

Course outline

Course Name	Research Methods
Course Code	MatE 6080
ECTS	6
Status	Compulsory
Course Objective	<p>This course is intended to equip students with the methodological skills they need to successfully complete a major research project, and enable them to develop a critical and engaged attitude to research methods and experimental design. In addition it provides students with the ability to consider hypothesis, design and plan experiments to test them, run experiments and analyze data using basic statistics; derive results, and validate them, and write up scientific reports based on the experimental studies. It is intended to provide profound knowledge in experimentation and experimental design strategy.</p> <p>At the end of the module, a learner should be able to:</p> <ul style="list-style-type: none"> ○ Identify relevant literature for a given research topic within the research curricula; ○ Extract knowledge from the research literature on developing research methodology; ○ Develop research strategy relevant to the research topic; develop research proposal and plan ○ Develop and evaluate a strategy for analyzing the hypotheses, experimentally, analyzing results, and presenting them visually; Write a scientific report on results and solutions; ○ Understand fundamentals of experimental design and statistical analysis and apply this knowledge in a practical context; ○ Categorizedifferentvariablesinstatisticalanalysisandevaluatesampledusing basic statistical measures such as distribution, probability, significance, variance and correlation. ○ Define and formulate research problems, and questions, and where appropriate, formulate hypotheses that can be tested; ○ Understand the relationships between, and the rational for using, particularly qualitative and quantitative research methods; they also understand different forms of sampling, sampling error, and potential biases in the interpretation of research findings; apply the concepts of generalization ability, validity, reliability and replicability. ○ Appraise and evaluate library resources applicable to a research at postgraduate level; ○ Design an experiment to have reliable result with minimum number of experiment, that can save time and cost of experiment
Course description:	Type and characteristics of research projects; Selecting an appropriate research methodology; Research proposal development and management techniques;

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	Literature reviewing method, resource collection and documentation; Research outcome presentation and analysis; Typical applications of experimental design; Review of basic statistical principles; Guidelines for designing experiments; Basic statistical concepts; Simple comparative experiments; Experiments with a single factor; The analysis of variance; Randomized blocks, Latin squares, and related designs; 2k factorial design; Blocking and confounding in the 2k factorial design; Two, three and mixed level factorial and fractional factorial designs; Factorial experiments with random factors; Nested and split plot designs; Fitting regression models; Response surface methods and other approaches.	
Reference:	Design of Experiments for Engineers and Scientists, Jiju Antony, 2003	
Teaching Methodology and assessment strategy	Lecture / Tutorial	
	Exercise / Assignment	
Assessment/ Evaluation	Individual assignment / exercise	25%
	Project	25%
	Final examination	50%
Attendance requirement	Minimum of 75% of lecture	