ATME College of Engineering

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A T M E

College of Engineering

DEPARTMENT OF CIVIL ENGINEERING

(ACADEMIC YEAR 2024 -25)

SUBJECT NAME: Research Methodology and Intellectual Property Rights

SUB CODE: BRMK557

SEMESTER: V

INSTITUTE

Vision of the Institute

Development of academically excellent, culturally vibrant, socially responsible and globally competent human resources.

Mission of the Institute

- To keep pace with advancements in knowledge and make the students competitive and capable at the global level.
- To create an environment for the students to acquire the right physical, intellectual, emotional and moral foundations and shine as tourch bearers of tomorrow's society.
- To strive to attain ever-higher benchmarks of educational excellence

DEPARTMENT

Vision of the Department

To develop globally competent Civil Engineers who excel in academics, research and are ethically responsible for the development of the society.

Mission of the Department

- To provide quality education through faculty and state of art infrastructure
- To identify the current problems in society pertaining to Civil Engineering disciplines and to address them effectively and efficiently
- To inculcate the habit of research and entrepreneurship in our graduates to address current infrastructure needs of society

Program outcomes (POs)

Engineering Graduates will be able to:

PO1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

Program Specific Outcomes (PSOs)

PSO1: Provide necessary solutions to build infrastructure for all situations through Competitive plans, maps and designs with the aid of a thorough Engineering Survey and Quantity Estimation.

PSO2: Assess the impact of anthropogenic activities leading to environmental imbalance on land, in water & in air and provide necessary viable solutions revamping water resources and transportation for a sustainable development

Program Educational Objectives (PEOs)

PEO 1- Engaged in professional practices, such as construction, environmental, geotechnical, structural, transportation, water resource engineering by using technical, communication and management skills.

PEO 2- Engaged in higher studies and research activities in various civil engineering fields and life time commitment to learn ever changing technologies to satisfy increasing demand of sustainable infrastructural facilities.

PEO 3- Serve in a leadership position in any professional or community organization or local or state engineering board

PEO 4- Registered as professional engineer or developed a strong ability leading to professional licensure being an entrepreneur.

Module-1

Introduction: The word research is composed of two syllables “Re” and “Search”. “Re” is the prefix meaning ‘Again or over again or a new’ and “Search” is the latter meaning ‘to examine closely and carefully’ or ‘to test and try’. Together they form, a careful, systematic, patient study and investigation in some field of knowledge undertaken to establish principles / policies

Meaning of Research: Research can be defined as

1. Search for knowledge
2. Systematic and scientific search for getting relevant answers on any taken up specific topic.
3. Scientific enquiry into a subject.
4. Research is a movement from the unknown to the known.
5. It is the voyage of discovery

Clifford Woody - Research comprises defining and redefining problems, formulating hypothesis or suggested solutions; collecting, organizing and evaluating data; making deductions and reaching conclusions; and at last carefully testing the conclusions to determine whether they fit the formulated hypothesis.

D. Slesinger and M. Stephenson in the Encyclopedia of Social Sciences define research as "the manipulation of things, concepts or symbols for the purpose of generalizing, to extend, correct or verify knowledge, whether that knowledge aids in construction of theory or in the practice“.

Objectives of Research: The objective of research is to find answers to the questions by applying scientific procedures. In other words, the main aim of research is to find out the truth which is hidden and has not yet been discovered. Although every research study has its own specific objectives, the research objectives may be broadly grouped as follows:

1.To gain familiarity with a phenomenon or to achieve new insights into it (exploratory or formulate research studies)

2. To portray accurately the characteristics of a particular individual, situation or a group (descriptive research studies)

3. To determine the frequency with which something occurs or with which it is associated with something else (diagnostic research studies)

4. To test a hypothesis of a causal relationship between variables (hypothesis-testing research studies)

Motivation in Research: The intention of doing research may be one or more of the following:

1. Get a research degree along with its consequential benefits
2. Face the challenges in solving the unsolved problems, i.e., concern over practical problems initiates research
3. Intellectual joy of doing some creative work
4. Service to society
5. Get respect.

Factors like directives of government, employment conditions, curiosity about new things, desire to understand causal relationships, social thinking and awakening, and the like may as well motivate people to carry research.

Types of Research:

1. Descriptive Vs Analytical Research Descriptive research consists of surveys and fact-finding enquiries of different types. The main objective of descriptive research is describing the state of affairs as it prevails at the time of study. The term 'ex post facto research' is quite often used for descriptive research studies in social sciences and business research. The most distinguishing feature of this method is that the researcher has no control over the variables here. He/she has to only report what is happening or what has happened. Majority of the ex post facto research projects are used for descriptive studies in which the researcher attempts to examine phenomena, such as the consumers' preferences, frequency of purchases, shopping, etc. Despite the inability of the researchers to control the variables, ex post facto studies may also comprise attempts by them to discover the causes of the selected problem. The methods of research adopted in conducting descriptive research are survey methods of all kinds, including correlational and comparative methods. Meanwhile in the Analytical research, the researcher has to use the already available facts or information, and analyze them to make a critical evaluation of the subject

Descriptive is fact finding to describe the state of affairs

Analytical Research is using already available information and analyse to make a criticalevaluation of the material

2. Applied Vs Fundamental Research An attempt to find a solution to an immediate problem encountered by a firm, an industry, a business organization, or the society is known as applied

research. Researchers engaged in such researches aim at drawing certain conclusions confronting a concrete social or business problem 4 Fundamental research mainly concerns generalizations and formulation of a theory. In other words, ―Gathering knowledge for knowledge ‘s sake is termed pure or basic research (Young in Kothari, 1988). Researches relating to pure mathematics or concerning some natural phenomenon are instances of Fundamental Research. Likewise, studies focusing on human behaviour also fall under the category of fundamental research.

Applied aims at finding a solution to the problem faced by the society/ organisation.

Fundamental Research is concerned with generalization and formulation of a theory

2. Quantitative Vs Qualitative Research Quantitative research relates to aspects that can be quantified or can be expressed in terms of quantity. It involves the measurement of quantity or amount. Various available statistical and econometric methods are adopted for analysis in such research. Which includes correlation, regressions and time series analysis etc Qualitative research is concerned with qualitative phenomena, or more specifically, the aspects related to or involving quality or kind. For example, an important type of qualitative research is Motivation Research ‘, which investigates into the reasons for certain human behavior. The main aim of this type of research is discovering the underlying motives and desires of in-depth interviews. The other techniques employed in such research are story completion tests, sentence completion tests, word association tests, and other similar projective methods. Qualitative research is particularly significant in the context of behavioural sciences, which aim at discovering the underlying motives of human behaviour

Quantitative research is based on quantitative measurements of some characteristics

Qualitative research is concerned with qualitative phemomenon

4. Conceptual vs. Empirical

The research related to some abstract idea or theory is known as Conceptual Research. Generally, philosophers and thinkers use it for developing new concepts or for reinterpreting the existingones.

Empirical Research, on the other hand, exclusively relies on the observation or experience withhardly any regard for theory and system. Such research is data based, which often comes up withconclusions that can be verified through experiments or observation. Empirical research is also known as experimental type of research, in which it is important to first collect the facts and their sources, and actively take steps to stimulate the production of desired information. In

this type of research, the researcher first formulates a working hypothesis, and then gathers sufficient facts to prove or disprove the stated hypothesis. He/she formulates the experimental design, which according to him/her would manipulate the variables, so as to obtain the desired information. The results obtained by using the experimental or empirical studies are considered to be the most powerful evidences for a given hypothesis

Conceptual research is related to some abstract ideas

Empirical research is data based research which relies on observation or experience.

5. Some other types of research

• one-time research or longitudinal research- depends upon the time of doing research

• field-setting research or laboratory research or simulation research- depends upon the environment in which research is carried on.

• clinical or diagnostic research- in-depth approaches or case study method may be employed to analyse the basic causal relations

• Exploratory research- consist of substantial structure and specific hypotheses to be verified

• Historical Research- sources like historical documents, remains, etc. Are utilized to study past events or ideas.

Research Approaches: The above description of the types of research shows that there are two basic approaches to research, viz., quantitative approach and the qualitative approach.

Quantitative approach can be further sub-classified into Inferential research - inferential approach to research is to form a data base from which to infer

characteristics or relationships of population. This usually means survey research where a sample of population is studied (questioned or observed) to determine its characteristics, and it is then inferred that the population has the same characteristics

Experimental research- characterized by much greater control over the research environment and in this case some variables are manipulated to observe their effect on other variables

Simulation research- Simulation approach involves the construction of an artificial environment within which relevant information and data can be generated. This permits an observation of the dynamic behaviour of a system (or its sub-system) under controlled conditions

Qualitative approach to research generates results either in non-quantitative form or in the form which are not subjected to rigorous quantitative analysis. Generally, the techniques of focus group interviews, projective techniques and depth interviews are used.

Significance of Research:

➢ Research inculcates scientific and inductive thinking and promotes the development of logical habits of thinking.

➢ Research provides the basis for all government policies in our economic system.

➢ Research has its special significance in solving various operational and planning problems of business and industry

➢ Research is equally important for social scientists in studying social relationships and in seeking answers to various social problems

a) To those students who are to write a master's or Ph.D. thesis, research may mean a careerism or a way to attain a high position in the social structure

(b) To professionals in research methodology, research may mean a source of livelihood

(c) To philosophers and thinkers, research may mean the outlet for new ideas and insights

(d) To literary men and women, research may mean the development of new styles and creative work

(e) To analysts and intellectuals, research may mean the generalizations of new theories.

Research Methods versus Methodology: Research methods may be understood as all those methods/techniques that are used for conduction of research. Research methods or techniques thus, refer to the methods the researchers use in performing research operations. Research methodology is a way to systematically solve the research problem. It may be understood as a science of studying how research is done scientifically. In it we study the various steps that are generally adopted by a researcher in studying his research problem along with the logic behind them

Research Method	Research methodology
Research methods refers to all those methods/techniques that are used for conduction of research. Research methods or techniques	Research methodology is a way to systematically solve the research problem. The scope of research methodology is wider than that of research methods
It involves conduction of experiments, tests, surveys etc	Techniques that can be used to conduct the experiments, tests etc
Aims at finding a solution to the research problem	Aims at employment of correct procedure to find the solution

Research and Scientific Method: The two terms, research and scientific method, are closely related. Research, as we have already stated, can be termed as "an inquiry into the nature of, the reasons for, and the consequences of any particular set of circumstances, whether these circumstances are experimentally controlled or recorded just as they occur. Further, research implies the researcher is interested in more than particular results; he is interested in the repeatability of the results and in their extension to more complicated and general situations."

The philosophy common to all research methods and techniques, although they may vary considerably from one science to another, is usually given the name of scientific method.

Karl Pearson writes, "The scientific method is one and same in the branches (of science) and that

method is the method of all logically trained minds … the unity of all sciences consists alone in

its methods, not its material; the man who classifies facts of any kind whatever, who sees their mutual relation and describes their sequences, is applying the Scientific Method and is a man of

science."

Scientific method is the pursuit of truth as determined by logical considerations. The ideal of science is to achieve a systematic interrelation of facts.

The scientific method is, based on the following basic postulates:

1. It relies on empirical evidence
2. It utilizes relevant concepts
3. It is committed to only objective considerations
4. It presupposes ethical neutrality, i.e., it aims at nothing but making only adequate and correctstatements about population objects
5. It results into probabilistic predictions
6. Its methodology is made known to all concerned for critical scrutiny are for use in testing the conclusions through replication
7. It aims at formulating most general axioms or what can be termed as scientific theories

Scientific method implies an objective, logical and systematic method, i.e., a method free from personal bias or prejudice, a method to ascertain demonstrable qualities of a phenomenon capable of being verified, a method wherein the researcher is guided by the rules of logical reasoning, a method wherein the investigation proceeds in an orderly manner and a method that implies internalconsistency

Importance of Knowing How Research is Done:

The importance of knowing how to conduct research are listed below:

➢ The knowledge of research methodology provides training to new researchers and enables them to do research properly. It helps them to develop disciplined thinking or a 'bent of mind'to objectively observe the field

➢ The knowledge of doing research inculcates the ability to evaluate and utilize the research findings with confidence;

➢ The knowledge of research methodology equips the researcher with the tools that help him/her to make the observations objectively and

➢ The knowledge of methodology helps the research consumers to evaluate research and make rational decisions.

Research Process: Research process consists of series of actions or steps necessary to effectively carry out research and the desired sequencing of these steps. The following Figure well illustrates a research process.

The various steps in a research process are as follows: (1) formulating the research problem (2) extensive literature survey (3) developing the hypothesis (4) preparing the research design (5) determining sample design (6) collecting the data (7) execution of the project (8) analysis of data (9) hypothesis testing (10) generalisations and interpretation (11) preparation of the report or presentation of the results, i.e., formal write-up of conclusions reached

1) Formulating a Research problem: In research process, the first step a researcher does is formulate a problem and define it properly. Research forms a circle. It starts with a problem and ends with a solution to the problem. A research problem is anything that a researcher finds unsatisfactory or unsettling, a difficulty of some sort, a state of affairs that needs to be changed, anything that is not working well as it was expected (Creswell, 2009) A problem statement consists of four parts: ➢ the ideal ➢ the reality or real situation ➢ the consequences or impacts, ➢ what the study wants to address or the aim of the study.

(2) Extensive Literature Survey: abstracting and indexing Journals, conference proceedings, government reports, books etc.

(3) Development of Working Hypothesis: A tentative assumption made to test its logical or empirical consequences. The role of hypothesis is to guide the researcher by delimiting the area and keep him on right track

Steps to develop a working hypothesis:

➢ Discussions with colleagues and experts about the problem, its origin and the objectives in seeking a solution

➢ Examination of data and records,

➢ Review of similar studies in the area or of the studies on similar problems

➢ Exploratory personal investigation which involves original field interviews on a limited scale with interested parties and individuals.

(4) Prepare the Research Design: state the conceptual structure within which Research will be conductedSeveral research designs- Experimental and Non-Experimental Hypothesis testing. Experimental design can be either informal or formal

(5) Determining Sample Design:

Census Survey, Sample Survey

Types of Sampling

➢ Deliberate sampling

➢ Simple random sampling

➢ Systematic sampling

➢ Stratified sampling

➢ Quota sampling

➢ Cluster sampling and area sampling

➢ Multi-stage sampling

➢ Sequential sampling

(6) Data Collection: ➢ Observation ➢ Personal Interview ➢ Telephone Interview ➢ Questionaires ➢ Schedules

(7) Execution of the Project: In a systematic manner and time

(8) Analysis of Data: The analysis of data requires a number of closely related operations such as establishment of categories, the application of these categories to raw data through coding, tabulation and then drawing statistical inferences.

(9) Hypothesis Testing: Various tests, such as Chi square test, t-test, F-test, have been developed by statisticians for testing the hypotheis. The hypotheses may be tested through the use of one or more of such tests, depending upon the nature and object of research inquiry. Hypothesis-testing will result in either accepting the hypothesis or in rejecting it.

(10) Generalization and Interpretations: If a hypothesis is tested and upheld several times, researcher may arrive at generalization, i.e., to build a theory. As a matter of fact, the real value of research lies in its ability to arrive at certain generalizations. If the researcher had no hypothesis to start with, he might seek to explain his findings on the basis of some theory. It is known as interpretation.

(11) Report or thesis writing: (a) layout • Preliminary pages • Main text • End matter (b) concise and objective style in simple language avoiding vague expressions such as 'it seems,' 'there may be', and the like. (c) Charts and illustrations should be used only if they present the information more clearly and forcibly. (d) various constraints experienced in conducting research operations must be mentioned. Criteria of Good Research: Whatever may be the types of research works and studies, one thing that is important is that they all meet on the common ground of scientific method employed by them. One expects scientific research to satisfy the following criteria.

1. The purpose of the research should be clearly defined and common concepts be used.

2. The research procedure used should be described in sufficient detail to permit another researcher to repeat the research for further advancement, keeping the continuity of what has already been attained. 3. The procedural design of the research should be carefully planned to yield

results that areas objective as possible.

4. The researcher should report with complete frankness, flaws in procedural design and estimatetheir effects upon the findings.

5. The analysis of data should be sufficiently adequate to reveal its significance and the methods of analysis used should be appropriate. The validity and reliability of the data should be checked carefully.

6. Conclusions should be confined to those justified by the data of the research and limited to those for which the data provide an adequate basis.

7. Greater confidence in research is warranted if the researcher is experienced, has a good reputation in research and is a person of integrity.

In other words, we can state the qualities of a good research as under:

1. Good research is systematic: It means that research is structured with specified steps to be taken in a specified sequence in accordance with the well-defined set of rules. Systematic characteristic of the research does not rule out creative thinking but it certainly does reject the use of guessing and intuition in arriving at conclusions.

2. Good research is logical: This implies that research is guided by the rules of logical reasoning and the logical process of induction and deduction are of great value in carrying out research. Induction is the process of reasoning from a part to the whole whereas deduction is the process of reasoning from some premise to a conclusion which follows from that very premise. In fact, logical reasoning makes research more meaningful in the context of decision making.
3. Good research is empirical: It implies that research is related basically to one or more aspects of a real situation and deals with concrete data that provides a basis for external validity to research results.
4. Good research is replicable: This characteristic allows research results to be verified by replicating the study and thereby building a sound basis for decisions.

Problems Encountered by Researchers in India: Researchers in India, particularly those engaged in empirical research, are facing several problems. Some of the important problems are as follows:
1. The lack of a scientific training in the methodology of research is a great impediment for researchers in our country. There is paucity of competent researchers. Many researchers take a leap in the dark without knowing research methods. Most of the work, which goes in the name of research is not methodologically sound. Research to many researchers and even to their guides, is mostly a scissor and paste job without any insight shed on the collated materials. The consequence is obvious, viz., the research results, quite often, do not reflect the reality or realities.

systematic study of research methodology is an urgent necessity. Before undertaking research projects, researchers should be well equipped with all the methodological aspects. As such, efforts should be made to provide short duration intensive courses for meeting this requirement.
2. There is insufficient interaction between the university research departments on one side and business establishments, government departments and research institutions on the other side. A great deal of primary data of non-confidential nature remains untouched/untreated by the researchers for want of proper contacts. Efforts should be made to develop satisfactory liaison among all concerned for better and realistic researches. There is need for developing some mechanisms of a university—industry interaction program so that academics can get ideas from practitioners on what needs to be researched and practitioners can apply the research done by the academics.

3. Most of the business units in our country do not have the confidence that the material supplied by them to researchers will not be misused and as such they are often reluctant in supplying the needed information to researchers. The concept of secrecy seems to be sacrosanct to business organizations in the country so much so that it proves an impermeable barrier to researchers. Thus, there is the need for generating the confidence that thein formation/data obtained from a business unit will not be misused.

4. Research studies overlapping one another are undertaken quite often for want of adequate information. This results in duplication and fritters away resources. This problem can be solved by proper compilation and revision, at regular intervals, of a list of subjects on which and the places where the research is going on. Due attention should be given toward identification of research problems in various disciplines of applied science which are of immediate concern to the industries.

5. There does not exist a code of conduct for researchers and inter-university and interdepartmental rivalries are also quite common. Hence, there is need for developing a code of conduct for researchers which, if adhered sincerely, can win over this problem.

6. Many researchers in our country also face the difficulty of adequate and timely secretarial assistance, including computerial assistance. This causes unnecessary delays in the completion of research studies. All possible efforts be made in this direction so that efficient secretarial assistance is made available to researchers and that too well in time. University Grants Commission must play a dynamic role in solving this difficulty.

7. Library management and functioning is not satisfactory at many places and much of the time and energy of researchers are spent in tracing out the books, journals, reports, etc., rather than in tracing out relevant material from them.

8. There is also the problem that many of our libraries are not able to get copies of old and new Acts/Rules, reports and other government publications in time. This problem is felt more in libraries which are away in places from Delhi and/or the state capitals. Thus efforts should be made for the regular and speedy supply of all governmental publications to reach our libraries.

9. There is also the difficulty of timely availability of published data from various government and other agencies doing this job in our country. Researcher also faces the problem on account of the fact that the published data vary quite significantly because of differences in coverage by the concerning agencies. 10. There may, at times, take place the problem of conceptualization and also problems relating to the process of data collection and related things Defining the Research Problem: Research Problem: The first and foremost stage in the research process is to select and properly define the research problem. A researcher should first identify

a problem and formulate it, so as to make it amenable or susceptible to research. In general, a research problem refers to an unanswered question that a researcher might encounter in the context of either a theoretical or practical situation, which he/she would like to answer or find a solution to. A research problem is generally said to exist if the following conditions emerge (Kothari, 1988): i. There should be an individual or an organization, say X, to whom the Problem can be attributed. The individual or the organization is situated in an environment Y, which is governed by certain uncontrolled variables Z ii. There should be at least two courses of action to be pursued, say A1 and A2. These courses of action are defined by one or more values of the controlled variables. For example, the number of items purchased at a specified time is said to be one course of action. iii. There should be at least two alternative possible outcomes of the said courses of action, say B1 and B2. Of them, one alternative should be preferable to the other. That is, at least one outcome should be what the researcher wants, which becomes an objective. iv. The courses of possible action available must offer a chance to the researcher to achieve the objective, but not the equal chance. Therefore, if P(Bj / X, A, Y) 10 represents the probability of the occurrence of an outcome Bj when X selects Aj in Y, then $P(B1 / X, A1,Y) \neq P (B1 / X, A2, Y)$. Putting it in simple words, it means that the choices must not have equal efficiencies for the desired outcome. Above all these conditions, the individual or organization may be said to have arrived at the research problem only if X does not know what course of action to be taken is the best. In other words, X should have a doubt about the solution. Thus, an individual or a group of persons can be said to have a problem if they have more than one desired outcome. They should have two or more alternative courses of action, which have some but not equal efficiency. This is required for probing the desired objectives, such that they have doubts about the best course of action to be taken. Thus, the components of a research problem may be summarized as: a) There should be an individual or a group who have some difficulty or problem.

b) There should be some objective(s) to be pursued. A person or an organization who wants nothing cannot have a problem.

c) There should be alternative ways of pursuing the objective the researcher wants to pursue. This implies that there should be more than one alternative means available to the researcher. This is because if the researcher has no choice of alternative means, he/she would not have a problem. d) There should be some doubt in the mind of the researcher about the choice of alternative means. This implies that research should answer the question relating to the relative efficiency or suitability of the possible alternatives. Selecting the Problem: Criteria for selection of research problem depend on the following characteristics. • Personal Inclination. •

Resources Availability. • Relative Importance. • Researcher Knowledge • Practicality: Practicality is also responsible for the selection. • Time-lines of the Problem. • Urgency. Personal Inclination: The chief motivation in the way of selecting research problem is the personal inclination of the researcher. If a researcher has personal interest in the topic, he would select that problem for his research work Resources Availability: During the selection, a researcher will see to the resources available. If these resources like money, time, accommodation and transport are available to the selection place, then the selection of the problem is easy. Data Availability: If the desired data is available to the researcher, then the problem would be selected. Urgency: Urgency is a pinpoint in the way of the selection of research problem. Urgent problem must be given priority because the immediate solution can benefit the people. Feasibility: Feasibility is also an important factor for the selection of the research problem. The researcher qualification, training and experience should match the problem. Area Culture: The culture of the area for which a researcher conducts his research is also responsible for the selection of research problem. Necessity of Defining the Problem: A problem clearly stated is a problem half solved. This statement signifies the need for defining a research problem. The problem to be investigated must be defined unambiguously for that will help to discriminate relevant data from the irrelevant ones. A proper definition of research problem will enable the researcher to be on the track whereas an ill-defined problem may create hurdles. Questions like: What data are to be collected? What characteristics of data are relevant and need to be studied? What relations are to be explored. What techniques are to be used for the purpose? and similar other questions crop up in the mind of the researcher who can well plan his strategy and find answers to all such questions only when the research problem has been well defined. Thus, defining a research problem properly is a prerequisite for any study and is a step of the highest importance. Technique Involved in Defining a Problem: The technique for the purpose involves the undertaking of the following steps generally one after the other: (i) statement of the problem in a general way (ii) understanding the nature of the problem (iii) surveying the available literature (iv) developing the ideas through discussions and (v) rephrasing the research problem into a working proposition.

Content Beyond Syllabus:

1. https://library.tiffin.edu/researchmethodologies/whatareresearchmethodologies
2. https://gradcoach.com/what-is-research-methodology/