Program Objectives:

The Master of Science in Civil Engineering program at FBSU aims at applying knowledge, strong reasoning, and quantitative skills to design and implement creative and sustainable solutions. It also helps graduate students to engage in life - long learning to meet evolving engineering challenges facing society. Furthermore, they are expected to exhibit strong communication, critical thinking, interpersonal, and management skills as leaders and contributors in the civil engineering profession.

The Master of Science in Civil Engineering program:

The Master of Science in Civil Engineering program at FBSU comprises of different areas of specialization, namely:

Master of civil engineering / Structural Engineering (Thesis track and Non-thesis track)

Master of civil engineering / Transportation Engineering (Thesis track and Non-thesis track)

Master of civil engineering / Construction Engineering and Management (Thesis track and Non-thesis track)

* The program offers research opportunities and advanced courses in a broad range of the aforementioned areas. The student may transfer from one major to another, or from one track to another (thesis or non-thesis) after the first semester of the study.

* The student shall submit a thesis proposal to the department Chair during the first 8 weeks of the second semester in order to be approved and accepted by the end of the semester

Program Structure:

The program is composed of two tracks; thesis track and non-thesis track.

1) **Thesis track** has 39 credit hours, distributed over 4 semesters; 27 credits in the form of courses, and 12 credits for the thesis.
2) **Non-Thesis track** is composed of 42 credit hours, also distributed over 4 semesters.

- **The first academic year for all majors (thesis and non-thesis track)**

Semester 1	Semester 2
Core Course - 3 hours	**Elective Course - 3 hours**
Core Course - 3 hours	**Elective Course - 3 hours**
Core Course - 3 hours	**Elective Course - 3 hours**
	Core Course (Seminar) - 3 hours
Total: 9 Credit Hours	Total: 12 Credit Hours
The student shall submit a thesis proposal to the department Chair during the first 8 weeks of the second semester in order to be approved and accepted by the end of the semester	
The total credit hours are 21 credits during the first academic year	

- **The Second academic year for all majors (Thesis track)**

Semester 3	Semester 4
Elective Course - 3 hours	**Elective Course - 3 hours**
Master thesis - 6 hours	**Master thesis - 6 hours**
Total: 9 Credit Hours	Total: 9 Credit Hours
The total credit hours are 18 credits during the Second academic year	
The total credit hours are 39 credits.	

- **The Second academic year for all majors (Non- thesis track)**

Semester 3	Semester 4
Elective Course - 3 hours	**Elective Course - 3 hours**
Elective Course - 3 hours	**Elective Course - 3 hours**
Elective Course - 3 hours	**Project - 3 hours**
Elective Course - 3 hours	
Total: 12 Credit Hours	Total: 9 Credit Hours
The total credit hours are 21 credits during the Second academic year	
The total credit hours are 42 credits.	

Core Courses and Elective Courses

A. Core Courses (For all majors)

- **Thesis track**:

Student are required to complete 24 credit hours as core course, distributed over 4 semesters; 12 credits in the form of courses, and 12 credits for the thesis.(as shown in the table below)

- **Non-thesis track** :

Student are required to complete 15 credit hours as core course, distributed over 4 semesters; 12 credits in the form of courses, and 3 credits for the project. (as shown in the table below)

Course code	**Course name**	**Cr.**
MATH 505	Advanced Engineering Mathematics	3
MATH 506	Advanced Engineering Statistics	3
CIVE 507	Computer Application in Civil Engineering	3
CIVE 599	Seminar	3
Total		**Total**
CIVE 600	Research Thesis (Thesis-Program only)	12
CIVE 598	Engineering Design Project (Non-Thesis Program only)	3

B. Elective Courses (For all majors)

- **Thesis track:**

Student are required to complete 15 credit hours as elective course, distributed over 4 semesters. (as shown in the tables below)

- **Non-thesis track**:

Student are required to complete 27 credit hours as elective course, distributed over 4 semesters (as shown in the tables below)

Structural Engineering (Elective courses)			
Course #	**Course code**	**Course name**	**Cr.**
1	CIVE 510	Advanced Reinforced Concrete	3
2	CIVE 511	Evaluation And Testing Of Concrete Structures	3
3	CIVE 512	Concrete Materials	3
4	CIVE 513	Advanced Structural Mechanics	3
5	CIVE 514	Advanced Structural Analysis	3
6	CIVE 515	Earthquake Engineering	3
7	CIVE 516	Behaviour And Design Of Steel Structures	3
8	CIVE 517	Finite Elements Methods	3
9	CIVE 518	Pre-Stressed Concrete	3
10	CIVE 581	Construction Engineering, Equipment, and Methods	3
11	CIVE 582	Advanced Project Management	3
12	CIVE 584	Construction Cost Estimating and Bidding	3
13	CIVE 519	Special Topics In Structural And Material Engineering	3

Transportation Engineering (Elective Courses)			
Course #	**Course code**	**Course name**	**Cr.**
1	CIVE 570	Advanced Transportation Engineering	3
2	CIVE 571	Pavement Structures And Design	3
3	CIVE 572	Urban Transportation Planning	3
4	CIVE 573	Advanced Traffic Engineering	3
5	CIVE 574	Geometric Design of Highways	3
6	CIVE 575	Transportation System Management	3
7	CIVE 576	Public Transportation Systems	3
8	CIVE 581	Construction Engineering, Equipment, and Methods	3
9	CIVE 582	Advanced Project Management	3
10	CIVE 587	Operation Management	3
11	CIVE 577	Special Topics In Transportation Engineering	3

Construction Engineering and Management			
Course #	**Course code**	**Course name**	**Cr.**
1	CIVE 580	Engineering Quality Management	3
2	CIVE 581	Construction Engineering, Equipment, and Methods	3
3	CIVE 582	Advanced Project Management	3

4	CIVE 583	Construction Liability and Contracts	3
5	CIVE 584	Construction Cost Estimating and Bidding	3
6	CIVE 585	Techniques of Project Planning and Control	3
7	CIVE 586	Construction Cost Engineering	3
8	CIVE 587	Operation Management	3
9	CIVE 588	Construction of Building	3
10	CIVE 510	Advanced Reinforced Concrete	3
11	CIVE 511	Evaluation And Testing Of Concrete Structures	3
12	CIVE 514	Advanced Structural Analysis	3
13	CIVE 515	Earthquake Engineering	3
14	CIVE 589	Special Topics in Construction Engineering	3

COURSES DESCRIPTIONS

1. Core Courses

The following core courses are required by all students in the M.S in Civil Engineering.

MATH 505 Advanced Engineering Mathematics (3 credit hours)
Series solutions of ordinary differential equations; Special functions; Laplace transform; Fourier transform; Fourier series; Partial differential equations; and Complex analysis.
Prerequisite: Graduate Standing

MATH 506 Advanced Engineering Statistics (3 credit hours)
Random sampling and data description, Tests of hypotheses, Simple and multiple linear regression and correlation, and Design of experiments with single and several factors.
Prerequisite: Graduate Standing

CIVE 507 Computer Applications in Civil Engineering (3 credit hours)
Computer modeling, and application in case studies in the fields of civil engineering.
Prerequisite: Graduate Standing

CIVE 598 Engineering Design Project (3 credit hours) (Non-Thesis Program Only)
Application of knowledge and skills acquired during the study of the graduate program in the solution of open-ended, advanced-level design problems from a technical, environmental and socio-economic viewpoint. Students can work with senior engineers from industry on a specific design project.
Prerequisite: Consent of the Advisor

CIVE 599 Seminar (3credit hours)
Graduate students working towards the M.S. degree are required to attend the seminars given by faculty, visiting scholars, and fellow graduate students. Additionally, each student must present at least one seminar on a timely research topic. Among other things, this course is designed to give the student an overview of research in the department, and a familiarity with the research methodology, journals and professional societies in his discipline.
Prerequisite: Graduate Standing

CIVE 600 Research Thesis (12 credit hours) (Thesis-Program only)
The student has to undertake and complete a research topic under the supervision of a graduate faculty member in order to probe in-depth a specific problem in the research area.

Prerequisite: CIVE 599

2. Elective Courses

The following are courses required in various areas of specializations

Structural Engineering:

CIVE 510 Advanced Reinforced Concrete (3 credit hours)

Moment-curvature for RC members, beam-column joints, design for torsion; Design of Walls; Inelastic flexural section analysis; strut and tie model; yield line theory ; biaxial bending of column; curved beam; Deep beam.

Prerequisite: Graduate Standing

CIVE 511 Evaluations and Testing of Concrete Structures (3 credit hours)

Introduction to in-situ testing and planning of test programs; various nondestructive tests (NDT), tests for concrete strength, quality, composition and durability; measurement of corrosion activity; chemical tests for cement, chloride and sulphate contents; cracking of concrete; in-situ load tests; condition assessment with case studies; types of concrete repair; repair strategy, compatibility and selection of repair materials, patch repair, corrosion repair and crack repair.

Prerequisite: CIVE 510

CIVE 512 Concrete Materials (3 credit hours)

Properties of concrete constituents; types of cements and their composition; cement hydration; microstructure of hydrated cement paste and its influence on strength, shrinkage and creep; chemical admixtures; alternate cement matrices; concrete durability and sustainability; introduction to repair materials.

Prerequisite: Graduate Standing

CIVE 513 Advanced Structural Mechanics (3 credit hours)

Unsymmetrical bending of beams; shear center; bending of curved beams; torsion of prismatic bars; beams on elastic foundations; introduction to Cartesian tensors; tensorial transformation of stress; Mohr's circle for 3-D stress transformation; dyadic symbols; finite and infinitesimal strain tensors; Mohr's circle for 3-D strain; constitutive equations for anisotropic materials and application to composite laminates; theories of yield and fracture.

Prerequisite: Graduate Standing

CIVE 514 Advanced Structural Analysis (3 credit hours)

Matrix algebra, solution of equations, review of energy principles, virtual work; degree of redundancy, choice of redundants, flexibility method, kinematic indeterminacy, development of element stiffness matrices, stiffness method of analysis of structures, computer applications and software development, axial force effects and eigenvalue analysis, introduction to the finite element method.

Prerequisite: Graduate Standing

CIVE 515 Earthquake Engineering (3 credit hours)

This course is to serve as an introduction to the multi-disciplinary field of earthquake engineering. Topics covered in the course include tectonics, ground motion characterization, probabilistic hazard analysis, response spectra, inelastic structural analysis, and performance-based earthquake-resistant design.

Prerequisite: Graduate Standing

CIVE 516 Behaviors and Design of Steel Structures (3 credit hours)

Elastic-plastic concepts of structural behavior; plastic design of beams and frames; design of plate girders, compression members with large width-thickness ratio and stiffened plate; composite design and behavior, behavior of rigid and semirigid connections; design considerations for fracture and fatigue; design of rigid frames; behavior of multistory frames and second-order analysis. **Prerequisite:** Graduate Standing

CIVE 517 Finite Element Methods (3 credit hours)
Basic equations of elasticity; virtual work; stiffness properties of structural elements; variational and weighted residual methods, applications to trusses, beams, plane frames, two-dimensional, axi-symmetric and three-dimensional solids; higher order and isoparametric elements; field and time-dependent problems of fluid and heat flow; software development.
Prerequisites: CIVE 513, CIVE 514, or Consent of the Instructor

CIVE 518 Prestressed Concrete (3 credit hours)
Prestressing systems; materials; behavior of prestressed concrete beams; criteria for analysis and design; losses; analysis of stresses; flexural design; shear; end blocks; deflection; composite members; continuous beams; partial prestressing, design applications; introduction to segmental construction.
Prerequisite: Graduate Standing

CIVE 519 Special Topics in Structural Engineering (3 credit hours)
Advanced topics selected from the broad area of structural and material engineering to provide the student with knowledge of recent applications and development in this specialty.
Prerequisite: Graduate Standing

Water and Environmental Engineering:

CIVE 530 Environmental Impact Assessment (3 credit hours)
All basic environmental impact assessment and auditing, topics related to description of environmental settings, prediction of impacts, evaluation of impacts & their mitigation plan, environmental impact assessment methodologies, environmental settings, prediction of impacts, evaluation of impacts & their mitigation plan
Prerequisite: Graduate Standing

CIVE 531 Environmental Chemistry and Microbiology (3 credit hours)
This course gives complete understanding of all basics of Environmental Chemistry and Microbiology, basic concepts of water chemistry, chemical reactions and contaminants in water and wastewater, biological treatment of wastewater
Prerequisite: Graduate Standing

CIVE 532 Solid Waste Management (3 credit hours)
All basic and advances Solid Waste Management, basic knowledge of solid waste in terms of characteristics and composition, processes used for sustainable solid wastes disposal systems, concepts of water chemistry, chemical reactions and contaminants in solid waste
Prerequisite: CIVE 531

CIVE 533 Air Pollution and Control (3 credit hours)
Introductory course in air pollution and its control; air pollution and effects, sources, dispersion models, engineering controls, and air quality legislation.
Prerequisite: Graduate Standing

CIVE 534 Special Topics in Water and Environmental Engineering (3 credit hours)
Advanced topics selected from the broad area of water resources and environmental engineering to provide the student with knowledge of recent applications and developments in the specialty.
Prerequisite: Graduate Standing

CIVE 540 Advanced Engineering Hydrology (3 credit hours)
Introduction to the elements of the hydrologic cycle; frequency analysis of precipitation and runoff; relationship between rainfall and runoff; flood routing; watershed modelling; and urban hydrology.
Prerequisite: Graduate Standing

CIVE 541 Groundwater Flow & Contaminant Transport (3 credit hours)
Properties of porous media; Fluid storage and flow in saturated media; Transport equations in porous media; Equation of motion; Darcy's law; Continuity and conservation equation; well hydraulics; principle of superposition; contaminants transport by advection; modelling of adjective transport.
Prerequisite: Graduate Standing

CIVE 542 Hydrogeology (3 credit hours)
Hydrologic cycle; Aquifers and their properties; Basics of groundwater flow; Flow to wells, aquifer testing, well installation; (Hydro) Geochemistry and water quality; Groundwater pollution and contaminant transport.
Prerequisite: Graduate Standing

CIVE 543 Hydrodynamics (3 credit hours)
Continuity: plane flow, axe-symmetric flow, stream flow functions, circulation, velocity potential; dynamics of frictionless fluids: Eulerian equations of motion, rotational incompressible flow, some elementary symmetric and axi-symmetric flow, rotational flow, equations in a moving coordinate system, flow past spheres and cylinders.
Prerequisite: Graduate Standing

CIVE 544 Surface and Ground Water Hydrology (3 credit hours)
Design concepts of hydrological structure, physical processes of the hydrology cycle, the computational fundamentals of hydrologic analysis, and the elements of design hydrology, catchment's surface water and groundwater resources.
Prerequisite: Graduate Standing

Geotechnical Engineering:

CIVE 550 Advanced geotechnical Engineering (3 credit hours)
Permeability and seepage, consolidation theory, secondary compression, three dimensional consolidation, settlement analysis, stress-strain-strength behavior of soils: drained and undrained conditions for cohesive and cohesionless soils, anisotropy of soils, classes of stability. **Prerequisite:** CIVE 330 or equivalent

CIVE 551 Advanced foundation Engineering (3 credit hours)
Bearing capacity of shallow foundations; factors affecting bearing capacity; immediate and consolidation settlement of shallow foundations; mat foundations; analysis, design, and installation of pile foundations; capacity and settlement of piles and pile groups; drilled piers and caissons
Prerequisite: CIVE 330 or equivalent

CIVE 552 Soil Behavior (3 credit hours)
Advanced knowledge and skills in soil behavior. the course includes soil formation, bonding, phyllosilicates and clay mineralogy, soil composition and engineering properties, soil structure and soil fabric, soil–water–chemical interactions, : effective, and total stress, volume change behavior, strength and deformation behavior, time effects on strength and deformation.
Prerequisite: CIVE 330 or equivalent

CIVE 553 Soil and Site Improvement (3 credit hours)
Behavior of natural soils; shallow and deep mechanical modifications; improvement by admixtures; grouting; hydraulic modifications; thermal and electrical treatments; modifications by inclusions and confinement; development of marginal lands; treatment of local problematic soils; landfills.
Prerequisite: CIVE 330 or equivalent

CIVE 554 Environmental Geotechnics (3 credit hours)
Geotechnical engineering of land disposal of hazardous and nonhazardous wastes; fate and transport of contaminants; compacted clay and synthetic liners; leachate collection and removal system; landfill cover and gas venting systems; design and stability of landfill elements; construction quality assurance and control; performance monitoring; remediation technologies. **Prerequisite:** CIVE 250 and CIVE 330 or equivalent

CIVE 555 Geotechnical earthquake engineering (3 credit hours)
A brief review of seismicity, fault-rupture mechanisms, and fundamentals of vibrations. Discussion of attenuation relationships, design motions and influence of soil behavior on ground shaking characteristics. Methods of analyzing seismic site response. Soil liquefaction phenomena and methods to predict seismic soil liquefaction initiation. Use of in-situ index tests in the estimation of seismic liquefaction risk. Seismic performance of slopes and earth structures and soil-structure interaction effects.
Prerequisite: CIVE 330 or equivalent

CIVE 556 Special Topics in Geotechnical Engineering (credit hours)
Advanced topics selected from the broad area of geotechnical engineering to provide the students with knowledge of recent applications and developments in this specialty.
Prerequisite: Consent of Instructor

Transportation Engineering:
CIVE 570 Advanced Transportation Engineering (3 credit hours)
Principles of traffic flow elements, capacity analysis of highways and intersections; design and analysis of signalization including warrants, timing, phasing and coordination; intelligent transportation systems.
Prerequisite: Graduate Standing

CIVE 571 Pavement Structures and Design (3 credit hours)
Fundamentals of pavement-vehicle interaction and the mechanics of pavement response; stress analysis in flexible and rigid pavements; material characterization; design of flexible and rigid pavements for highways and airports; surface, base and subgrade courses evaluation and design; modern design techniques and their applications.
Prerequisite: Graduate Standing

CIVE 572 Urban Transportation Planning (3 credit hours)
Transportation planning processes, transportation land use interaction, travel evaluation and demand estimation, traffic generation theories and assignment models, and transit analysis.
Prerequisite: Math 505

CIVE 573 Advanced Traffic Engineering (3 credit hours)
Macroscopic and microscopic characteristics of flow, speed and density; statistical distribution of traffic characteristics; shock wave analysis; queuing theory; application of theory of traffic flow to design and control of traffic; fundamentals and applications of existing tools and softwares.
Prerequisite: Consent of the Instructor

CIVE 574 Geometric Design of Highways (3 credit hours)
Geometric configuration and design of streets and freeways, design of intersections and interchanges, parking facilities design, roadside and guardrail design; and safety issues.
Prerequisite: Consent of the Instructor

CIVE 575 Transportation System Management (3 credit hours)
Application of systems approach to transportation; the determination of transportation demand and supply; the equilibrium process; transportation system evaluation; cost effectiveness techniques; use of optimization techniques in transportation.

Prerequisite: Graduate Standing

CIVE 576 Public Transportation Systems (3 credit hours)
Mass transit operation and management, development in urban public transportation modes; systems and services, transit characteristics and vehicle technology, demand forecasting, routing and scheduling problems, and land-use impact.
Prerequisite: Graduate Standing

CIVE 577 Special Topics in Transportation Engineering (3 credit hours)
Advanced topics selected from the broad areas of transportation engineering to provide the knowledge with the recent applications and development.
Prerequisite: Graduate Standing

Construction Engineering and Management

CIVE 580 Engineering Quality management (3 credit hours)
concepts of total quality management in the engineering context including: philosophies and frameworks of quality management, quality assurance and quality control incorporating quality into strategic planning and execution of large engineering projects and processes, leadership, process measurement and management, continuous quality improvement, standardization, and total quality management.
Prerequisite: Graduate Standing

CIVE 581 Construction Engineering, Equipment, and Methods (3 credit hours)
Major construction equipment and concrete construction. Selection of scrapers, dozers, cranes, etc. based on applications, methods, and production requirements. Power generation, transmission, and output capacity of equipment engines. Calculation of transport cycle times and equipment productivity. Construction methods of earthworks; grouting; and earth reinforcing; dredging and dewatering; concrete mixing, delivery, and placement. Design of forms for concrete walls and supported slabs. Equipment cost and procurement decisions. Equipment economic life; productivity estimation; and cost of production.
Prerequisite: Graduate Standing

CIVE 582 Advanced Project Management (3 credit hours)
Skills generally required for sound project management in a variety of management settings are studied in addition to specific management issues typically associated with engineering and construction companies. Students are introduced to the Project Management Institute's Body of Knowledge (PMBOK). A discussion of project organizational structures and the evolving use of project management processes helps establish an appreciation for the role of a Project Manager. The elements of a project and the role and responsibilities of the Project Manager are studied in depth. Students are also acquainted with risk management concepts, labor, safety, procurement. The course will also cover construction operation planning, job site layout, supervision, measurement, analysis, and improvement. Dimensions of performance: safety, quality, quality of work life, productivity, and innovation.
Prerequisite: Consent of the Instructor

CIVE 583 Construction Liability and Contracts (3 credit hours)
This course provides an overview of the fundamental aspects of the laws that affect construction and engineering companies as well as the project owners. The FIDIC conditions of EPC, BOT, and PPP contracts with Particular emphasis is placed on contract forms and provisions related to liability for engineering design and construction companies, bonds and sureties, the roles and responsibilities of the typical participation in the process, variation orders, claims and dispute resolution. Students will learn the importance of contract language negotiations.
Prerequisite: COEN 300

CIVE 584 Construction Cost Estimating and Bidding (3 credit hours)

A broad study of estimating methodologies ranging from order of magnitude to detailed estimates are presented focusing on labor, equipment, materials, subcontractors, job conditions, location, project overhead, general and administrative cost, and profit. The course will also cover cost indices, parametric estimates, unit price proposals, and measuring work in addition to life-cycle costing and value engineering. Students will learn about the importance of constructing a detailed Work Breakdown Structure in the estimating process. Substantial course focus will be placed on the term group project which consists of the development of a bid estimate for a small construction project.
Prerequisite: CIVE 581

CIVE 585 Techniques of Project Planning and Control (3 credit hours)
This course provides a thorough understanding of the project scheduling process in construction planning and control. Students learn the relationship between the work breakdown structure, organization breakdown structure and the activities used in developing project schedules. The Critical Path Method, the Program Evaluation and Review Technique, overlapping networks, and the Line of Balance scheduling methods are discussed. The use of scheduling techniques for project control, resources leveling and resources constraint management, cash flow management, time-cost relationships and schedule crashing at minimum cost are investigated as is the importance of communications in the planning and monitoring/controlling processes. The use of project schedule to assess the time and cost impacts of delays and variations orders and claims are examined. Students will experience hands on use with project scheduling software.
Prerequisites: CIVE 582 or CIVE 583

CIVE 586 Construction Cost Engineering (3 credit hours)
Cost engineering for construction organizations, projects, and operations. Construction financing; break-even, profit, and cash flow analyses; capital budgeting. Construction financial accounting, cost accounting, and cost control systems including earned value analysis. This course also provides an extensive overview of financial and managerial accounting concepts for non-financial managers and the elements of accounting (Generally Accepted Accounting Practices), financial records and financial statements are established. Fundamental financial calculations associated with the time value of money, decision making problems and relevant techniques, benefit/cost analysis, methods of economic appraisal, and consideration of inflation and taxation in investment decisions. Students are expected to demonstrate proficiency in the use of Excel functions in solving financial problems.
Prerequisite: CIVE 584

CIVE 587 Operations Management (3 credit hours)
This introductory level course provides students with an understanding of the latest quantitative tools for management decision-making. Topics include quality-control applications, optimization techniques including break-even analysis, linear and integer programming, the Simplex method, multicriteria decisions, the transportation model, and the allocation and assignment model. Other topics include time-series analysis, queuing theory, simulation, and decision trees analysis. Computer applications, case analysis and problem-solving sets are used throughout the course.
Prerequisite: CIVE 584 or CIVE 585

CIVE 588 Construction of Buildings (3 credit hours)
Material selection, construction details, manufacture, fabrication, and erection of building structures using steel, light wood, timber, cast-in-place concrete, precast concrete, and masonry; and of building materials for roof, floor, and wall surfaces. Life Cycle Cost Analysis Methods and Applications in Buildings; Building Energy Modeling and Simulation; Energy Management in Buildings; Impact of Building Occupants and Behavioral Challenges; Renewable Energy and Efficiency in Buildings; Existing Buildings and Technical/Social Challenges of Energy Retrofits; and Building Certifications. Field trips to fabrication plants and construction sites.
Prerequisite: CIVE 580, CIVE 582

CIVE 589 Special Topics in Construction Engineering
Any selected topic in state-of-the-art in construction engineering and management. Selected topics might include: agile management, process reengineering, and management of specific projects (technology, construction, industrial).
Prerequisite: Consent of the Instructor