BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI,
FIRST SEMESTER 2022-2023
Course Handout

Date: 18/08/2022

Course No. : BITS E661
Course Title: Research Methodology - I (5 Unit course)
Instructors: P. T.V. Praveen Kumar, Sashideep Gutti, Santanu Prasad Datta.

COURSE OBJECTIVE:

This course aims at training the PhD students towards acquiring competence in methodologies and methods involved in academic research. The course will expose students to various components of a scientific research which includes literature review, framing and testing hypothesis, designing research, data collection and analysis, writing reports and research proposals, and ethics.

LEARNING OUTCOMES:

1. Examine the validity of a hypothesis
2. Demonstrate the ability to use search engines to gather and review literature.
3. Apply statistical methods to analyze data for determining errors, outliers and correlation.
4. Demonstrate the ability to make an organized presentation on a research topic.
5. Apply ethical principles to situations that arise during research involving humans and animals.

SCOPE OF THE COURSE

Topics listed in the next section, listed in several modules under Course Outline, will be covered under the course. The course will comprise of lectures by the module Instructors (from engineering, sciences and Humanities discipline to give a holistic flavor to this course), working on assignment, project report submission by the PhD student and finally a comprehensive exam at the end.

For Full time and Part Time Ph.D students: Topics listed in the next section will be covered under the course as per the classes given in the time table by the team of instructors.

For Ph.D Aspirants : The course will involve self- learning by the students in addition to the inputs (as required) from the Instructor In-charge and the team of Instructors.

REFERENCE:

1. Prof. C. George Thomas “Research Methodology and Scientific Writing”, Ane Books Pvt. Ltd., 2015
2. Kothari, C.R., 1990. Research Methodology: Methods and Techniques. New Age International. 418p.
3. K. Trochim, W.M.K., 2005. Research Methods: The concise knowledge base, Atomic Dog Publishing. 270p.

Additional Resources for Reference:

1. Research Methods in Science and Engineering By Scott A. Gold (https://www.crcpress.com/Research-Methods-in-Science-and-Engineering/Gold/p/book/9781482208290)
2. Research Methods for Engineers By David V. Thiel
3. Writing for Science and Engineering: Papers, Presentations and Reports By Heather Silyn-Roberts

COURSE OUTLINE: The following modules will be included as part of this course:

Modules	Faculty from	No. of lectures	Contents	Topic
Module 1	Sashideep Gutti	6 lectures	**Introduction of Research Methodology:** Literature survey/ Defining a problem to be addressed	**Approaches to Research:** Resources or search engines available for gathering information and literature in related area, Critical review of available literature, Problem Identification & Formulation (finding research gaps), Research Question, Concept of a research proposal, Basic Machine Learning tools for data interpretation
Module 2	P.T.V. Praveen Kumar	6 lectures	**Research Design:** Experimental Design; Data Collection & analysis (Note: it should fulfill the student's research requirement and will be delivered in consultation with DRCs)	Hypothesis – Qualities of a good Hypothesis, Hypothesis Testing – Logic & Important Features of a good research design; Concept and Importance of Research Design:–Experimental Design: Concept of Independent & Dependent variables. Qualitative and Quantitative Research Data collection/ Sampling: Concepts of Statistical Population, Sample Size, Sampling Error, Probability, Practical considerations in sampling and sample size, Data Preparation and Data Analysis
Module 3	Santanu P Datta	6 lectures	Research documentation and presentation	Structure and components of research report, Seminars and paper presentations, Writing Research papers, Essential components for Thesis writing & Scientific editing tools, Synopsis, Importance of ethics in research, Ethical issues related to publishing; Plagiarism and Self-Plagiarism, Use of anti-plagiarism software, originality in research, conflict of interest.
Module 4	TBA	2 lectures	Ethics in research	Human and animal ethics, Intellectual Property Rights, Copyrights.

5. Evaluation Scheme:

No.	Component	Weightage	Due date	Instructor Responsible for the component
1.	Assignment 1 (Covers Module 1 and 2)	20%	Will be announced in class	Sashideep Gutti and P. T. V. Praveen Kumar
2.	Mid semester evaluation	20%	Will be announced in class	All instructors
3.	Assignment 2 (Covers Module 3 and 4)	20%	Will be announced in class	Santanu P Datta and Sashideep Gutti.
4.	Final project report and presentation	40%	Will be announced in class	All instructors

6. Notices: All Notices for the course will be displayed in CMS. The deadlines for the evaluation components are strict.

7. Academic Honesty and Integrity Policy: Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.