COVID HEADER

If Texas Tech University campus operations are required to change because of health concerns related to the COVID-19 pandemic, it is possible that this course will move to a fully online delivery format. Should that be necessary, students will need to have access to a webcam and microphone for remote delivery of the class. Additionally, students will need to have access to Blackboard, Zoom, Microsoft Word & PowerPoint, Raider Email. Note: This course is entirely taught online.

ARCH 2351 - Architectural Technology I: Matter (3 SCH) | T,R 3:30-4:50PM



College of Architecture, Texas Tech University Fall 2020 Instructor: Christopher Esper - <u>C.esper@ttu.edu</u>

Metropol Parasol, Seville Spain - Jürgen Mayer

Course Title: Architectural Technology I: Matter

Catalog Description

Introduction to architectural technology and our constructed relationship with the environment. Emphasis on contemporary materials, behaviors, sources, sustainability, methods of fabrication, products and their potentialities.

Course Description/Studio Brief

Architectural Technology I will focus on the introduction to architectural materials and their methodology -- both in concepts of materiality and systems of construction. The course will engage students broadly on two fronts. Part I – 'Identify' in which students will learn about the individual materials that go into building construction such as Wood, Masonry, Concrete, Steel, & Glass in service of Part II – "Combine;" where we will look at how various materials come together to produce architectural enclosure, structural assembly and how structure, materials and the methods and means by which they are selected, have deep aesthetic, economic, social and operational implications.

Student Learning Objectives

Upon satisfactory completion of this course, students will have an understanding of the following:

- Construction The understanding of five primary Building Systems of contemporary architecture, and their sub-systems, assemblies, components, materials and methods of construction. (Light Wood Framing, Light Steel Framing, Steel Frame, Concrete Frame, and Masonry)
- 2. Design The ability to choose building systems, sub-systems, assemblies, components and materials that support the architect's design concept. Communication The ability to utilize Design Drawings to inform the design process and communicate tectonic design decisions.
- 3. Building Systems The understanding of building systems as a hierarchal relationship of sub-systems, assemblies, components, and materials.
- Building Sub-Systems The understanding of the interrelationship of the four major Building Sub-systems (Structure, Enclosure, Interior and Mechanical), which comprise a Building System.
- Layering The understanding of Building Systems as a hierarchical layering of components, materials and methods of construction. Integration – The understanding that Building Systems require the integration of subsystems, assemblies, components and materials with each other.
- 6. Materials the understanding of the principles and attributes of the five major building materials (Wood, Masonry, Steel, Concrete and Glass utilized in the primary building systems.
- 7. Tectonics The understanding how the building technology of architecture can be a part of the aesthetic of architecture.

Student Performance Objectives

- Actively engage in class and lab discussion by questioning, hypothesizing, reading required texts and engaging in independent web and text research.
- Work through sketching and basic computer drawing to analyze standalone material systems and how they work in a structural assembly.
- Introduction to architectural materials and their methodology.
- Introduction to wall assemblies and structural systems through one to one scale analog projects.
- Understanding of basic construction materials through research of Forces, Wood, Masonry, Concrete, Steel, Glass case studies.
- The ability to properly assess what materials is/ should be used within various structural assemblies.
- The ability to apply design decisions to construction details, assemblies, and full structural systems.

Means of Evaluation:

Deliverables:

- Attendance/ Class Participation (5% of Final Grade)
 - Students are expected to engage in in-class participation via questions to the instructor, to their peers during precedent study presentation presentations and actively engage in a lab setting during the preparation of student presentations, during work of the semester project and/or in general, discussing the subject matters covered in lectures.
- 4 Student Sketchbook/Notebook Submissions (10% of Final Grade)
 - Students will be required to keep a highly organized set of notes consisting of annotated sketches, to be submitted alongside the submission of an exam.
- 8- Supplemental Assignments (15% of Final Grade)
 - At the end of lectures, students will be assigned supplemental assignments which will include 1-5 sketch design exercises pertaining to topics discussed during a lecture. There will be a minimum of 2 Virtual Site visits in which the instructor will also pose questions to students. Supplemental assignments will also include requests to conduct brief research from web/ text resources or produce a drawing or sketch.
- Team Student Precedent/ Case Study (15% of Final Grade)
 - In groups of 5 students will produce a case study presentation based on a building assigned by the instructor. Students will work both in/outside of a lab setting to assess the building materials and systems as they pertain to the topic of the week. Students will analyze the buildings materials and assembly through drawing, diagraming and by presenting text description on the historical background of the projects, presenting evidence-based research the reason for the architect's design decisions. Students will describe by drawing architectural details, systems and layers of the building. Ultimately the goal is to teach students how to conduct investigative or forensic assessment beyond what is readily found on the internet. Assignment and team members will be formally presented and posted on Blackboard in a forthcoming class with more details and information's on deliverables and examples. Production of the case study presentation will take place during Part I of the course during lab time and outside of scheduled labs with students coordinating independently via zoom.

• Team Semester Project (25% of Final Grade)

In groups of 5, (different from the groups you will be assigned for the case study assignment,) student will propose a new type of material concept or way of applying a material concept learned in the course. Students will design a modular or systemic structure by which aggregations of material modules can be used to inform the design of a prototypical pavilion. Students will work in the lab setting during Part II of the course to work. Assignment and team members will be formally presented and posted on Blackboard in a forthcoming class with more details and information's on deliverables and examples. Production of the semester project will take place during part 2 of the course during lab time and outside of scheduled labs with students coordinating independently via zoom.

- 4 'Take home' Essay style exams (30% of Final Grade)
 - Students will be assigned 'Take home'. Essay style exams that will require thoughtful response. Students will be encouraged to utilized web and text resources to supplement their responses. Unless otherwise noted in the exam, students will not be required to answer in a binary format but are expected to thoughtfully respond in writing and hand, 2D and 3D sketches with reasoning based on what they have learned from lectures.

Methods of Assessment:

- Completion of all deliverables in a timely manner no late work accepted.
- Engage in questioning and feedback during instructor lectures, peer precedent case study presentations and within the lab setting.
- Keep an organized binder of sketches and notes.
- Produce research through a group precedent presentation.
- Actively participate in an online group collaborative setting during labs, preparations of case study presentations, working through the semester project.

Teaching Methods/Studio Methods:

The course will utilize various methods to teach student the fundamental of building construction technologies through the attendance of lectures, response to assignments and take-home exams, production of analytical hand and 2D & 3D computer sketches and the research and presentation of assigned precedent case studies that will correlate to the lecture subject matter. Student will work in groups to produce presentations as well as semester projects within laboratory discussion and participate in online collaboration sessions to produce a semester project.

Students will be required to utilize the following:

- Digital and/or Physical Sketchbook, which will help students analytically think through a material or system by drawing and annotation.
- Microsoft Word to respond to exams, which may also utilize the placement of 2D Digital or Hand Sketched responses.
- Rhino, AutoCad to produce 2D/3D Sketches for the sketchbook and exam response.
- Photos of physical sketch modeling at home is acceptable but not required.
- Presentation software such as PowerPoint, Google Slides or InDesign to produce case study presentations, which teach students how to collect, interpret and present information to others and by default instill the knowledge within themselves.
- Students will partake in a semester design project that will result in the technical design and drawing of a simple spatial enclosure. Assignment details will be identified later in the semester.

PART	THEME	TOPIC		DATE	MODE	ASSIGNMENT (ASSIGNED/ DUE)		READINGS
PART 1- IDENTIFY	Site + Context	Course Intro/ Syllabus	т	8/25/20	Presentation of Syllabus, Course Structure			N/A
		Contemporary Issues in Design & Construction	R	8/27/20	Lecture	Case Study Presentation - ASSIGNED		Building Construction Illustrated Ch. 1. Architectural Graphic Standards Ch. 12
		Occupancy, Construction Types & Building Codes	т	9/1/20	Lecture			Building Construction Illustrated Ch. 2 Architectural Graphic Standards Ch. 13
	Bridge	Intro to Loads & Forces	R	9/3/20	Lecture	A#1 - Load Tracing Assignment - ASSIGNED		
	Stack	Masonry + Stone Construction	т	9/8/20	Lecture	A#2 - Stacking Collage - ASSIGNED	A#1 DUE BY MIDNIGHT	Architectural Graphic Standards Ch. 9
			R	9/10/20	Case Study Presentation Groups 1+2	EXAM 1 - ASSIGNED	A#2 DUE BY MIDNIGHT	
		Principals of Concrete - Foundation Systems, Cast-In-Place & Tilt-Up	т	9/15/20	Lecture		EXAM 1 - DUE BY MIDNIGHT	Building Construction Illustrated Ch. 3
	st		R	9/17/20	Case Study Presentation Groups 2 + 3			Architectural Graphic Standards Ch. 2
	Са	Principals of Concrete - Precast Modularity	т	9/22/20	Lecture	A#3 - Contemporary Casting Techniques - ASSIGNED		Building Construction Illustrated Ch. 4-5
			R	9/24/20	Case Study Presentation Groups 4 + 5			
		Principals of Wood - Material, Historic	т	9/29/20	Lecture		A#3 DUE BY MIDNIGHT	
			R	10/1/20	6 + 7			
	Join	Wood Systems - Balloon and Wood + Metal Platform Framing	т	10/6/20	Lecture	A#4 - Frame Design ASSIGNED		
			R	10/8/20	8 + 9			
		Heavy Timber, Joints, Japanese Joinery	т	10/13/20	Lecture	A#5 - Joint Design ASSIGNED	A#4 DUE BY MIDNIGHT	
			R	10/15/20	Case Study Presentation Groups 10 + 11	EXAM 2 - ASSIGNED		
PART 2 - COMBINE		Bamboo & Tensile Wood Construction	т	10/20/20	Guest Lecturer - Prof. Catherine Soderberg		EXAM 2- DUE BY MIDNIGHT	TBD - Handout
			R	10/22/20	Case Study Presentation Groups 12 + 13	Semester Project - ASSIGNED	A#5 DUE BY MIDNIGHT	
	an	Principals of Steel Design - Spanning, Frames and Connections	Т	10/27/20	Lecture			
	Sp		R	10/29/20	14 + 15			Building Construction
		Prefabricated Assemblies, Waffle Assemblies	т	11/3/20	Virtual Site Visit - Cimarron Pointe	A#6 -Response to Virtual Site Visit - ASSIGNED		Illustrated Ch.6
			R	11/5/20	Case Study Presentation Groups 16 + 17	EXAM 3 - ASSIGNED.	A#6 DUE BY MIDNIGHT	
	e	Envelope Assembly - Thermal/ Moisture	т	11/10/20	Lecture		MIDNIGHT	Building Construction
	nclose		R	11/12/20	18 + 19			Illustrated Ch. 7
	Ē	Glass & Glazing	т	11/17/20	Lecture	A#7 Semester Project - Digital Presentation Mediums - ASSIGNED		Building Construction Illustrated Ch. 8
		Curtains, Screens	R	11/19/20	Lecture	EXAM 4 - ASSIGNED		
		Buildings	Т	11/24/20	Virtual Site Visit - Working Capitol	Site Visit - ASSIGNED.	MIDNIGHT	Architectural Graphic Standards Ch. 15
	erform	Thanksgiving - No Class	R	11/26/20	Thanksgiving - No Class		MIDNIGHT A#8 DUE BY	
		Comprehensive	ſ	12/1/20	Final Lecture		MIDNIGHT	
	"	Last Day of Class	W	12/2/20	N/A			
		no class - muividual Study Day	к	12/3/20	I eam WORK Session		Semester Project -	N/A
		Final Exam	т	12/8/20	FINAL PRESENTATION		DUE - Presentation	

Required Texts

- Ching, Francis D.K. *Building Construction Illustrated*, 5th Edition Wiley. Feb 2014. ISBN: 978-1-118-45834-1
- Bassler, Bruce L. Architectural Graphic Standards: Student Edition. John Wiley & Sons, 2008.

Non Required (Optional) Texts

- Allen, Edward, and Joseph Iano. *Fundamentals of Building Construction: Materials and Methods*. Wiley, 2019.
- Ambrose, James, and Patrick Tripeny. *Building Structures, 3rd Edition*. John Wiley & Sons, 2011.
- Ching, Francis D. K.; Winkel, Steven R. Building Codes Illustrated. Wiley, 2016.
- Ching, Francis D. K. *Building Structures Illustrated: Patterns, Systems, and Design, 2nd Edition.* John Wiley & Sons, 2014.
- Deplazes, Andrea. *Constructing Architecture: Materials, Processes, Structures*. Birkhäuser, 2018.
- Herzog, Thomas, et al. Facade Construction Manual. DETAIL, 2018.
- Sandaker, Bjørn Normann, et al. The Structural Basis of Architecture. Routledge, 2019.
- Schittich, Christian. In Detail: Building Skins: Concepts, Layers, Materials. Birkhauser Publishers for Architecture, 2001.

Course Requirements (if any)

- Sketchbook/Notebook
- Laptop top computer with Camera/Microphone access
- Zoom
- Microsoft Word/PowerPoint

Grading

Final Grade will be based on the following rubric:

- Attendance/ Class Participation: 5%
- 4 Sketchbook/Notebook Submissions 10%
- 8 Supplemental Assignments- 15%
- Team Student Precedent/ Case Study 15%
- 1 Team Semester Project 25%
- 4 Exams: 30%

Grading will be according to the following:

- A: Excellent- Exceptional performance strongly exceeding requirements of assignments, Initiative involving independent resourcefulness, strong positive attitude toward the work, a growing level of improvement.
- **B: Good-** Above average, adequate performance above the norm, accurate and complete beyond requirements, good initiative, positive attitude toward the work, improvement showing marks of progress.
- **C: Average-** Mediocre or conservative performance, satisfying all requirements of assignments with a neutral and ordinary level of initiative, attitude, and performance.
- **D: Not Acceptable-** Performance not meeting the passing standards of the course, initiative unacceptable, work below standard.
- **F: Failing-** Ineffective performance not satisfying the requirements to an extreme degree, level of initiative, attitude, and improvement non-existent.

		Grading Scale		
EXCELLENT	GOOD	AVERAGE	INFERIOR	FAILING
A+ = 98-100%	B+ = 88-90	C+ = 78-80	D = 67-70	64% and below
A = 94-97%	B = 84-87%	C = 74-77%	D- = 65-66%	
A- = 91-93%	B- = 81-83%	C- = 71-73%		

NAAB Criteria Met (2014 SPC's)

Realm A: Critical Thinking and Representation. Graduates from NAAB-accredited programs must be able to build abstract relationships and understand the impact of ideas based on the study and analysis of multiple theoretical, social, political, economic, cultural, and environmental contexts. Graduates must also be able to use a diverse range of skills to think about and convey architectural ideas, including writing, investigating, speaking, drawing, and modeling.

Student learning aspirations for this realm include:

- Being broadly educated.
- Valuing lifelong inquisitiveness.
- Communicating graphically in a range of media.
- Assessing evidence.
- Comprehending people, place, and context.
- Recognizing the disparate needs of client, community, and society.

Realm B: Building Practices, Technical Skills, and Knowledge. Graduates from NAAB accredited programs must be able to comprehend the technical aspects of design, systems, and materials and be able to apply that comprehension to architectural solutions. In addition, the impact of such decisions on the environment must be well considered.

Students learning aspirations include:

- Creating building designs with well-integrated systems
- Comprehending constructability
- Incorporating life safety systems
- Integrating accessibility
- Applying principals of sustainable design

B.4 Technical Documentation

Ability to make technically clear drawings, write outline specifications, and prepare models
illustrating and identifying the assembly of materials, systems, and components appropriate
for a building design.

B.5 Structural Systems:

• Ability to demonstrate the basic principles of structural systems and their ability to withstand gravitational, seismic, and lateral forces, as well as the selection and application of the appropriate structural system.

University Attendance Policy:

Responsibility for class attendance rests with the student. Instructors set an attendance policy for each course they teach. The University expects regular and punctual attendance at all scheduled classes, and the University reserves the right to deal at any time with individual cases of non attendance. Instructors should state clearly in their syllabilitheir policy regarding student absences and how absences affect grades.

CoA Attendance Policy:

Recording of absences is not a punitive record. Being present is evidence of minimal engagement with the material of the course, which is needed to matriculate and master the content of a course. Disallowing a student to matriculate through a course because of excessive absences is not a punishment, but rather evidence that the student has not been present for classroom instruction for a sufficient amount of time required to engage the material to an expected standard.

Therefore, the CoA considers four (4) absences in a studio, or in a lecture class that meets two or three times per week, grounds for dropping the student from the course. However, for CoA courses, the College supports the instructor's absence policy as stated in the individual course syllabus.

In the event of excessive absences, the student must visit the instructor to discuss his or her status in the course. Excessive absences constitute cause for dropping a student from class. If the drop occurs before the 45th class day of the long semester or the 15th class day of the summer term, the instructor will assign a designation of either DG or DW (see section on "Dropping a Course"). If the drop occurs after the time period, the student will receive a grade of F. This drop can be initiated by the instructor but must be formally executed by the academic dean. In extreme cases the academic dean may suspend the student from the university.

If a student is absent because of official University or College approved trips, the student must not be counted absent, but the student is responsible for any work or exam missed during the absence, Trips sponsored by the CoA must be approved by the Chair of Instruction of the CoA. The Instructor responsible for the student's absence must notify the student's instructors of the departure and return schedules in advance of the trip. The instructor notified must not penalize the student. Students who are absent because of University or College business must be given the same privileges as other students (e.g., if other students are given the choice of dropping one of four tests, the students with excused absences must be given the same privilege).

II. COVID-19 INFORMATION

Face coverings are required. Texas Tech University requires that students wear face coverings while in classes, while otherwise in campus buildings, and when social distancing cannot be maintained outdoors on campus.

Signage. Be attentive to signage posted at external and some classroom doorways that indicates entry and exit ways, gathering and queuing spaces, and availability of masks and hand sanitizer.

Seating assignments. N/A -The course will be taught entirely online and students will not be required to gather. All team meetings, instructor and TA meetings will take place via zoom or over email.

Illness-Based Absence Policy

If at any time during this semester you feel ill, in the interest of your own health and safety as well as the health and safety of your instructors and classmates, you are encouraged not to attend face-to-face class meetings or events. Please review the steps outlined below that you should follow to ensure your absence for illness will be excused. These steps also apply to not participating in synchronous online class meetings if you feel too ill to do so and missing specified assignment due dates in asynchronous online classes because of illness.

1. If you are ill and think the symptoms might be COVID-19-related:

a. Call Student Health Services at 806.743.2848 or your health care provider. After hours and on weekends contact TTU COVID-19 Helpline at 806.743.2911.

b. Self-report as soon as possible using the Dean of Students COVID-19 webpage. This website has specific directions about how to upload documentation from a medical provider and what will happen if your illness renders you unable to participate in classes for more than one week.
c. If your illness is determined to be COVID-19-related, all remaining documentation and communication will be handled through the Office of the Dean of Students, including notification of your instructors of the period of time you may be absent from and may return to classes.
d. If your illness is determined not to be COVID-19-related, please follow steps 2.a-d below.

2. If you are ill and can attribute your symptoms to something other than COVID-19:

a. If your illness renders you unable to attend face-to-face classes, participate in synchronous online classes, or miss specified assignment due dates in asynchronous online classes, you are encouraged to visit with either Student Health Services at 806.743.2848 or your health care provider. Note that Student Health Services and your own and other health care providers may arrange virtual visits.

- b. During the health provider visit, request a "return to school" note;
- c. E-mail the instructor a picture of that note;
- d. Return to class by the next class period after the date indicated on your note.

Following the steps outlined above helps to keep your instructors informed about your absences and ensures your absence or missing an assignment due date because of illness will be marked excused. You will still be responsible to complete within a week of returning to class any assignments, quizzes, or exams you miss because of illness.

If you have interacted with individual(s) who have tested positive for COVID-19:

Maintain a list of those persons and consult Student Health Services at 806-743-2911 or your primary care provider on next steps. Do not return to class until you are medically cleared by your Health Care Provider.

III.University Required Statements

ADA STATEMENT:

Any student who, because of a disability, may require special arrangements in order to meet the course requirements should contact the instructor as soon as possible to make any necessary arrangements. Students should present appropriate verification from Student Disability Services during the instructor's office hours. Please note: instructors are not allowed to provide classroom accommodations to a student until appropriate verification from Student Disability Services has been provided. For additional information, please contact Student Disability Services in West Hall or call 806-742-2405.

ACADEMIC INTEGRITY STATEMENT:

Academic integrity is taking responsibility for one's own class and/or course work, being individually accountable, and demonstrating intellectual honesty and ethical behavior. Academic integrity is a personal choice to abide by the standards of intellectual honesty and responsibility. Because education is a shared effort to achieve learning through the exchange of ideas, students, faculty, and staff have the collective responsibility to build mutual trust and respect. Ethical behavior and independent thought are essential for the highest level of academic achievement, which then must be measured. Academic achievement includes scholarship, teaching, and learning, all of which are shared endeavors. Grades are a device used to quantify the successful accumulation of knowledge through learning. Adhering to the standards of academic integrity ensures grades are earned honestly. Academic integrity is the foundation upon which students, faculty, and staff build their educational and professional careers. [Texas Tech University"] Quality Enhancement Plan, Academic Integrity Task Force, 2010]

RELIGIOUS HOLY DAY STATEMENT:

"Religious holy day" means a holy day observed by a religion whose places of worship are exempt from property taxation under Texas Tax Code §11.20. A student who intends to observe a religious holy day should make that intention known in writing to the instructor prior to the absence. A student who is absent from classes for the observance of a religious holy day shall be allowed to take an examination or complete an assignment scheduled for that day within a reasonable time after the absence. A student who is excused under section 2 may not be penalized for the absence; however, the instructor may respond appropriately if the student fails to complete the assignment satisfactorily.

DISCRIMINATION, HARASSMENT, AND SEXUAL VIOLENCE STATEMENT:

Texas Tech University is committed to providing and strengthening an educational, working, and living environment where students, faculty, staff, and visitors are free from gender and/or sex discrimination of any kind. Sexual assault, discrimination, harassment, and other Title IX violations are not tolerated by the University. Report any incidents to the Office for Student Rights & Resolution, (806)-742-SAFE (7233) or file a report online at titleix.ttu.edu/students. Faculty and staff members at TTU are committed to connecting you to resources on campus. Some of these available resources are: TTU Student Counseling Center, 806-742-3674, https://www.depts.ttu.edu/scc/(Provides confidential support on campus.) TTU 24-hour Crisis Helpline, 806-742-5555, (Assists students who are experiencing a mental health or interpersonal violence crisis. If you call the helpline, you will speak with a mental health counselor.) Voice of Hope Lubbock Rape Crisis Center, 806-763-7273, voiceofhopelubbock.org (24-hour hotline that provides support for survivors of sexual violence.) The Risk, Intervention, Safety and Education (RISE) Office, 806-742-2110, https://www.depts.ttu.edu/rise/ (Provides a range of resources and support options focused on prevention education and student wellness.) Texas Tech Police Department, 806-742- 3931, http://www.depts.ttu.edu/ttpd/ (To report criminal activity that occurs on or near Texas Tech campus.)

CIVILITY IN THE CLASSROOM STATEMENT:

Texas Tech University is a community of faculty, students, and staff that enjoys an expectation of cooperation, professionalism, and civility during the conduct of all forms of university business, including the conduct of student-student and student-faculty interactions in and out of the classroom. Further, the classroom is a setting in which an exchange of ideas and creative thinking should be encouraged and where intellectual growth and development are fostered. Students who disrupt this classroom mission by rude, sarcastic, threatening, abusive or obscene language and/or behavior will be subject to appropriate sanctions according to university policy. Likewise, faculty members are expected to maintain the highest standards of professionalism in all interactions with all constituents of the university (www.depts.ttu.edu/ethics/matadorchallenge/ethicalprinciples.php).

LGBTQIA SUPPORT STATEMENT*:

I identify as an ally to the lesbian, gay, bisexual, transgender, queer, intersex, and asexual (LGBTQIA) community, and I am available to listen and support you in an affirming manner. I can assist in connecting you with resources on campus to address problems you may face pertaining to sexual orientation and/or gender identity that could interfere with your success at Texas Tech. Please note that additional resources are available through the Office of LGBTQIA within the Center for Campus Life, Student Union Building Room 201, www.lgbtqia.ttu.edu, 806.742.5433."

*If you prefer to list campus resources rather than a statement about ally status, you might include the following among other campus resources you wish to share:

Office of LGBTQIA, Student Union Building Room 201, www.lgbtqia.ttu.edu, 806.742.5433 Within the Center for Campus Life, the Office serves the Texas Tech community through facilitation and leadership of programming and advocacy efforts. This work is aimed at strengthening the lesbian, gay, bisexual, transgender, queer, intersex, and asexual (LGBTQIA) community and sustaining an inclusive campus that welcomes people of all sexual orientations, gender identities, and gender expressions.