Private University of Tacna (UPT)
School of Architecture
Syllabus 2027-I

1. COURSE

AR3B1. Structural and MEP Coordination (Mandatory)

2. GENERAL INFORMATION

2.1 Course	:	AR3B1. Structural and MEP Coordination
2.2 Semester	:	6^{th} Semester.
2.3 Credits	:	4
2.4 Hours	:	4 HT; 4 HP;
2.5 Duration of the period	:	16 weeks
2.6 Type of course	:	Mandatory
2.7 Learning modality	:	Face to face
2.8 Prerrequisites	:	AR2B3. BIM Scheduling and Cost. (5^{th} Sem)

3. PROFESSORS

Meetings after coordination with the professor

4. INTRODUCTION TO THE COURSE

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).

5. GOALS

- Coordinate a federated BIM model's structural and MEP elements, identifying and resolving spatial conflicts between systems using IFC/CIS2 data exchange.
- Develop structural connection and MEP routing details to fabrication-level (LOD 400), producing shop-drawing-ready models for steel, precast, and prefabricated MEP assemblies.
- Run systematic model-auditing and parameter-validation routines on a BIM model, correcting naming, data, and modeling-quality issues before it is shared or federated.
- Build hands-on proficiency in the course's structural/MEP coordination and fabrication-detailing software through a sequence of guided, graded practicum exercises culminating in a cumulative deliverable.

6. COMPETENCES

AG-A06) Recognizes the need to learn independently and continuously, adapt to new and emerging technologies, and apply critical thinking in the face of technological change. (Usage)

AG-A08) Understands the structural and environmental design problems associated with construction and the engineering of building design. (Usage)

AG-A14) Possesses creative capacity in construction techniques, grounded in a comprehensive understanding of the disciplines and construction methods related to architecture. (Usage)

7. TOPICS

Unit 1: BIM for Structural and MEP Coordination (24 hours)	
Competences Expected: AG-A08	
Topics	**Learning Outcomes**
• BIM-based structural workflows: structural analysis model from architectural BIM (Revit, Tekla), data exchange via IFC or CIS/2 • MEP systems coordination in BIM: routing and clash-avoidance for HVAC ducts, plumbing, and electrical conduit within a federated model; spatial coordination with structural and architectural elements	• Describe the BIM-based workflow for exchanging a model between architectural, structural, and MEP software, and explain the role of IFC/CIS2 in that exchange [Familiarity] • Coordinate a federated model's structural and MEP elements, identifying and resolving spatial conflicts between systems [Usage] • Evaluate a structural/MEP-coordinated BIM model for spatial conflicts, data-exchange integrity, and coordination completeness [Assessment]
Readings : [Sac+18]	

Unit 2: Fabrication-Level BIM Detailing (24 hours)	
Competences Expected: AG-A14	
Topics	**Learning Outcomes**
• Structural fabrication detailing: connection design, rebar detailing, and steel/precast shop-drawing-level modeling (Tekla, Advance Steel) • MEP fabrication modeling: spool drawings for ductwork and piping, prefabrication-ready routing, and hanger/support detailing at LOD 400 • Coordinating fabrication-level models with offsite prefabrication schedules and delivery logistics	• Describe the difference between a construction-level (LOD 350) and a fabrication-level (LOD 400) structural or MEP model, and identify the detailing each requires [Familiarity] • Develop a structural connection or MEP routing detail to fabrication-level (LOD 400), ready for shop-drawing production [Usage] • Evaluate a fabrication-level BIM model for the completeness and buildability of its connection and routing details [Assessment]
Readings : [Kol03]	

Unit 3: BIM Model Quality Control and Auditing (24 hours)	
Competences Expected: AG-A06	
Topics	**Learning Outcomes**
• Model auditing tools and routines: automated checks for unnamed/duplicate elements, orphaned families, and file size/performance issues • Parameter and naming-convention validation: checking that model elements carry the required parameters and follow the project's naming standards before federation • Automated rule-checking scripts (Dynamo, Solibri rulesets) for enforcing modeling standards across a large or multi-author model	• Describe the kinds of modeling and data errors a BIM quality-control audit is designed to catch, and why they matter before model federation [Familiarity] • Run a model audit on a BIM file, identifying and correcting naming, parameter, and modeling-quality issues before sharing it with the project team [Usage] • Evaluate a model's audit report to judge whether it is ready for federation and coordination, or requires further cleanup [Assessment]
Readings : [Ken14]	

Unit 4: BIM Software Practicum (24 hours)	
Competences Expected: AG-A06	
Topics	**Learning Outcomes**
• Guided, graded software exercises in the BIM tool(s) specific to the course's theme (authoring, coordination, scheduling, analysis, or FM platforms), building toward a cumulative course deliverable • Practice aligned with vendor or industry certification exams (Autodesk Certified Professional, buildingSMART openBIM) relevant to the course's software focus	• Describe the practicum structure for the course's BIM software focus and the deliverable it builds toward [Familiarity] • Complete a sequence of guided exercises in the course's BIM software focus, building toward a cumulative practicum deliverable [Usage] • Evaluate the student's own practicum deliverable against the software proficiency expected for the course's BIM theme [Assessment]
Readings : [Win12]	

8. WORKPLAN

8.1 Methodology

Individual and team participation is encouraged to present their ideas, motivating them with additional points in the different stages of the course evaluation.

8.2 Theory Sessions

The theory sessions are held in master classes with activities including active learning and roleplay to allow students to internalize the concepts.

8.3 Practical Sessions

The practical sessions are held in class where a series of exercises and/or practical concepts are developed through problem solving, problem solving, specific exercises and/or in application contexts.

9. EVALUATION SYSTEM

********* EVALUATION MISSING ********

10. BASIC BIBLIOGRAPHY

[Kol03] Branko Kolarevic. *Architecture in the Digital Age: Design and Manufacturing*. 1st. Spon Press, 2003.

[Win12] Eric Wing. *Autodesk Revit MEP: No Experience Required*. 1st. Sybex, 2012.

[Ken14] Karen M. Kensek. *Building Information Modeling*. 1st. Routledge, 2014.

[Sac+18] Rafael Sacks et al. *BIM Handbook: A Guide to Building Information Modeling for Owners, Designers, Engineers, Contractors, and Facility Managers*. 3rd. Wiley, 2018.