic fabric, BIM's extension to horizontal/civil infrastructure and city-scale urban information modeling, and reality-capture techniques (laser scanning, photogrammetry) that ground any of these models in verified real-world geometry. Together with the recurring BIM Software Practicum, it equips students

with the specialized BIM skill set needed for heritage conservation, infrastructure, and as-built documentation practice, immediately ahead of the sequence's integrative capstone course, AI-Assisted Automation.

This course includes the following topics: **1:** Heritage BIM (HBIM) **2:** BIM for Infrastructure and Urban Modeling **3:** Reality Capture for BIM: Point Clouds and Photogrammetry **4:** BIM Software Practicum

9.2 AR3D3. Design Studio IX

Design Studio IX: Metropolitan Infrastructure and Civic Facility raises the sequence's scale and program complexity once more after Design Studio VIII (AR3D2, prerequisite), to the metropolitan scale: students design a high-complexity civic facility – a transit terminal, a stadium, a convention center – whose scale requires long-span structural systems and an explicit integration with the city's urban structure, alongside the development feasibility analysis appropriate to a project of this magnitude. This course is the foundation for the sequence's final, most comprehensive studio, Design Studio X (AR3D4).

This course includes the following topics: **1:** Large-Scale and Complex Buildings **2:** Urban Design at Multiple Scales **3:** Long-Span and Special Structures **4:** Building Systems and Assemblies **5:** Development Process and Feasibility

9.3 AR402. Research Workshop

Research Workshop is the applied, tutored counterpart of Scientific Research Methodology (ARC400) and Statistics (ARC401): instead of learning methods in the abstract, each student designs their own non-experimental research proposal on a real territorial problem, culminating in a consistency matrix. This mirrors the existing Thesis I course (AR401), reusing the same three Research KUs (Design, Theoretical Framework, Hypotheses and Variables) without the design-studio-specific unit, since this track's output is a research proposal, not a design project.

This course includes the following topics: **1:** Research Design and Methodologies **2:** Theoretical Framework and Literature Review **3:** Research Hypotheses and Variables

10.1 AR3D4. Design Studio X

Design Studio X: Comprehensive Architectural Project closes the Design Studio sequence that began in Design Studio I (AR1D1) and continued through Design Studio IX (AR3D3, prerequisite). Students develop a high-complexity anteproyecto (preliminary design) that integrates, for the first time within a single project, every major dimension practiced across the sequence: a complex building program, a fully coordinated structural and systems assembly, net-zero-oriented sustainability strategies, and Building Information Modeling as the representational and coordination platform, all verified against applicable building codes. Unlike the Tesis sequence (AR401-AR403), this course does

not involve thesis research or an individual defense: it is the Design Studio sequence's comprehensive, integrative capstone project.

This course includes the following topics: **1:** Large-Scale and Complex Buildings **2:** Building Systems and Assemblies **3:** BIM Fundamentals and Authoring **4:** BIM Execution Planning and Standards **5:** Energy Efficiency and Net-Zero Design **6:** Building Codes, Accessibility, and Zoning

10.2 AR403. Research Work

Research Work is the execution and defense phase of the research track, building directly on the approved proposal from Research Workshop (ARC402, prerequisite). Each student works under individualized advisor supervision to collect, process, and analyze data on a real territorial or urban problem, arriving at evidence-grounded conclusions that respond to the research questions formulated earlier in the sequence.

This course includes the following topics: **1:** Data Collection, Analysis, and Discussion of Results **2:** Research Report and Defense

10.3 AR404. Innovation and Entrepreneurship

Innovation and Entrepreneurship closes the specialization alongside Research Work (ARC403), giving students the professional-practice and real-estate-development toolkit – entrepreneurship models, project feasibility, PropTech, and participatory development – needed to turn a territorial or urban diagnosis into a viable, fundable initiative. It draws on Real Estate Development and Construction Economics (RED) and the entrepreneurship-specific unit of Professional Practice and Ethics (PRO), the two Arch2027 knowledge areas that cover the business side of the profession.

This course includes the following topics: **1:** Business of Architecture and Entrepreneurship **2:** Development Process and Feasibility **3:** PropTech and Digital Real Estate Innovation **4:** Stakeholder and Participatory Development

10.4 AR4B1. AI-Assisted Automation

AI-Assisted Automation closes the ten-course required BIM I-X sequence (AR1B1 through AR4B1), building directly on the authoring, coordination, scheduling/cost, and facilities-management skills developed course by course across the line, and on Heritage and Infrastructure's (AR3B4) immediate prerequisite content. As the line's capstone, it shifts the focus from any single BIM workflow to the integration of all of them: students apply AI-assisted and scripted automation to real BIM tasks, deliver a single end-to-end project package against their own stated BIM Execution Plan, and critically evaluate the research and practice trends – urban-scale digital twins, blockchain-based model provenance, BIM-robotics convergence – that are extending BIM beyond its current established workflows. The recurring BIM Software Practicum unit closes the course, as it does every course in the line, with a certification-aligned, hands-on deliverable in the tool most relevant to this course's AI-automation focus.

This course includes the following topics: **1:** AI-Assisted BIM Automation **2:** Integrated BIM Project Delivery (Capstone) **3:** Emerging Trends in BIM Practice **4:** BIM Software Practicum