

IUCEE

Engineering Education Research Scholar Certification 2020

Unit & Assessment Outline

Course Details

This is a practical-oriented course where the participants would learn about the scientific approach to research and the methods and techniques of academic research in an engineering education context. The participants would 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. Once equipped with this knowledge, participants would be confident to undertake research in their chosen area and contribute their research findings to peer-reviewed journals.

Course Goals:

1. To guide and certify faculty in the area of research in engineering education. These faculty can serve as mentors to others in their institutions, and also work on undertaking studies that investigate effectiveness of institutional policies and initiatives on improving the educational processes.
2. To provide well-rounded international exposure and focus on inter-institution collaboration. Research cannot be done in isolation. The certification program is designed to make several connections that will result in long-term collaboration (both international and within India).

Course Objectives

This course has the following objectives:

1. To develop an understanding of different research designs and techniques
2. To develop an understanding of how to conduct and write a literature review
3. To develop an understanding of the ethical considerations of engineering education research
4. To develop an appreciation of the different aspects of scholarly writing and evaluate its quality
5. To develop an understanding of research reporting and language conventions

Expected Deliverable: Each participant will submit a paper to a SCOPUS-indexed journal at the end of the program. It is expected that papers will have more than one co-author, with a maximum of 5 co-authors.

Pedagogy

This course is delivered entirely online through CANVAS and GoToMeeting webinars and the teaching methods include readings, lectures, power-point presentations, discussions, exercises and ongoing assignments that would eventuate in the production of a research paper.

Evaluation Methods

- Assignments
- Participation in discussion forums
- Final Project: Submission of a paper at the end of the course based on original research conducted during the course /past unpublished research

Assessment Criteria

- Demonstration of detailed, accurate knowledge and understanding of scientific research
- Use of highly relevant research/theories skillfully applied to support the proposed argument presented in the research article
- Integration of explicit evidence of critical thinking relevant to the research
- Drawing insightful connections and conclusions in response to the research question, clearly supported with evidence

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Date	Module	Content	Tasks	Weighting
16/8/2020	1	Basics of Research <ul style="list-style-type: none">• Introduction to EER• Difference between ER & EER• Introduction to Scientific Research• The context of Research in Engineering Education• Ethical considerations in research and professional conduct	Discussion on Scenarios provided Online Exercises	DUE ON 30/8/2020 10%
30/8/2020	2	Basic English Grammar <ul style="list-style-type: none">• Features of Academic Writing• Characteristics of Academic language• Using tenses in a journal article• Sentence Structures		

		<ul style="list-style-type: none"> • Main and subordinate clauses • Conjunctions • Use of Active and Passive voice • The connectors/linking words 		
13/9/2020	3	Conducting a Literature Review <ul style="list-style-type: none"> • 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 		
20/9/2020	4	Literature Review (contd..) <ul style="list-style-type: none"> • Quoting and paraphrasing • Avoiding plagiarism • Citing others and others' work • Use of appropriate tense and reporting words 	Participation in Discussion & Writing a draft of Literature Review	DUE ON 4/10/2020 10%
	5	Research Questions, variables and hypotheses <ul style="list-style-type: none"> • 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 		
11/10/2020	6	<ul style="list-style-type: none"> • 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 		10%
18/10/2020	7	Methods: Deciding your research design Experimental & Non-experimental <ul style="list-style-type: none"> • Qualitative • Quantitative • Mixed Methods • Sampling techniques • Participants • Materials 	Participation in Discussion & Writing a draft of research questions and drawing a theoretical/hypothetical	25/10/2020

		<ul style="list-style-type: none"> • Procedure 	model for your research	
1/11/2020	8	Descriptive Research <ul style="list-style-type: none"> • Case studies • Naturalistic observation Self-report Methods <ul style="list-style-type: none"> • Survey methods • Questionnaires • Interviews • Rating Scales Longitudinal vs Cross-sectional studies		
8/11/2020	9	Basic Statistical Analyses: Descriptive statistics <ul style="list-style-type: none"> • 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) 	Participation in Discussion & Writing a draft methods section for your research	DUE ON 22/11/2020 10%
	10	Open discussion on <ul style="list-style-type: none"> • Selection of the problem, research questions and methods 	Intervention and Data Collection	
	11	Open discussion on <ul style="list-style-type: none"> • Selection of the problem, research questions and methods 	Intervention and Data Collection	
29/11/2020	12	Collating the results <ul style="list-style-type: none"> • 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 		
13/12/2020	13	Need for a discussion of results <ul style="list-style-type: none"> • 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 	Draft reporting of results	10% DUE ON 28/2/2021
17/1/2021	14	<ul style="list-style-type: none"> • Need for reporting limitations, and suggesting 		

		<p>recommendations for future research and implications of your research</p> <ul style="list-style-type: none"> • Writing an effective conclusion 		
	15 & 16	<p>Open discussion on</p> <ul style="list-style-type: none"> • Maintaining the flow of argument • Checking whether the research question, hypotheses, methods and discussion are meaningfully connected with each other 	Draft writing of discussion section	DUE ON 28/3/2021 10%
24/1/2021	17	<p>Writing an empirical research report</p> <ul style="list-style-type: none"> • The report structure • Writing an abstract • Reference list and in-text referencing in APA format 	Collating different sections of the research report	
	18	<p>Open discussion on</p> <ul style="list-style-type: none"> • 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 		
	19	<p>Open discussion on</p> <ul style="list-style-type: none"> • Coherence of the argument • Highlights of the results and discussion • Use of appropriate tense throughout the paper • Adherence to APA style of reporting <p>Establishing effective synthesis of research</p>		
	20	<ul style="list-style-type: none"> • Editing, proofreading and maintaining the flow of argument • Submission of the first draft of the paper 	Final submission of the draft research report	DUE ON 30/5/2021 40%