

EM540 – Operations Research and Analytics

COURSE SYLLABUS

The information below outlines the course content, student learning outcomes, class requirements, assessment methods, grading structure, course outline, and student notices for EM540.

COURSE INFORMATION

Course ID:	EM540
Course Title:	Operations Research and Analytics
Number of Credits:	3 credits
Prerequisites:	Graduate standing, Students should have a solid understanding of algebra, basic calculus, probability concepts and statistical methods. An awareness of matrix algebra is desirable.
Current semester:	Spring, XXXX
Course location:	Online
Meeting Times:	TBA
Instructor:	Luna Magpili, PhD
Office Location:	Online
Contact:	PH 757.632.0419; luna.magpili@wsu.edu
Office hours:	TBA
Consultation:	For questions and clarifications, prefer posts and use of discussion forum on the Canvas course website to ensure maximum benefit of the whole class. Extended consultations are by appointment. Emails and phone calls without appointment are entertained during business hours, <u>Eastern Standard Time (EST)</u> .
Course description:	Operations Research extends math modeling to managerial decisions, organizational problems and business systems, which have many solutions.

Operations Research uses these models to better understand the option available to the manager and help guide the manager towards the 'best solution' among the many possible satisfying solutions.

This course introduces the student to a number of models in supply chain and operations management, which have been proven effective in solving certain classes of managerial problems. The student will see the rationale behind the technique and understand how to apply the tools in practical applications.

COURSE MATERIALS

- Textbook:** *Quantitative Analysis for Management (12th or 13th Edition)*
- By Barry Render; Ralph M. Stair; Michael E. Hanna, Hale, Trever, Pearson, © 2014/ 2018, ISBN-13: 978-0134543161, ISBN-10: 0134543165. Available at- https://www.amazon.com/Quantitative-Analysis-Management-Barry-Render-ebook/dp/B01MZC8B76/ref=sr_1_1?keywords=Quantitative+Analysis+for+Management+13th+Edition&qid=1577978651&s=digital-text&sr=1-1
- Textbook companion website-
http://media.pearsoncmg.com/ph/bp/bridgepages/bp_render_bridgepage/qam_13e/index.html
- Software:** QM for Windows, Excel QM, Excel QM for Macs (downloadable from the textbook companion website); or any OR software such as Excel Solver
- Course Webpage:** ALL course materials (announcements, instructions, lectures, homework, exams, solutions, and readings) can be accessed from the Canvas course site at <https://learn.wsu.edu/>. Login with your WSU username and password when prompted. Class materials are uploaded on a weekly basis. Submissions of ALL course work should be done through Canvas.
- Sessions:** Lecture slides and/ or pre-recorded lectures will be available prior to class sessions as needed. If available, make sure to view the pre-recording(s) before attending the live class. The live class sessions will be conducted during the scheduled meeting times via Zoom. A recording of the live session will also be archived and available on the Canvas course site.

COURSE LEARNING OUTCOMES AND ASSESSMENT

Learning outcomes:

- L1. Ability to recognize problems in real-world situations where operations research models can be applied.
- L2. Knowledge of the substantive areas to which operations research can be applied and the ability to implement models and techniques in one or more of these areas.
- L3. Understanding of models and techniques, formulation and results of an analytical or mathematical nature that aid decision-making.
- L4. Gaining a perspective that integrates management, computer science and mathematics to solve the new challenges of modern complex systems.

Requirements and Evaluation:

Class/ Homework	40%
Midterm	20%
Final Exam	20%
<u>Case Study</u>	<u>20%</u>
TOTAL	100%

Classwork:

Exercises will be given in class to be worked on individually or as a group. Only participation will be graded. If a student misses a class, classwork may also be done asynchronously by watching the recording and uploading the classwork in Canvas. Missed classwork should be submitted prior to the next class session. If there are no obvious classwork done in class, submit a brief discussion about the class and what you learned.

Homework:

Weekly homework sets will be assigned and posted on Canvas. Homework will be due the following week prior to class and submitted through Canvas. Homework sets shall include but not be limited to problem solving, discussion questions, scheduled presentations, research and technical reviews, and reading assignments.

Midterm: The midterm is given after Session 6 and covers topics from Sessions 1-6. It will be open notes and open books. Answers and solutions shall be submitted through Canvas on or before the assigned due date. Late submission will not be accepted. The midterm exam is an individual effort. No consultations among students or other individuals are allowed. If you have questions or clarifications, consult with the instructor.

Final exam: The final exam is given on the last day of class and covers ALL the topics of the entire course. It will be open notes and open books. Answers and solutions shall be submitted through Canvas on or before the assigned due date. Again, the final exam is an individual effort. Consultations among students or other individuals are absolutely prohibited. Late submission will not be accepted.

Case Study: The class will be divided into groups. Students will have to option to sign up for a group. Each group should have at least three (3) members. Group members shall work together on assigned case problems. Please be prepared to share with the class and submit analysis and discussion points through Canvas one day prior to the scheduled case presentation session.

A portion of the weekly live class session will be allocated to team meetings and collaboration. Teams can opt to meet during that time or schedule alternative meeting times. Student contribution to the team will be determined through peer evaluation and included in the case study grade.

Attendance: Although attendance is not required, students are responsible to fulfill and timely submit all the requirements of the course including classwork during the live sessions.

Late Submission: ALL coursework MUST be completed and submitted by the designated due dates, in the designated Canvas location. Full credit cannot be earned by late or incomplete submissions. Coursework lose 10% of their possible value each day late if submitted after the posted due date/time. Coursework lose all of their value at 10 days past due. Late exams without instructor approval will not be accepted.

Exceptions to the above policy may be granted by the Instructor if the instructor receives a request for late submission by email prior to the submission date and for a valid reason. Extenuating circumstances such as work and personal extraordinary demands may be valid reasons for such an exception. Reasonable accommodations can be made with instructor approval.

Student Effort:

Students will typically be engaged in the following types of activities in an online course: attending and participating in class or listening to the class recording, reading, listening to/ viewing media, participating in online discussions, conducting research, completing individual and team assignments, reviewing instructor feedback, meeting with team members, completing self-assessments, studying for and completing exams, etc. The most important step for being successful in an online graduate course is establish a schedule so that you have dedicated time each week for completing these class related activities – spread over multiple days. In general, students should expect to study a minimum of 6 hours outside class time per class for a 3-credit course. For Spring and Fall courses this equates to 6 hours outside class per week.

Grading Scale:

A 94-100	C+ 77-79
A- 90-93	C 73-76
B+ 87-89	C- 70-72
B 83-86	D 65-69
B- 80-82	F 0-64

If the final % is less than a whole number, the grade will not be rounded.

COURSE MAP/ OUTLINE

Learning outcomes:

- L1. Ability to recognize problems in real-world situations where operations research models can be applied.
- L2. Knowledge of the substantive areas to which operations research can be applied and the ability to implement models and techniques in one or more of these areas.
- L3. Understanding of models and techniques, formulation and results of an analytical or mathematical nature that aid decision-making.
- L4. Gaining a perspective that integrates management, computer science and mathematics to solve the new challenges of modern complex systems.

Course Outline:

Session #	Date	Learning Objectives	Topic	Coursework
1	1/19	L1, L2, L3, L4	Ch 1: Introduction to Quantitative Analysis and Modeling	CW, HW1
2	1/26	L1, L2, L3, L4	Ch 7: Linear Programming Model Basics Supply Chain and Operations Management Perspective	CW, HW2
3	2/2	L1, L2, L3, L4	Ch 8: Linear Programming Applications Capacity and Facility Planning in the Supply Chain	CW, HW3
4	2/9	L1, L2, L3, L4	Ch 8: Sensitivity Analysis Adjusting Capacities for Throughput Ch 10: Integer Programming Supply Chain Investment Options	CW, HW4
5	2/16	L1, L2, L3, L4	Ch 9: Network Models Supply Chain and Transportation Network Problem	CW, HW5
6	3/9	L1, L2, L3, L4	Other Analytical Models Goal Programming Nonlinear Programming	CW, HW7

7	2/23	L1, L2, L3, L4	Case Presentation HW1-7 Q&A	Case
	3/2		Midterm Exam Session (1-6)	Midterm
8	3/16	L1, L2, L3, L4	Ch 2: Probability Concepts Descriptive vs Prescriptive Analytics Forecasting	CW, HW8
9	3/23	L1, L2, L3, L4	Ch 13: Simulation Modeling Queuing and Service Systems Planning	CW, HW9
10	3/30	L1, L2, L3, L4	Ch 3: Decision Analysis and Decision Trees Incorporating Uncertainty and Risk in Supply Chains	CW, HW10
11	4/6	L1, L2, L3, L4	Integrating Models Using Simulation with Decision Trees Integrating Models – Supply Chain Application	CW, HW11
	4/13		SPRING BREAK	
12	4/20	L1, L2, L3, L4	Application/ Advanced Topic Invited Speaker: Using AI in Supply Chain and Operations Management	HW12
13	4/27	L1, L2, L3, L4	Case Presentation HW9-12 Discussion	Case
			Final Exam Session (Exam Week)	Final Exam

*CW- Classwork may be given in class; HW-Homework assigned weekly

GENERAL COURSE POLICIES

See Syllabus Page on the Canvas course site for the General Course Policies

Course location:	Online
Live Class Sessions:	Thursdays, 6:15 – 8:45pm
Instructor:	Luna Magpili, PhD
Contact:	PH 757.632.0419; luna.magpili@wsu.edu
Office Location:	Zoom: https://wsu.zoom.us/j/9111111111

General Course Policies

Text and Resources:

[More Information](#) 

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Incomplete Grade Policy

An incomplete (I) grade is given to a student who, for reasons beyond the student's control, is unable to complete the course requirements within the enrolled semester. An incomplete will only be considered if at least 50% of point assignments required in the course are completed and submitted by the end of the enrolled semester. The incomplete must be cleared and completed within one year following the semester in which the "I" grade was assigned. If the incomplete is not completed and a grade change is not submitted by the deadline, the grade will automatically change to an "F".

A student may not simply repeat the course to remove an Incomplete grade. A student must have a written permission from their faculty advisor to register for future semesters if the student has two or more Incomplete grades on their transcripts. If a student intends to graduate less than one year following the semester in which the 'I' grade was assigned, the student must clear the incomplete before the end of the semester that they intend to graduate or receive a certificate. A student will not be allowed to graduate or receive a certificate with an Incomplete grade on their transcript.

A student who desires an Incomplete grade must:

- (1) Notify the professor in writing,
- (2) Provide sufficient reason for the incomplete request,
- (3) Complete and submit an Incomplete Grade Agreement Form found

at- <http://gradschool.wsu.edu/?p=3673>  (<http://gradschool.wsu.edu/?p=3673>)

Expectations for Student Effort

Students will typically be engaged in the following types of activities in an online course: attending and participating in class or listening to the class recording, reading, listening to/viewing media, participating in online discussions, conducting research, completing individual and team assignments, reviewing instructor feedback, meeting with team members, completing self-assessments, studying for and completing exams, etc. The most important step for being successful in an online graduate course is establish a schedule so that you have dedicated time each week for completing these class related activities – spread over multiple days. In general, students should expect to have a minimum of 6 hours outside class time per class for a 3-credit course. For Spring and Fall courses this equates to 6 hours outside class per week; for Summer courses this equates to 12 hours outside class per week. Other tips for being successful in an online program include learning from each other; keeping an open mind; becoming an advocate for online learning; and building a support structure of folks who will help you achieve your learning goals.

Company Proprietary Information

Students should be careful not to discuss, present, or submit company proprietary information in this course. If students are not certain of the status of company related information, they should contact the proper authority in their company to ascertain whether the information is or is not company proprietary.

Academic Integrity

Academic integrity is the cornerstone of higher education. As such, all members of the university community share responsibility for maintaining and promoting the principles of integrity in all activities, including academic integrity and honest scholarship. Academic integrity will be strongly enforced in this course. Violation of WSU's Academic Integrity Policy (identified in Washington Administrative Code (WAC) 504-26-010(3) and -404) may result in penalties up to and including failing the assignment, exam, quiz, course requirement, or the course itself and students will not have the option to withdraw from the course pending an appeal, and will be reported to the Office of Community Standards.

Cheating includes, but is not limited to, plagiarism and unauthorized collaboration as defined in the Standards of Conduct for Students, WAC 504-26-010(3). You need to read and understand all of the definitions of cheating (<https://app.leg.wa.gov/WAC/default.aspx?cite=504-26-010> (<https://app.leg.wa.gov/WAC/default.aspx?cite=504-26-010>)). If you have any questions about what is and is not allowed in this course, you should ask course instructors before proceeding.

Undergraduate only: If you wish to appeal a faculty member's decision relating to academic integrity, please use the form available at communitystandards.wsu.edu/ (<https://communitystandards.wsu.edu/>).

ETM requires students to including the following statement on exams and other course assignments as required by the instructor:

I commit myself to Washington State University's high standards to uphold academic honesty and scholarly values as established by the WSU's Standards of Conduct. I affirm that I have not given or received any unauthorized assistance on this assignment/examination, that the work product presented here is the work of the author(s) [myself or all team members listed], and that all materials from other sources (including books, articles, Internet, or other media), whether quoted or paraphrased, have been properly cited.

<student signature>

Typing my name above serves as my signature

Copyright

Any course-related materials, presentations, lectures, etc. are the instructor's intellectual property and may be protected by copyright. The use of University electronic resources for commercial purposes, including advertising to other students to buy notes, is a violation of WSU's computer abuses and theft policy (WAC 504-26-218). Selling class notes through commercial note taking services without written advance permission from the faculty, could be viewed as be as copyright infringement and/or academic integrity violation, WAC 504-26-010 (3)(a,b,c,i).

Academic Regulations

Students enrolled in online courses are subject to the same University academic regulations as on-campus students. For the most accurate and up to date information go to **Academic Reaulations**

[\(https://registrar.wsu.edu/academic-regulations/\)](https://registrar.wsu.edu/academic-regulations/).

Discrimination and Harassment Policy

Discrimination, including discriminatory harassment, sexual harassment, and sexual misconduct (including stalking, intimate partner violence, and sexual violence) is prohibited at WSU (See [Policy Prohibiting Discrimination, Discriminatory Harassment, Sexual Harassment, And Sex And Gender Based Violence \(https://policies.wsu.edu/prf/index/manuals/executive-policy-manual-contents/ep15-discrimination-sexual-harassment-and-sexual-misconduct/\)](https://policies.wsu.edu/prf/index/manuals/executive-policy-manual-contents/ep15-discrimination-sexual-harassment-and-sexual-misconduct/) (Executive Policy 15) and WSU Standards of Conduct for Students ([Chapter 504-26 WAC \(https://app.leg.wa.gov/WAC/default.aspx?cite=504-26\)](https://app.leg.wa.gov/WAC/default.aspx?cite=504-26)).

If you feel you have experienced or have witnessed discriminatory conduct, you can contact the WSU Office of Civil Rights Compliance & Investigation (CRCI) and/or the [WSU Title IX Coordinator \(https://crcl.wsu.edu/title-ix/\)](https://crcl.wsu.edu/title-ix/) at 509-335-8288 to discuss resources, including confidential resources, and reporting options. (Visit [crcl.wsu.edu \(https://crcl.wsu.edu/title-ix/\)](https://crcl.wsu.edu/title-ix/) for more information).

Most WSU employees, including faculty, who have information regarding sexual harassment or sexual misconduct are required to report the information to CRCI or a designated Title IX Coordinator or Liaison. (Visit [crcl.wsu.edu/reporting-requirements \(https://crcl.wsu.edu/reporting-requirements-2/\)](https://crcl.wsu.edu/reporting-requirements) for more info).

Reasonable Accommodation Statement

Reasonable accommodations are available for students with documented disabilities or chronic medical or psychological conditions. If you have such a condition and need accommodations to fully participate in this class, please visit your campus' Access Center/Services website to follow published procedures to request accommodations. Students may also contact their campus offices to schedule an appointment with an Access Advisor. All disability related accommodations are to be approved through the Access Center/Services on your campus. It is a university expectation that students connect with instructors (via email, Zoom, or in person) to discuss logistics within two weeks after they have officially requested their accommodations.

For more information, contact an Access Advisor on your home campus:

- [WSU Global Campus, Pullman, Everett, Bremerton, and Puyallup Access Center](#)

(<https://www.accesscenter.wsu.edu/>): 509-335-3417 or email access.center@wsu.edu

(<mailto:access.center@wsu.edu>)

- **Spokane Access Services** (<https://spokane.wsu.edu/studentaffairs/access-resources/>): email spokane.access@wsu.edu (<mailto:spokane.access@wsu.edu>)
- **Tri-Cities Access Services** (<https://www.tricity.wsu.edu/disability/>): email tricity.AccessServices@wsu.edu (<mailto:tricity.AccessServices@wsu.edu>)
- **Vancouver Access Center** (<https://studentaffairs.vancouver.wsu.edu/access-center/>): 360-546-9739 or email van.access.center@wsu.edu (<mailto:van.access.center@wsu.edu>)

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Accommodations for Religious Observances or Activities

Washington State University reasonably accommodates absences allowing for students to take holidays for reasons of faith or conscience or organized activities conducted under the auspices of a religious denomination, church, or religious organization. Reasonable accommodation requires the student to coordinate with the instructor on scheduling examinations or other activities necessary for course completion. Students requesting accommodation must provide written notification within the first two weeks of the beginning of the course and include specific dates for absences. Approved accommodations for absences will not adversely impact student grades. Absence from classes or examinations for religious reasons does not relieve students from responsibility for any part of the course work required during the period of absence. Students who feel they have been treated unfairly in terms of this accommodation may refer to Academic Regulation 104 – Academic Complaint Procedures.

Safety and Emergency Notification

Classroom and campus safety are of paramount importance at Washington State University and are the shared responsibility of the entire campus population. WSU urges students to follow the “Alert, Assess, Act,” protocol for all types of emergencies and the **“Run, Hide, Fight”** (<https://oem.wsu.edu/emergency-procedures/active-shooter/>) response for an active shooter incident. Remain ALERT (through direct observation or emergency notification), ASSESS your specific situation, and ACT in the most appropriate way to assure your own safety (and the safety of others if you are able).

Please sign up for emergency alerts on your account at MyWSU. For more information on this subject, campus safety, and related topics, please view the FBI's Run, Hide, Fight video and visit the WSU safety portal.

Full details including campus-specific safety information can be found at

<https://provost.wsu.edu/classroom-safety/> (<https://provost.wsu.edu/classroom-safety/>)

Lauren's Promise

I will listen and believe you if someone is threatening you.

Lauren McCluskey, a 21-year-old honors student athlete, was murdered on Oct. 22, 2018, by a man she briefly dated on the University of Utah campus. We must all take actions to ensure that this never happens again.

If you are in immediate danger, call 911.

If you are experiencing sexual assault, domestic violence, and stalking, please report it to me and I will connect you to resources or call the National Alternatives to Violence at 877-334-2887 (24-hour crisis hotline).

Any form of sexual harassment or violence will not be excused or tolerated at Washington State University. WSU has instituted procedures to respond to violations of these laws and standards, programs aimed at the prevention of such conduct, and intervention on behalf of the victims.

- **National Resources for Domestic Violence, Sexual Assault, and Stalking:**
- **National Domestic Violence Hotline:** 1-800-799-SAFE and <https://www.thehotline.org/help/> (<https://www.thehotline.org/help/>)
- **RAINN (Rape, Abuse & Incest National Network):** 1-800-656-HOPE (4673) and <https://www.rainn.org/> (<https://www.rainn.org/>)
- **Victim Connect Resource Center:** 1-855-484-2846 and <https://victimconnect.org/> (<https://victimconnect.org/>)
- **Love is Respect – National Dating Abuse Hotline:** 1 (866) 331- 9474
 - Text: 22522 and <https://www.loveisrespect.org/> (<https://www.loveisrespect.org/>)
- **Anti-Violence Project Hotline:** 212-714-1141 and <https://avp.org/get-help/> (<https://avp.org/get-help/>)

Online Collaboration

The essence of education is exposure to diverse viewpoints. You will engage with people with vastly different opinions and backgrounds. You are encouraged to disagree with the substance of others' ideas and opinions but do so with an active sense of respect for one another, and without losing focus on the topic at hand. Personal attacks, inflammatory statements, flaming, trolling, and disruption of the discussion do not have a place in academic discourse. Postings must comply with University policy on use of computing resources, including those regarding harassment and discrimination, as well as conform to the **[WSU Community Standards \(https://communitystandards.wsu.edu/home/\)](https://communitystandards.wsu.edu/home/)**.

Your instructors will promote high-quality academic discussions by removing any posts they view as disruptive of the educational process and alerting students whose posts have been removed that they have violated course expectations. Students who continue to misuse the discussion boards after a warning may be subject to removal of access rights, course failure, and referral to the Office of Community Standards.

[Review the netiquette guidelines. \(https://online.wsu.edu/currentstudent/netiquette-guidelines/\)](https://online.wsu.edu/currentstudent/netiquette-guidelines/)

Technical Support

The **[WSU Global Campus Current Student \(https://online.wsu.edu/currentstudent/\)](https://online.wsu.edu/currentstudent/)** site has all the non-content and administrative and contact related information you need to be a successful online learner as well as **[study tips and skills for success \(https://online.wsu.edu/currentstudent/student-support/skills-for-success/\)](https://online.wsu.edu/currentstudent/student-support/skills-for-success/)**.

Before contacting Technical Support please visit our **[Equipment Requirements web page \(http://online.wsu.edu/currentStudent/supportTeam/techRequirements.aspx\)](http://online.wsu.edu/currentStudent/supportTeam/techRequirements.aspx)** to ensure your system meets our computer requirements and test your connection.

Technical support is available 24/7

A member of our technical support team will assist you or direct your request to the appropriate group. The technical support team is NOT able to answer questions about course content or procedures (e.g., assignments, grades).

Please visit our **[Tech Support web page \(https://online.wsu.edu/techready/tech-support/\)](https://online.wsu.edu/techready/tech-support/)** for up to date hours and contact information.

Library Support

Library Support

All students enrolled in Washington State University online courses can use the WSU Libraries online databases and receive reference and research assistance from their home campus. Students can also borrow books and other circulating material as well as access full-text journal articles.

General Library Links by Campus

- [Pullman Library Support \(http://libraries.wsu.edu/\)](http://libraries.wsu.edu/)
- [Global Campus Library Support \(http://libguides.libraries.wsu.edu/global\)](http://libguides.libraries.wsu.edu/global)
- [Vancouver Library Support \(https://library.vancouver.wsu.edu/\)](https://library.vancouver.wsu.edu/)
- [Tri-Cities Library Support \(http://tricities.wsu.edu/library\)](http://tricities.wsu.edu/library)
- [Library Support at Spokane – Riverpoint and Nursing at Yakima \(https://spokane.wsu.edu/library/\)](https://spokane.wsu.edu/library/)
- [College of Nursing Library Support \(https://nursing.wsu.edu/library-services/\)](https://nursing.wsu.edu/library-services/)

Online Tutoring

As a WSU student enrolled in an undergraduate course, you have FREE unlimited access to Online Tutoring. This is not a course requirement, but a resource for you to utilize as needed.

With three ways to access a tutor you can choose the one that best fits your needs:

- **Submit a paper:** Writing Lab tutors will respond to papers in ANY academic subject. Just submit your paper, ask specific questions on the submission form, and a tutor will respond within 24-48 hours.
- **Live tutoring:** eChat rooms allow students to meet with tutors in one-on-one tutoring sessions via a fully interactive, virtual online environment.
- **Leave a question:** Students can leave specific questions for a tutor in any of our subjects by taking advantage of our eQuestions option. Our tutors will respond to your question within 24-48 hours.

More details and the list of available tutoring subjects can be found at www.eTutoringOnline.org (<https://www.etutoringonline.org/>).

As a WSU student enrolled in a graduate level course, you have FREE unlimited access to writing support through eTutoringOnline. This is not a course requirement, but a resource you may utilize as needed.

Writing Lab tutors will respond to papers in ANY academic subject. If you're working on a paper for ANY of your courses our tutors can help you. Just submit your paper, ask specific questions on the submission form, and a tutor will respond within 24-48 hours. For more information visit [www.eTutoringOnline.org \(https://www.etutoringonline.org/\)](https://www.etutoringonline.org/).

Important Dates and Deadlines

Students are encouraged to refer to the [academic calendar \(https://registrar.wsu.edu/academic-calendar/\)](https://registrar.wsu.edu/academic-calendar/) often to be aware of critical deadlines throughout the semester.

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Please see the [Course Schedule](#) for the most comprehensive list of due dates.