

## Volume VI Number 4

**SCUDEM V 2020 REGISTRATION OPEN! JMM GOES VIRTUAL!**

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### SCUDEM V 2020 - GOING VIRTUAL - REGISTRATION OPEN NOW

SIMIODE Challenge Using Differential Equation Modeling - SCUDEM V 2020 is going virtual and registration is NOW Open for Students, Coaches, and Judges.

We ask faculty to invite their students NOW to [register for SCUDEM V 2020](#). Students can register as a team or individually. In the latter case SIMIODE will put students and coaches together from around the world to work on a model and make new friends and life-long mathematical colleagues.

Key features include - **opportunity to work together with student team members and faculty coaches from around the world** and more:

- Teams of three high school or undergraduate students will select one of three area problems (physics/engineering, chemistry/life sciences, humanities/social science) to work on during the Challenge Period 23 October -14 November 2020 and upload their team's 10 minute video presentation for judging.
- [Helpful materials for students](#) prepared by SIMIODE student interns and former SCUDEM participants is available.
- Teams can consist of students from one school or many schools. SIMIODE will facilitate team formation and coach assignment from individual student and mentor/coach registration.
- SIMIODE offers opportunities to meet colleagues from around the world in team/coach pairings from individual registrations.
- [Faculty and graduate students can volunteer](#) to coach/mentor teams as well as judge to score and give constructive feedback to teams.

Be sure to check out the [convincing videos](#) in which students and faculty share their enthusiasm and experience in engaging in modeling with differential equations in SCUDEM events past. You can see all the previous events' problems and all student submissions for each year of SCUDEM at [SCUDEM V 2020](#), e.g., [SCUDEM IV 2019 results](#).

There are no registration fees for SCUDEM V 2020 in developing countries and there is a modest \$10 US individual registration for all other students.

We invite all to visit and join the [Facebook Group - SCUDEM Mathematical Community](#) to see more joy in modeling with differential equations.

See the results of our [SCUDEM Lite 2020](#) in which 8 teams produced impressive videos for judging this March in a prelude to SCUDEM V 2020 going virtual.

In our [12 July 2019 Blog](#) we highlighted the results from a recently published article, "[Building mathematics self-efficacy of STEM undergraduates through mathematical modelling](#)," in the *International Journal of Mathematical Education in Science and Technology*, in which the authors conclude that SCUDEM increases students' self-efficacy in mathematical modeling. Do SCUDEM for your students!

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### SIMIODE RELATED ACTIVITIES AT THE VIRTUAL JOINT MATHEMATICS MEETINGS

The [Joint Mathematics Meetings](#) of the MAA and AMS will be held virtually on 6-9 January 2021. This will be an opportunity to join in the world's foremost mathematics gathering without the cost of travel and expensive hotel and food costs. In the past attendance was restricted because of travel, room, board, and registration fees, but now costs are reduced to registration fee only. So come on in and join JMM and experience the community and joy of mathematics. Moreover, when the AMS releases registration fees shortly we expect they would be reduced.

So [check out the program](#) and plan to attend virtually and soak up great mathematics, both in teaching and research. Registration opens 14 September 2020. Join us! Be there!

### **SIMIODE Presence at JMM**

SIMIODE will have three related events at JMM 2021, two paper sessions and one minicourse. Below are the details and opportunities. Please consider [submitting an abstract](#) by 15 September 2020 for the paper sessions. This is an opportunity to share your ideas and enthusiasm for your own teaching efforts and perhaps involve students in the presentation.

- **AMS Special Session** - Adopt, Adapt, Assign Modeling Activities in Differential Equations

Presenters will share their experience in adopting, adapting, and assigning modeling activities in their differential equations course. This will include materials written by the teacher as well as modeling activities brought to class from other sources, e.g., SIMIODE, CODEE, COMAP, the literature. During the summers of 2018, and 2019 SIMIODE conducted NSF funded workshops for faculty practitioners who want to incorporate modeling in their differential equations coursework. This session will give these colleagues and others an opportunity to share their story of bringing modeling as a motivator to learning differential equations by their students.

Presenters will discuss their personal rationale for including modeling in their coursework, the issues in gathering and shaping materials for their own teaching efforts, how they integrated modeling into their syllabus – small and big, student reaction and learning, and their personal growth in this process. Both pedagogical and technical details will be presented with audience reflection on the experience. The intent is to have a discussion of just how one could go about incorporating more modeling in a differential equations course through personal accounts of teachers who have engaged in the process.

- **Contributed Paper Session** - Data-Driven Modeling Projects to Motivate Active Learning & Engagement

*A Common Vision for Undergraduate Mathematical Sciences Programs in 2025* makes a number of recommendations for improving the mathematics curriculum in the United States, including an emphasis on mathematical modeling and a focus on technology. Modeling is widely used to motivate student learning in courses across the mathematics curriculum, and implementation of the modeling process varies by course, background of the professor, majors of the students, departmental constraints, and type of institution. Inquiry-based activities, driven by the data, allow students to determine what the data is saying by building mathematical models, finding solutions, and exploring the impact of those solutions. These activities promote students' quantitative literacy by building connections between the data, the model, and the real-world problem at hand. The goal of this session is to deepen the engagement of students through modeling-first and data-first active pedagogies across the mathematics curriculum, in classes aimed at both STEM and non-STEM students. We invite scholarly presentations of data-driven activities, projects, or course designs that generate active, inquiry-oriented learning and increased student engagement in the mathematics classroom. The diversity of presented modeling implementations benefits the community through shared resources, support, and new perspectives. Presenters are encouraged to discuss the value of modeling to themselves as teachers and to their students as learners, as well as techniques for data collection, implementation, and assessment.

- **Minicourse** - Modeling-based Differential Equations

This minicourse is designed to introduce faculty to a modeling-based approach to differential equations and to support faculty in finding, using, and adapting materials for modeling activities in their courses. Participating faculty will experience hands-on classroom activities designed to support this pedagogical approach and engage in discussion about the benefits and challenges of using this approach with leaders who are experienced in this area. Leaders will share their own experiences in designing and using modeling-focused classroom activities and share resources for finding and adapting modeling scenarios. Participants will also be encouraged to share experiences they have had using modeling. Finally, participants will be given time to explore existing resources and adapt them for their course in small groups with guidance from experienced faculty leaders, helping participants gain confidence in incorporating modeling effectively in the classroom.

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### **SIMIODE REMOTE TEACHING MODULES FOR OFF THE SHELF ONLINE INSTRUCTION**

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SIMIODE offers [SIMIODE Remote Teaching Modules](#) consisting of off the shelf, ready to use classroom materials which include videos for teacher and student in support of teaching and learning with complete materials for teaching and assessing results. Further, there are [Questions and Answers](#) from our OnLine 13 August 2020 SIMIODE Panel and Q&A on Remote Teaching Modules. This material is available to registered members of the Teacher Group in SIMIODE. [Registration is free](#) in SIMIODE so join the Community of Practice and benefit from these resources.

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### **COMING SOON! SIMIODE ONLINE HYPERLINKED TEXT**

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Kurt Bryan, Rose-Hulman Institute of Technology, Terre Haute IN USA, is authoring a hyperlinked text in SIMIODE which will bind resources so faculty can teach a complete differential equations course motivated by modeling and students can save a bundle of money! Dr. Bryan (with co-author Tanya Leise, Amherst College, Amherst MA USA) has authored several pieces in *SIAM Reviews* over the years. For example they explain "[The \\$25,000,000,000 Eigenvector: The Linear Algebra behind Google](#)". He has also authored (with Allen Broughton, Rose-Hulman Institute of Technology) *Discrete Fourier Analysis and Wavelets - Applications to Signal and Image Processing*.

The SIMIODE OnLine text will have the traditional topics flow, but will be rooted in modeling as a motivation and teaching approach with links to SIMIODE and other resources. We expect the text to come on line in January 2021 and we will share details as we go. So for now, know there will be a very affordable and solid text - on the order of \$45 US - that will motivate learning differential equations through modeling. The text will include traditional exercises in addition to rich motivating modeling activities from SIMIODE and elsewhere. Contact [Director@simiode.org](mailto:Director@simiode.org) if you wish to be kept apprised of progress, offer to review, or consider becoming an early user. We hope to have a preliminary draft available in late Fall 2020. All other resources in SIMIODE will remain FREE as Open Educational Resources (OER) while this text will bring together the modeling approach SIMIODE supports, weaving together and binding the freely available SIMIODE resources. In addition, modeling activities, exercises, and projects along with rich sections on dimensional analysis, parameter estimation and system identification, and control theory, for example, will point the way to future applications for students while motivating them to see the value and context of differential equations in operation. If interested in receiving an early draft review version contact [Director@simiode.org](mailto:Director@simiode.org).

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## NEW MODELING SCENARIOS IN SIMIODE

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- Jue Wang authored a [modeling activity](#) which engages student in studying the recent coronavirus outbreak which has infected millions of people worldwide and spread to over 200 countries.
- [Realistic modeling car suspension systems](#) is what Therese Shelton offers students in her modeling scenario with commercial specs on parts.
- Tracy Weyand offers two new Modeling Scenarios: (1) on [fraction of the population entering first time marriage](#) and (2) [temperature in an environment](#) in which heating system has troubles.
- Lenka Pribylova and colleagues from the CZECH Republic offer [World Population modeling activities](#). This material is in English and Czech language.

These are but a few of the many new publications in SIMIODE for you to use with your students. We invite you to search for topics of your interest and include SIMIODE materials in your teaching.

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## SIMIODE SOURCES FOR YOUR OWN MODELING SCENARIOS

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SIMIODE offers [potential modeling scenario ideas](#). There are now over 500 of these! These are materials, thoughts, pointers, summaries, articles, etc. to encourage and support your modeling scenario ideas. You must be registered and signed in to view these resources. Consider these ideas and use them to design your own modeling scenarios for your students and then publish this material in SIMIODE.

Of course, you can publish your own source materials, perhaps ideas you have not been able to get to, but want to or wish to engage with others in producing a Modeling Scenario. Just upload them for all to see. Use the "Start a new Potential Scenario Idea" button and contribute.

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## PUBLISH YOUR CLASS EFFORTS IN SIMIODE

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If you are teaching differential equations of some sort you have probably written and assigned projects. Consider publishing your materials online in SIMIODE using our peer reviewed, double blind referee system. More and more colleagues are accepting our invitation for sharing and publishing their teaching materials in SIMIODE for others to enjoy. Join in with us!

SIMIODE maintains a [double-blind, peer-reviewed process](#) for quality online publication of Modeling Scenarios and Technique Narratives. However, we encourage authors to submit their ideas at any stage of development and/or class projects for immediate feedback of a less formal nature. We will render constructive support and encouragement as well as technical feedback. In the past the SIMIODE Director, Brian Winkel, as Founding Editor of the journal *PRIMUS*, found this to be a very good way to foster confidence, help prospective authors contribute to the broader community, and get their ideas published. Please drop us a note with your ideas and/or materials to [Director@simiode.org](mailto:Director@simiode.org). We will respond quickly!

You can see how to submit your materials [here](#). What you do is important to your students, but it is also worthy of sharing with colleagues and their students. Step up and write up your projects for SIMIODE. You will have an online refereed publication at SIMIODE. You will be pleased to know others are using your ideas, building on your success, and enjoying what you share with your students. So, what are you waiting for? Just do it!

One purpose of SIMIODE is to offer colleagues solid, refereed teaching material on which they can base a modeling first course in differential equations. Thus publishing your new ideas and activities for students is a main objective of SIMIODE so others can see your fine work and engage their own students in similar manner. However, it is reasonable to ask yourself, "Why should I prepare, submit, and publish in SIMIODE?" [Here](#) we give you many good reasons to publish in SIMIODE. Check them out and see that many fit you. Then join us by sending us your efforts.

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## WORDS FROM THE DIRECTOR

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SIMIODE is a [community](#) which is alive, vibrant, and rich in resources and individual talents to assist colleagues who wish to teach differential equations using modeling to motivate students. There are a number of ways you can add to the community:

**Contribute materials.** You can learn more about this at our [Author Information](#) section and get even more details once you have signed into SIMIODE. There you will find types of materials and instructions on how to contribute and begin the process leading to publication in

SIMIODE. **Register to referee and review submitted materials.** Good scholarship merits attention and our double-blind, peer-referee system affords quality reviews of submitted materials. Please, visit our [Manuscript Management system](#) and register as a referee.

**Post slides from your presentations, classes, or talks.** When you give a talk you can post your slides, details of the talk or meeting, and comments at [Resources: Presentations](#). Now that you have spread the word beyond the SIMIODE community bring it back home for your fellow SIMIODE members to see. As always please let us hear from you with your concerns, your news, and your activities. Contact us at [Director@SIMIODE.org](mailto:Director@SIMIODE.org).  
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