

IUCEE Engineering Education Research Course 2022-23
Sohum Sohoni and Prathiba Nagabhushan

Course Details

This is a practical-oriented course where the participants will learn about the scientific approach to research and the methods and techniques of academic research in an engineering education context. The participants will examine and be practically exposed to the significant components of a research framework, which includes problem definition, research design, methods of data collection and analyses, ethical issues in research and report writing. In addition, there will be a strong focus on the mechanics of grammar and writing in the context of formal research reporting. Assignments will include detailed and scaffolded reviews of existing research publications with the goal of participants eventually writing pieces of their own research paper. The long-term vision for the course is to equip participants with the knowledge and confidence to undertake research in their chosen area and contribute their research findings to peer-reviewed journals. A second long-term goal is to plug the participants into the existing ecosystem for EER, as reviewers and associate editors for JEET, reviewers for the annual conference, and leaders of the EER cluster.

Pedagogy

This course is delivered entirely online through CANVAS and Zoom webinars. The teaching methods include readings, lectures, power-point presentations, discussions, and several case-study assignments. It is expected that the course will have one or two teaching assistants to facilitate detailed and timely feedback. Meetings will be every other week, with a total of 20 meetings spanning one year.

Expected Audience

The course is targeted for those who are beginning their EER journey, i.e. faculty who are not already well-known researchers in engineering education research. A significant year-long commitment is required for this course. The expectation is for participants to work in groups. Groups will be intentionally created with participants from multiple institutions to build connections for longer-term collaboration.

Course Schedule:

Course will begin Saturday, October 29, 2022.
Meetings will be alternate Saturdays at 8 am IST

Registration Fees:

- 2 FREE registrations for members of Consortium Institutions
(send names directly to [krishna_vedula @uml.edu](mailto:krishna_vedula@uml.edu))
- Additional participants of IUCEE Consortium Institutions: Rs. 9,000 plus GST
- Participants from NON Consortium Institutions: Rs. 18,000 plus GST

Instructors



Dr. Sohum Sohoni is a Professor of Computer Science at the Milwaukee School of Engineering. Prior to his role at MSOE, he served as faculty at Arizona State University and Oklahoma State University. He received his PhD in Computer Engineering from the University of Cincinnati in 2004, and his BE in Electrical Engineering from the Govt. College of Engineering Pune (COEP) in 1998. His research is in Computer Engineering and Engineering Education. He has published over 40 peer-reviewed papers and has received several best paper awards. A computer architecture visualization platform that he and his students designed has been used by over 2000 students at 3 universities in the USA. He has received many teaching awards including the Regents Distinguished Teaching Award in 2010 at Oklahoma State University. He is a member of ACM and ASEE (American Society for Engineering Education), and a Senior Member of IEEE. He serves as the Associate Director of the Indo Universal Collaboration for Engineering Education (IUCEE) and as the Co-Editor-in-Chief of the Journal of Engineering Education Transformations. He leads the Engineering Education Research course for IUCEE along with



Dr. Prathiba Nagabhusan is an educational psychologist who has a PhD from the Australian National University, Canberra, Master of English from Madras University and Master of Education from Bangalore University. She is currently teaching Psychology to senior secondary students and Methods of Teaching English and Humanities to Master of Teaching students at the Australian Catholic University, Canberra. With over 25 years of teaching experience at different levels of educational system in India, Mexico and Australia, she has also taught in a variety of educational settings, with diverse students and across a wide range of cultural contexts. A Gold-Medallist from Madras and Bangalore Universities, Prathiba has won the National Award for 'Innovations in Teaching' from the NCERT, New Delhi and recently received an International Award for the Best Research Paper at the International Conference on Cognitive & Behavioural Psychology, Singapore. She is a member of Global Science & Technology Forum, Singapore. Prathiba was the Cultural Ambassador of India to Mexico, sponsored by the Rotary International, Evanston, Illinois, USA. She is the recipient of the prestigious "Achievement Award - 2019 for the Outstanding Services to the ACT Community" by Mr Andrew Barr, the Chief Minister of the Australian Capital Territory. Prathiba's publications include research articles on student motivation and engagement in learning, global trends in education and pre-service teachers' emotional well-being. Her current research interests include self-efficacy in students, ICT in education and educational practices and research in engineering education. Her book "Engaging Adolescent Students in Contemporary Classrooms: Emerging Research and Opportunities" is a compendium of her valuable research on adolescents' motivation towards and engagement in their learning. Prathiba lives with her husband Nagabhusan, a mechanical engineer, working for the Federal Government of Australia, in Canberra. They have a daughter, Samyuktha, who also lives in Canberra with her husband and children.

Course Unit & Assessment Outline

The outline below is tentative.

Module	Content
1	Basics of Research Introduction to EER Difference between Technical/Engineering Research and EER Introduction to Scientific Research The context of Research in Engineering Education Ethical considerations in research and professional conduct
2	Basic English Grammar Features of Academic Writing Characteristics of Academic language Using tenses in a journal article Sentence Structures Main and subordinate clauses Conjunctions Use of Active and Passive voice The connectors/linking words
3	Conducting a Literature Review Steps involved in literature review Functions of a literature review Performing systematic literature review Selecting appropriate theoretical framework Checklist for reviewing a journal article for literature review Working with literature review – Creating mind maps
4	Literature Review (continued) Quoting and paraphrasing Avoiding plagiarism Citing others and others' work Use of appropriate tense and reporting words
5	Research Questions, Variables, and Hypotheses Defining the topic Framing of the research questions based on the chosen topic and literature review Refining the research questions Variables and hypotheses Formulating the hypotheses
6	Constructing Research Questions, using Question Words such as what/why/how/ Creating a theoretical/hypothetical model that will be used in your study with appropriate references to the literature reviewed

7	<p>Methods: Deciding your Research Design Experimental & Non-experimental Qualitative Quantitative Mixed Methods Sampling techniques Participants Materials Procedure</p>
8	<p>Descriptive Research Case studies Naturalistic observation Self-report Methods Survey methods Questionnaires Interviews Rating Scales Longitudinal vs Cross-sectional studies</p>
9	<p>Basic Statistical Analyses: Descriptive statistics Calculating percentages Visual representation of data – histograms, bar graphs, Pie chart, line graphs Measures of central tendencies – mean, median and mode Measure of variability The Normal distribution (Normal Probability Curve)</p>
10	<p>Open Discussion on Selection of the problem, research questions and methods</p>
11	<p>Open Discussion on Selection of the problem, research questions and methods</p>
12	<p>Collating the Results Use of a logical structure When to use tables and graphs Reporting research results in APA style Use of appropriate tense in reporting the results</p>
13	<p>Need for a discussion of results Addressing the research questions Addressing the hypotheses Reviewing the literature again Comparing and contrasting your results with the past research findings Explaining the probable reasons for your results/findings</p>
14	<p>Need for reporting limitations, and suggesting recommendations for future research and implications of your research Writing an effective conclusion</p>

15 & 16	<p>Open discussion on Maintaining the flow of argument Checking whether the research question, hypotheses, methods and discussion are meaningfully connected with each other</p>
17	<p>Writing an empirical research report The report structure Writing an abstract Reference list and in-text referencing in APA format</p>
18	<p>Open discussion on Coherence of the argument Highlights of the results and discussion Use of appropriate tense throughout the paper Adherence to APA style of reporting Establishing effective synthesis of research</p>
19	<p>Open discussion on Coherence of the argument Highlights of the results and discussion Use of appropriate tense throughout the paper Adherence to APA style of reporting Establishing effective synthesis of research</p>
20	<p>Final Meeting and Reflection on Course</p>