GANPAT UNIVERSITY

FACULTY OF ENGINEERING AND TECHNOLOGY

Programme	Master of Technology				Branch	Mechanical Engineering (Specialization in Additive Manufacturing)			
Semester	I				Version	1.0.0.0			
Effective from Academic Year	**2025-26**				Effective for the batch Admitted in				**July 2025**
Subject code	**3ME1118**		Subject Name		**Fundamentals of Research Methods**				
Teaching scheme					Examination scheme (Marks)				
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	2	0	0	0	2	Theory	40	60	100
Hours	2	0	0	0	2	Practical	00	00	00

Pre-requisites:
Basic knowledge of mathematics and statistics at undergraduate level, familiarity with technical writing and communication skills, awareness of core engineering/technology domain to identify research problems.

Course Learning Outcomes:
The course content should be taught and implemented with an aim to develop different skills leading to the achievement of the following competencies and course learning outcomes: CO1. Explain different types of research and their applications in engineering. CO2. Identify and formulate research problems with well-defined objectives and hypotheses. CO3. Conduct a systematic literature review and use referencing tools effectively. CO4. Design research methodologies using appropriate sampling and data collection techniques. CO5. Analyze quantitative and qualitative data using statistical/analytical software.

Course Content		
Name of UNIT	**Unit Content**	**Hrs**
UNIT – 1	Introduction to Research: Meaning, Objectives, Significance; Types of Research (Basic, Applied, Descriptive, Analytical, Exploratory); Research process in engineering	**04**
UNIT – 2	Research Problem Formulation & Literature Review: Identifying and defining problems; Research objectives and hypotheses; Literature review methods; Databases & citation indexing; Plagiarism awareness	**04**
UNIT – 3	Research Design and Methodology: Research designs (Experimental, Descriptive, Exploratory, Case Study); Sampling techniques; Data collection methods (survey, interview, observation, experiment); Measurement & scaling	**06**
UNIT – 4	Data Analysis and Interpretation: Quantitative analysis (descriptive & inferential statistics); Qualitative analysis (content analysis, thematic coding); Software tools (Design Expert/Excel/R/MATLAB); Result interpretation & validation	**06**
UNIT – 5	Research Ethics, Reporting, and Documentation: Ethics & IPR; Report/dissertation/thesis structure; Guidelines for research paper writing; Referencing styles (APA/IEEE); Tools like Mendeley/Zotero	**06**
	Total	**26**

List of Practical

The practical should be carried out in such a manner that students are able to acquire different learning out comes in cognitive, psychomotor and affective domain to demonstrate course learning outcomes.

No.	Unit	Name of Practical
1	1	Write a short note on different types of research with real-world engineering/technology examples.
2	2	Formulate a research problem and write its objectives, scope, and possible hypotheses.
3	2	Conduct a literature survey on a selected research problem using Google Scholar/Scopus/Web of Science. Prepare a reference list using **Mendeley/Zotero**.
4	3	Design a simple research methodology for the selected problem, including sampling and data collection methods.
5	4	Perform a basic **data analysis exercise** (descriptive statistics, correlation, regression) using Excel/SPSS/R.
6	4	Carry out a small-scale **qualitative analysis** (thematic/content analysis) from interview/survey responses.
7	5	Prepare a **mini research report** and present it in seminar form (following IEEE/APA referencing style).

List of Instruments / Equipment / Trainer Board	
1	Latest educational network version Design Expert/R/MATLAB

List of Reference Books

No.	Title of Reference Books	Authors	Publication
1	Research Methodology: Methods and Techniques	C.R. Kothari, Gaurav Garg	New Age International Publishers
2	Design and Analysis of Experiments	Douglas C. Montgomery	John Wiley & Sons