

GUJARAT TECHNOLOGICAL UNIVERSITY

RESEARCH SKILLS
SUBJECT CODE: 2710001
SEMESTER: I

Type of course: Research

Prerequisite: Knowledge of access to referred journals;

Rationale: This is not a subject on Communication or English language. This subject is designed for conducting and presenting research in engineering. Hence it is recommended that the subject be taught by teachers who have done research in the relevant engineering discipline.

Assessment: It is essential to explain the concepts of research to the students, hence the scheme shows theory hours. However the assessment shall be done only through Practical presentation by the students before a review committee

To the Student:

The purpose of this subject is to orient the students to the scientific methodology of research and presenting their research. Research constitutes primarily, literature review, giving critical comments on the literature reviewed and identifying the gap, problem formulation, modelling in either an analytical or experimental set up, validating the model and solving the problem you set for yourself.

At the end, student should be able to present and defend the solution he/she has found, in a simple and easy manner. Communicating the research outcomes, is an art wherein, you do not want to either undermine or over emphasise the content, within the short time limit given for such presentations. The balance of critical technicality and overall outcomes is the key to an effective presentation. The content and articulation should be such as to convey in a unified manner, the gist of your work.

To the Teacher:

It is envisaged that the teacher from the engineering research fraternity, will discuss each topic, through case studies of actual 5 papers from the best referred international journals, related to the particular discipline of engineering. Theory classes will be used to demonstrate each concept in Module 1,2 and 3. Whereas, each topic taught in class is to be practiced in tutorials, Module 4 is to be demonstrated through mock review of presentation by student before the rest of the class in the tutorial hours.

Tutorials:

Tutorials are to be utilized for demonstration of literature review and separate problem identified by each student. Student should search at least 5 papers from referred journals, read, critique, identify gaps, identify problem statement, write paper, prepare powerpoint and finally present the mock Research Topic. Please note that this course demonstrates the concepts for conducting good research. Hence the topic identified here is not the final Research Topic for the dissertation.

Teaching and Examination Scheme:

| Teaching Scheme | | | Credits C | Examination Marks | | | | Total Marks | | |
|-----------------|---|---|--------------|-------------------|--------|-----------------|--------|----------------|----|-----|
| L | T | P | | Theory Marks | | Practical Marks | | | | |
| | | | ESE (E) | PA (M) | PA (V) | | PA (I) | | | |
| | | | | | ESE | OEP | PA | | RP | |
| 1 | 2 | 0 | 2 | 0 | 0 | 80 | 0 | 20 | 0 | 100 |

Content:

| | | Teaching Hrs | Module Weightage |
|------------|---|-----------------|---------------------|
| | Module 1 Starting Research and Literature Review | 05 | 40 |
| 1.1 | Find what is expected of the you | | |
| | Identify specific requirements for evaluation/review and what constitutes completion of your work | | |
| 1.2 | Decide which sources you will need | 1 | |
| | Differentiate between journals, conferences, books, magazines and their quality | | |
| | Understand how to establish their quality and authenticity | | |
| 1.3 | Finding Information | 1 | |
| | How to conduct effective searches | | |
| | How to find relevant papers related to your area of research | | |
| | How to capture critical information | | |
| 1.4 | Identify main ideas in scholarly literature | 1 | |
| | Understand and identify the bias, theoretical position and evidence produced | | |
| 1.5 | Write notes to organize your ideas | 1 | |
| | Compare ideas and concepts from different papers | | |
| 1.6 | References | 1 | |
| | Understand the importance of distinguishing your work from others work and acknowledging such references. | | |
| | Learn international standards of referencing | | |
| | Module 2 Identify Problem and Methods to Solve it | 05 | 40 |
| 2.1 | Analyse the question | 1 | |
| | Identify key areas in your field | | |
| | Determine the nature and extension of papers that you should read | | |
| 2.2 | Identify the gaps | 2 | |
| | Learn to Critique existing knowledge and how to find the gap | | |
| | Formulate the Problem Statement | 1 | |
| | Understand what should be the key aspects of your problem statement | | |
| 2.3 | Examples of effective and ineffective Titles | | |
| | Validation | 1 | |
| 2.4 | Identify problem and experimental/theoretical data for comparison with your model | | |
| | Learn how to extrapolate/scale data for validation | | |
| 2.5 | Find what is acceptable level of error and justification thereof | | |
| | Module 3 Writing your Assignment | 03 | 10 |
| 3.1 | Structure your assignment | 1 | |
| | Identify the key features of any written work | | |
| 3.2 | Build your argument | 1 | |

| | | | |
|------------|---|-----------|-------------|
| | Recognise the importance of emphasizing your point | | |
| | Distinguish between your point and the evidence available | | |
| | Acknowledge the evidence | | |
| 3.3 | Review and finalize your work | | |
| | Know and follow the Process of reviewing and proof reading your work | 1 | |
| | Use feedback to improve your work | | |
| | Module 4 Delivering Your Presentation | 01 | 10 |
| 4.1 | Check the logistics of your presentation | | |
| | Identify the key message of your presentation | | |
| | Understand the expectations and what will be the key review points | | |
| 4.2 | Develop the structure of your presentation | | |
| | Understand the key components of an oral presentation | | |
| | Know the usual structure of a good presentation | | |
| 4.3 | Putting together the support material | | |
| | Identify all the material you need to carry as supporting material | | |
| 4.4 | Get feedback on oral presentation | | |
| | Get your presentation reviewed : prepare a set of questions such as “Am I audible?”, “Am I too fast?”, “Am I reading too much from the slides?” etc, to get feedback | | |
| | Use the feedback to improve your technique | | |
| 4.5 | Prepare for delivery of your Oral presentation | | |
| | Rehearse and time your presentation | | |
| | Prepare to answer questions from the audience: Fundamental concepts should be spoken from memory as reviewer will be looking for evidence of your thorough understanding. | | |
| | Read more than the content you are presenting; keep sources ready on hand for reference; | | |
| | Total | 14 | 100% |

References:

- <http://www.elsevier.com/online-tools/scopus>
- <http://computationalengineering.mit.edu/research/methodology>
- <https://www.ieee.org/index.html>
- <http://www.asce.org/>
- <http://www.asme.org/>
- **Research Methodology: Methods and Techniques, by C.R. Kothari, Newage Publishers**

List of Assignments:

1. What do you understand by Impact factor and H factor. Identify 5 good research papers based on I and H factor.
2. Write critical review of each paper and summary of strength and gaps of above referred papers.
3. Demonstrate how you have identified the Research Gap. Write what is existing knowledge in literature review and what can be further researched.
4. Write briefly on how the Problem statement is identified.
5. Describe the various methods for validating the research problem from the papers referred.
6. Describe the key features of a Research Paper. Write a paper on the Literature Review conducted.
7. Presentation of Problem formulation and Literature Review

Course Outcome:

After learning the course the students should be able to:

1. Conduct a quality literature review and find the research gap.
2. Identify an original and relevant problem and identify methods to find its solution
3. Validate the model
4. Present and defend the solution obtained in an effective manner in written or spoken form.