GRADUATION THESIS

"BACHELOR'S (UNDERGRADUATE) THESIS"

SCIENTIFIC RESEARCH PROJECT

CONTENT, FORMAT, AND STYLE GUIDELINES

FOR STUDENTS

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Prepared by the

GRADUATION THESIS COORDINATION COMMITTEE

FACULTY OF PHARMACY - GAU

IF YOU FAIL TO PLAN,

YOU PLAN TO FAIL

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1. THE “SCIENCE” CONCEPT

1.1. The Nature of “Science”

Science is the intellectual and practical activity encompassing the systematic study of the structure and behaviour of the physical and natural world and the knowledge that we obtain about them through observation and experiment.

Science is not only a body of knowledge, but also a way of knowing.

It is defined as the observation, identification, description, experimental investigation, and theoretical explanation of natural phenomena.

Science is a human activity through which problems and questions dealing with natural phenomena can be identified and defined, and solutions proposed and tested. In this process, data are collected and analyzed, and available knowledge is applied to explaining the results.

Science is the pursuit and application of knowledge and understanding of the natural and social world through systematic methodology based on “evidence”.

Science is an intellectual activity carried on by humans that is designed to discover information about the natural world in which humans live and to discover the ways in which this information can be organized into meaningful patterns.

“A science” is a particular branch of science such as physics, chemistry, or biology.

The term ***“Scientific Literacy”*** has been used to include the following:

- Understanding science and its applications
- Ability to think scientifically
- Ability to use scientific knowledge in problem solving

1.2. Scientific Thinking

Scientific Thinking refers to both thinking about the content of science and the set of reasoning processes that permeate the field of science: Experimental design, causal reasoning, and hypothesis testing.

Scientific Thinking refers to the mental processes used when reasoning about the content of science engaged in typical scientific activities.

Scientific Thinking refers to the thought processes that are used in science, including the cognitive processes involved in theory generation, experiment design, hypothesis testing, data interpretation, and scientific discovery.

1.3. Definition of Scientific Research

The term “Research” is composed two words ‘Re’ and ‘Search’ which means “search again and again”.

Scientific Research is a systematic, formal and intensive process of carrying on the scientific method of analysis. It is a systematic effort to gain knowledge / new knowledge.

Scientific Research is a scientific and systematic search for pertinent information on a specific topic. It is the process of systematically obtaining accurate answers to questions by the use of the scientific methodology of gathering, evaluating, and interpreting information.

Scientific Research is a formal, systematic application of the scientific approach to the study of a problem to discover new information or expand and verify existing knowledge.

Scientific Research is a careful investigation through scientific methodology for new facts in any branch of scientific knowledge.

The purpose of Scientific Research is to discover answers to questions through the application of scientific procedure.

Scientific Research is a movement from the known to the unknown.

It is actually a voyage of discovery.

1.4. The Meaning of Scientific Research

Scientific Research is the systematic investigation undertaken within the scientific methodology framework in order to discover new facts and get additional information.

Scientific research is defining and redefining problems, formulating hypotheses or suggested solutions; collecting, organizing and evaluating data; making deductions and reaching conclusions; and finally, carefully testing the conclusions to determine whether they fit the formulated hypotheses.

Scientific Research is a systematic and unbiased way of solving a problem (by answering questions or supporting hypotheses) through generating verifiable data.

The term “Scientific Research” refers to the systematic method consisting of framing the problem, formulating a hypothesis, collecting the data, analysing the facts and reaching certain conclusions either in the form of solutions(s) towards the concerned problem or in certain generation for some theoretical formulation.

The Purpose of Scientific Research is to…

- Review or synthesize existing knowledge
- Investigate existing situations or problems
- Provide solutions to problems
- Explore and analyse more general issues
- Construct or create new procedures or systems
- Explain new phenomenon
- Generate new knowledge
- …or a combination of any of the above

2. SCIENTIFIC RESEARCH DESIGN, SCIENTIFIC METHODOLOGY, AND SCIENTIFIC RESEARCH METHODS

2.1. Scientific Research Design

Scientific Research is the research conducted for the purpose of contributing towards science by the systematic collection, interpretation and evaluation of data.

Before beginning the Scientific Research, the researcher should determine the subject, do planning and specify the methodology.

Scientific Research Design refers to the overall strategy to integrate the different components of the scientific research in a coherent and logical way. It is the set of methods and procedures used in collecting and analyzing data.

2.2. Scientific Methodology

Methodology is the systematic, theoretical analysis of the methods applied to a field of study. It comprises the theoretical analysis of the body of methods and principles associated with a branch of knowledge. Typically, it encompasses concepts such as paradigm, theoretical model, and quantitative or qualitative techniques.

Scientific Methodology is the general research strategy that outlines the way in which a research project is to be undertaken and, among other things, identifies the methods to be used in it. Scientific Research Methods include all the techniques and methods which have been taken for conducting research.

Scientific Methodology is a process for evaluating empirical observations, and organising it into knowledge.

Among the activities often identified as characteristic of Scientific Methodology are systematic observation and experimentation, inductive and deductive reasoning, and the formation and testing of hypotheses and theories.

2.3. Scientific Research Methods

Scientific Research Methods are the tools and techniques for doing scientific research.

3. RESEARCH ETHICS, ACADEMIC INTEGRITY (HONESTY), AND SCIENTIFIC MISCONDUCT

3.1. Ethics

Ethics, a branch of Philosophy, is concerned with systematizing, defending and recommending concepts of ***"right and wrong conduct"***.

Ethics deal with the conduct of people and guides the norms or standards of behaviour of people and relationships with each other.

3.2. Scientific Ethics & Research Ethics

Scientific Ethics is defined as the ***"Standards of Conduct" for Scientists*** in their professional work. The basic universal ethical values, which are the foundation of the integrity and credibility of science, refer to the representatives of all disciplines of science, without any exceptions.

Ethical values, standards of scientific integrity, as well as good practice in science emphasize the ethical and social responsibility of Scientists.

Scientific Researchers should be objective, unbiased, and truthful in all aspects of the research process.

The term "Research Ethics" refers to a wide variety of values, norms, and institutional arrangements that help constitute and regulate scientific activities.

Research Ethics is a codification of ***"scientific morality"*** in practice.

Guidelines for Research Ethics specify the values and norms of the research community.

It also implies duties of honesty, integrity, objectivity, accountability and openness alongside thoughtful inquiry, rigorous analysis, and the application of professional standards.

3.3. Scientific Misconduct

Scientific Misconduct is defined as "Intention or gross negligence leading to fabrication of the scientific message or a false credit or emphasis given to a Scientist" and includes, besides plagiarism, data manipulation and fabrication.

Actions <u>Contrary to</u> Scientific Research Ethics are:

- **Plagiarism**: to show others' original ideas, methods, data or works as part of or completely their own work.
- **Fraudulent**: To use data that is not actually existent or falsified in scientific research.
- **Distortion**: To falsify the research records or obtained data, to show that the devices or materials not used in the research are used.

Forms of Academic Dishonesty / Scientific Misconduct:

- Inventing data and results (fabrication)
- Alteration or changing the results (falsification)
- Plagiarism

Fabrication

Fabrication is “making up” results and recording or reporting them.

Falsification

Falsification is manipulating research processes or changing or omitting data.

Plagiarism

Plagiarism is a type of “intellectual theft”. Using ideas and research findings of others, and yet pretending that they are your own is plagiarism, which is unethical.

Plagiarism is defined as using the words or ideas of others and passing them off as your own. Plagiarism means using the work of others in preparing an assignment and presenting it as your own without explicitly acknowledging, or referencing where it came from.

In quoting or paraphrasing material from other sources, those sources must be acknowledged in full. Plagiarism occurs when students fail to acknowledge that ideas have been borrowed.

Specifically, plagiarism occurs when:

- Phrases and passages are used verbatim without quotation marks and without a reference to the author
- An author's work is paraphrased and presented without a reference
- Other students' work is copied or partly copied
- Other people's designs and images are presented as the student's own work
- Laboratory results of someone else are used without appropriate attribution

Plagiarism encompasses copying of someone else's work or ideas without proper reference and present it as an own piece of work. It is considered as academic misconduct. To avoid plagiarism, do not literally copy any phrases from source materials (article, book, or report) and always give a proper reference to the original source from which you borrow insights and knowledge.

Plagiarism can take many forms, from deliberate cheating to accidentally copying from a source without proper acknowledgement.

• ***Copying:*** Using the same or very similar words to the original text or idea without acknowledging the source or using quotation marks. This includes copying materials, ideas or concepts from a book, article, report or other written document, presentation, composition, artwork, design, drawing, circuitry, computer program or software, website, internet, other electronic resource, or another person's assignment, without appropriate acknowledgement.

• ***Inappropriate Paraphrasing****:* Changing a few words and phrases while mostly retaining the original structure and/or progression of ideas of the original, and information without acknowledgement. This also applies in presentations where someone paraphrases another's ideas or words without credit and to piecing together quotes and paraphrases into a new whole, without appropriate referencing.

• ***Collusion:*** Presenting work as independent work when it has been produced in whole or part in collusion with other people. Collusion includes students providing their work to another student before the due date, or for the purpose of them plagiarising at any time, paying another person to perform an academic task and passing it off as your own, stealing or acquiring another person's academic work and copying it, offering to complete another person's work or seeking payment for completing academic work. In addition, it is important that students understand that it is not permissible to buy essay/writing services from third parties. Nor is it permissible to sell copies of lecture or tutorial notes as students do not own the rights to this intellectual property.

• ***Inappropriate citation:*** Citing sources which have not been read, without acknowledging the "secondary" source from which knowledge of them has been obtained.

If a researcher plagiarizes the work of others, they are bringing into question the integrity, ethics, and trustworthiness of the sum total of his or her research.

Penalties for students found guilty of plagiarism can include a reduction in marks, failing a course, or for more serious matters, suspension or exclusion from the University.

3.4. Ethical Declaration

I hereby declare that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct.

I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work.

Name, Last name :
Signature :

4. GRADUATION THESIS (BACHELOR'S THESIS, UNDERGRADUATE THESIS)

It begins in the Ninth Semester and ends in the Tenth Semester for the Students of the GAU School of Pharmacy.

The Bachelor's Thesis is a research paper based on an independent, original scientific study (theoretical and/or practical) which is a prerequisite for the graduation.

The Bachelor's Thesis Must Demonstrate The Student's Ability:

- to think critically
- to determine subject matter for the thesis
- to choose an appropriate methodology
- to appropriately organise the material of the research
- to budget his / her time (time management)
- to conduct the research
- to draw independent conclusions and show their practical implications
- to report the research in correct and coherent Academic English

5. DEFINITION OF THESIS / GRADUATION THESIS

5.1. THESIS

A Thesis is a long essay or dissertation involving personal research, written by a candidate for a University Degree.

A Thesis is a long piece of writing based on your own ideas and research that you do as part of a University Degree.

A Thesis is a document submitted in support of a candidate for an Academic Degree or Professional Qualification presenting the author's research.

A Thesis or dissertation is the written report of a research study undertaken in fulfilment or partial fulfilment of a University Degree such as a Bachelors Degree, Masters Degree, Doctorate, or a Postgraduate Diploma.

A Thesis is a written record of the work that has been undertaken by a candidate.

It constitutes objective evidence of the author’s knowledge and capabilities in the field of interest and is therefore a fair means to “gauge” them.

It is an undertaking that allows you to explore areas or problems in detail, and develop and utilize your thinking and analytical skills.

A Thesis is graded on ***the quality of research***, ***the significance of the contributions***, and ***the style of presentation***.

5.2. GRADUATION THESIS

A Graduation Thesis is the documentation of your original research or scholarship that serves as partial completion of graduation requirements.

A Graduation Thesis Author (that is, the Student) completes the tasks identified below:

- Introduce a Research Problem and explain its background
- Ask one or more Research Questions or state one or more Hypotheses
- State Objectives of the research or project
- Explain what other scholars have written on the topic
- Design and describe a Research Method
- Collect and analyze Data
- Explain and discuss Findings
- Form Conclusions and identify issues for further inquiry

Why Write a Graduation Thesis?

The primary purpose for writing a Graduation Thesis is to explain new knowledge or develop new understanding about a specific topic.

It is a wonderful opportunity to work with experienced researchers and Faculty Mentors. It is a piece of scholarship your Thesis Supervisor will help you craft, refine, and polish.

Your Graduation Thesis will serve many functions:

- Add to the body of knowledge in your research area
- Provide a foundation for future research in your scientific discipline
- Be adapted for publication as a scientific article
- Become the basis for presentation of your research at professional and academic conferences

Your Thesis should demonstrate a capacity for independent thinking, contribute to existing scientific knowledge and must meet international standards for such research.

You should write your Thesis in accordance with the academic writing rules. Academic writing is clear, concise, focused, structured and backed up by "evidence".

6. GRADUATION THESIS - RESPONSIBILITIES AND TASKS OF THE STUDENT

6.1. GRADUATION THESIS - RESPONSIBILITIES OF THE STUDENT

You Are Expected to:

- Maintain excellent communication with your Thesis Supervisor.
- Schedule regular meetings (average one hour per week) with your Thesis Supervisor or arrange regular contact (by phone, email or Skype).
- Submit a review of the relevant literature at an early stage; this will usually form part of your Graduation Thesis.

  If your project is itself a systematic literature review, you should establish in writing your search methods and terms, criteria for inclusion and exclusion, and analytical approach at an early stage.
- Preparing the Graduation Thesis Proposal
- Submit the Graduation Thesis by the agreed deadline.

  It is generally a good idea to submit sections of your Graduation Thesis as you are proceeding with your project, so that your Thesis Supervisor can check your progress and that writing is progressing satisfactorily.

You Are Expected to Demonstrate Your Ability to:

- ✓ Identify and define a significant issue relevant to Pharmaceutical Sciences
- ✓ Systematically collect relevant, up-to-date information about the issue
- ✓ Analyse, interpret and discuss the information
- ✓ Draw conclusions and make recommendations
- ✓ Write the Graduation Thesis in accordance with academic standards and scientific writing guidelines

Your Main Responsibilities:

1. To maintain regular contact with your Thesis Supervisor.

   It is the student's responsibility to inform their Thesis Supervisor of the progress. Difficulties must be communicated at the time they are encountered.

2. To write the Graduation Thesis in a good standard of clear English using appropriate academic terms and citation and referencing.

   It is not the responsibility of the Thesis Supervisor to ensure that this condition is met.

3. To write the dissertation with guidance from the Thesis Supervisor.

   The dissertation and research work must be your own. The dissertation is to reflect <u>your</u> subject understanding and research abilities, not that of your Thesis Supervisor.

6.2. GRADUATION THESIS - TASKS OF THE STUDENT

- **Tasks for Semester Nine**

  (Preparation, Proposal and Theoretical Part of The Thesis)

- Topic selection
- Literature search and critical evaluation
- Formulation of the problem statement, research question(s), hypothesis, aim(s) and objective(s) of the research
- Preliminary choice of methodology and rationale for the choice
- Identification of the research instruments, the scope and explanation of the procedures for data collecting
- Collection of most of the material for the theoretical part of the Thesis, compilation of the List of References needed for the Thesis
- Development of the final outline and a detailed planning calendar for implementing the research
- Preparation of the Thesis Proposal
- Preparation of the first draft of ***"Introduction"*** and ***"Literature Review" Sections*** (theoretical part) of the Thesis for submission to the Thesis Supervisor

- **Tasks for Semester Ten**

  (Conducting The Research and Academic Writing of the Thesis)

- The submission of the work done for assessment:
  . Title
  . Contents
  . Introduction
  . Literature Review
  . the rationale for the choice of the Research Methodology
  . List of References
- Collection and Analysis of the Data for the ***"Results" Section***
- Review of the ***"introduction" Section***
- Completion of the ***"Results" Section***
- Writing of the ***"Conclusion"*** and ***"Recommendations" Sections***
- Review of the theoretical part and ***"Summary"*** of the Thesis
- Final editing of the Thesis and Submission of the Thesis for assessment

7. GRADUATION THESIS SUPERVISOR

You will be supported by an Academic Supervisor (Graduation Thesis Supervisor) through the entire Graduation Thesis Process.

You may ask your Thesis Supervisor to read in detail a draft of a portion of your Graduation Thesis in order to give feedback on ***scientific content*** and ***presentation style***.

The Thesis Supervisor is there to facilitate and not to lead; hence, the responsibility for the content, format, and style quality of a dissertation is entirely that of yourself, the Student!

7.1. The Role of The Graduation Thesis Supervisor

The supervisor role includes the following:

1. To advise the Student whether or not the project appears to be feasible and the possible risks that may be involved, for example problems in trying to access scientific literature.

2. To assist the Student in finding useful and relevant reading material and appropriate academic framework within which to place the topic.

3. To advise on the choice of suitable methodological approach(es).

4. To assist the Student in tailoring the Thesis Proposal to the time and other resource constraints.

5. To monitor progress and to advise on what is required to achieve a quality Graduation Thesis.

The role of your Graduation Thesis Supervisor is to guide you through the various stages of your research study and, ultimately, assist you in writing your Graduation Thesis.

In order to make the best possible use of your Supervisor's experience, expertise and time, it is essential to prepare for your meetings.

This is especially important for the first meeting you have with your Thesis Supervisor, because it is at this juncture that you can establish some key points which will underpin the way you approach writing your Thesis.

At the outset, arrange a regular series (e.g. weekly) of meetings with your Thesis Supervisor throughout the Scientific Research Process, including the Thesis write-up period. ***A record will be kept of each of these meetings detailing the dates of meetings, what was discussed and any action points.***

Your Thesis Supervisor is Expected to:

- Help you formulate an appropriate Thesis Proposal
- Meet regularly with you to support your research / project work (Your supervisor would normally expect to meet with you for an average of one hour per week)
- Inform you if you are not making satisfactory progress and/or require additional support
- Provide ongoing assessment of your work throughout the period of Thesis Supervision including advice on matters of format, style, and presentation
- Review the final draft of the Graduation Thesis and advise you whether it is in a suitable form for evaluation

Issue Tick Box

Some useful issues to establish with your Thesis Supervisor before you begin to write your Thesis include:

Timetable for completion of stages of Thesis □

Theoretical/conceptual framework of Thesis □

Potential sources of “evidence” / further reading □

Research question(s) and design of Thesis □

Statement of research contribution □

Methodology □

Statistical techniques for interpreting data □

Graduation Thesis Meetings and Reports

The Thesis Supervisor and the Student are required to meet on a regular basis and keep track of their progress and problems.

The Student and the Thesis Supervisor are required to meet at least once in every two weeks and the report of these meetings will be submitted by the Supervisor to the Graduation Thesis Coordination Committee.

8. GRADUATION THESIS ROADMAP

Graduation Thesis consist of two courses, namely Preparation, Proposal, and the Theoretical Part of the Thesis in the 9th Semester and Research Implementation and Thesis writing in the 10th Semester.

The Graduation Thesis ***should be realizable within two semesters***.

Students and Thesis Supervisors should consider the time constraints practically to define the scope of the Graduation Thesis Research Project and to make realistic plans accordingly.

- **Calendar of Due Dates**

  . Topic Selection
  . Thesis Proposal Preparation
  . Research Process Algorithm
  . Drafting the Thesis
  . Final version of the Thesis
  . Presentation / Poster Presentation

9. GRADUATION THESIS PROCESS STEPS AND TIME FRAME

9.1. Graduation Thesis Process Steps

A) Assigning Students to Supervisors and Projects / Topic Selection

B) Framing The Student / Supervisor Roles and Responsibilities

C) Planning The Thesis Timeline / Calendar of Due Dates
(Steps - Tasks - Timetable)

D) Research Problem & Research Question

E) Literature Search and Criticle Evaluation

F) Hypothesis Formulation

G) Identifying Appropriate Research Methodology (Research Design)

H) Graduation Thesis Research Project Proposal Preparation

I) Graduation Thesis Research Project Proposal Acceptance

J) Effectively Carrying Out The Graduation Thesis Project
(Conducting The Research Phase)

K) Graduation Thesis Progress Supervision (Student - Supervisor Meetings)

L) Graduation Thesis Project Progress Monitoring

M) Structuring The Graduation Thesis (Format and Style)

N) Writing the Graduation Thesis (Scientific Writing))

O) Defending The Graduation Thesis

P) Graduation Thesis Evaluation

Q) Poster Presentation

R) Dissemination of the Graduation Thesis Research Findings

9.2. Graduation Thesis Time Frame

Undertaking a research project requires a good deal of self-discipline.

Many students find time just slips away from them when they have no weekly classes and no coursework deadlines to meet.

Formulating a project timetable with the assistance of your Thesis Supervisor, in the form of a ***Gantt Chart***, can be a real help.

Timetable - Semester 9, by Week

Task	1	2	3	4	5	6	7	8	9	10	11	12	13	14
A	x													
B	x													
C	x													
D		x												
E			x	x										
F				x	x									
G						x	x							
H							x	x						
I								x						
J									x	x	x	x	x	x
K	x		x		x		x		x		x		x	
L									x	x	x	x	x	x

Timetable - Semester 10, by Week

Task	1	2	3	4	5	6	7	8	9	10	11	12	13	14
J	x	x	x	x	x	x	x	x	x					
K	x		x		x		x		x		x		x	x
L	x	x	x	x	x	x	x	x	x	x	x	x	x	x
M					x	x	x	x	x	x	x			
N								x	x	x	x	x		
O													x	
P														x
Q														x
R														x

10. GRADUATION THESIS PROPOSAL

The Graduation Thesis Proposal is an important working document and which over the next few months becomes transformed into the Graduation Thesis.

The Graduation Thesis Proposal is a brief document that contains an outline plan for a research project. It is produced at the beginning of the research process in advance of any data collection.

The Proposal will become your road map through the Graduation Thesis process.

The Graduation Thesis Proposal should be ***at least 2.000 words in length*** (which is equivalent to approximately ***7-8 pages***).

The Graduation Thesis Proposal is intended to convince others that you have a worthwhile research project and that you have the competence and the work plan to complete it. The Graduation Thesis Proposal should contain all the key elements involved in the research process.

The Graduation Thesis Proposal must be capable of convincing the Evaluation Committee about the ***credibility, achievability, and reproducibility (repeatability)*** of the research design.

Regardless of your research area and the methodology you choose, the Graduation Thesis Proposal must address the following questions:

- **What** you plan to accomplish
- **Why** you want to do it
- **How** you are going to do it

The Basic Purposes of All Graduation Thesis Research Project Proposals are to Convince The Graduation Thesis Evaluation Committee that:

a) The research project has clear objectives
b) The research project is worth doing (it is significant / important in some sense and will make an original contribution to knowledge / understanding in the field)
c) The proposed methods are suitable and feasible
d) There is a well thought plan for achieving the research objectives in the available timeframe

Because of a wide variety of circumstances, the focus of your research may change. If this happens, then you should change your Graduation Thesis Proposal and also agree with your Thesis Supervisor that such a change is appropriate.

10.1. The Key Components of a Graduation Thesis Proposal

Title - The title of your Graduation Thesis Research Project
Problem - A description of the problem being addressed
Significance - The significance of the research
Background - A summary of the key relevant literature, references, or needs analysis that justifies the project
Hypothesis - A statement of the hypothesis you are testing
Aims - A statement of the expected outcomes of your project, and how they will help to address the problem
Objectives - An outline of the specific strategies or steps by which you intend to achieve your research aims
Ethics - An appreciation of any ethical issues raised and how they will be addressed
Methodological Approach - A detailed outline of the actual research, data collection and analysis methods you will use (sometimes called "Project Protocol")
Time Frame - A timetable or plan of the key activities or stages of your research project (Schedule of Activities : Gantt Chart)
References

Graduation Thesis Proposal - Literature Review

The pillar of the Graduation Thesis Research Project Proposal preparation is an effective literature search and criticle evaluation, and a comprehensive literature review.

Literature Review indicates:

- that you have studied the work of the authors in your research field
- that you are familiar with the major themes relevant to that subject area
- what further findings (research results) that you intend to accomplish

You should bear in mind that you are reviewing the literature in order to develop focused Research Question(s) about your topic. Therefore, your literature review should lead to and justify your Research Objective(s) and Question(s).

Graduation Thesis Proposal - Proposed Methodology

The Methodology section should discuss what methods you are going to use in order to address the Research Objective(s) of your Graduation Thesis.

You need to justify why the chosen methods were selected as the most appropriate for your research, amongst the many alternative ones; given its specific objectives, and constraints you may face in terms of time.

Reference to general advantages and disadvantages of various methods and techniques without specifying their relevance to your choice decision is unacceptable. Remember to relate the methods back to the needs of your Research Question(s).

The Cover Sheet of the Graduation Thesis Proposal must have the original signatures of the Student and the Graduation Thesis Supervisor.

11. RESEARCH APPROACHES AND TYPES OF RESEARCH

11.1 RESEARCH APPROACHES

Quantitative Research

The emphasis of Quantitative Research is on collecting and analysing numerical data; it concentrates on ***measuring*** the scale, range, and frequency of data.

Qualitative Research

Qualitative Research is more subjective in nature than Quantitative Research and involves examining and reflecting on the less tangible aspects of a research subject, e.g. values, attitudes, perceptions.

Basic (Fundamental) Research

The primary aim of Basic (Fundamental) Research is to improve knowledge generally, without any particular applied purpose in mind at the outset.

Applied Research

Applied Research is designed from the start to apply its findings to a particular situation.

Deductive Research

Deductive research moves from general ideas / theories to specific particular situations.

Inductive Research

Inductive research moves from particular situations to make broad general ideas / theories.

11.2. TYPES OF RESEARCH

Exploratory Research

Exploratory Research, as the name implies, intends merely to explore the research questions and does not intend to offer final and conclusive solutions to existing problems.

This type of research is usually conducted to study a problem that has not been clearly defined yet. It is an examination into a subject in an attempt to gain further insight. With Exploratory Research, a researcher starts with a general idea and uses research as a tool to identify issues that could be the focus of future research.

The Exploratory Research is meant to provide details where a small amount of information exists. Conducted in order to determine the nature of the problem, Exploratory Research is not intended to provide conclusive evidence, but helps us to have a better understanding of the problem.

Conclusive Research

As the term suggests, Conclusive Research is meant to provide information that is useful in reaching conclusions or decision-making.

In this type of studies, research objectives and data requirements need to be clearly defined.

Descriptive Research

Descriptive Research is defined as a research method that describes the characteristics of the population or phenomenon that is being studied.

Descriptive Research attempts to determine, describe, or identify **“what”** is.

The descriptive Research uses description, classification, measurement, and comparison to describe.

Descriptive Research means observing and measuring without manipulating variables.

Analytical Research

Analytical Research is a specific type of research that involves critical thinking skills and the evaluation of facts and information relative to the research being conducted.

Analytical Research attempts to establish **“why”** it is that way or **“how”** it came to be.

It involves the in-depth study and evaluation of available information in an attempt to explain complex phenomenon.

Analytical Research is primarily concerned with testing hypothesis and specifying and interpreting relationships.

12. SCIENTIFIC RESEARCH PROCESS

Scientific Research is a process consisting of the identifying and defining the research problem, testing the hypothesis through data collection, reaching of conclusion from the test results of the hypotheses, and evaluating and reporting the research.

Scientific Research Process consists of series of actions or steps necessary to effectively carry out scientific research:

1) Determining the Research Topic
2) Framing the Research Problem and Research Question
3) Effective Literature Search and Criticle Evaluation of the Literature
4) Developing Hypothesis
5) Identifying the Research Design and Research Methodology
6) Formulating the Sample Size and Sampling Technique
7) Collecting the Data
8) Data Analysis
9) Hypothesis Testing
10) Preparation of the Research Report (Scientific Writing) and Presentation

13. RESEARCH TOPIC SELECTION AND SIGNIFICANCE OF THE STUDY

13.1. RESEARCH TOPIC SELECTION

There are three factors which a researcher needs to consider in choosing a research topic:

1) ***Interest*** of the researcher

2) Researcher's ***competence***

3) The ***relevance and usefulness*** of the topic

The selection of a thesis topic is an important process.

You will spend many months conducting research and writing about the findings; therefore, you should be passionate and excited about your topic.

Your Thesis Supervisor will be able to help you select an appropriate topic, but here are some points to keep in mind:

- Your Graduation Thesis should present either new information on a subject or a fresh analysis of existing data.

- The topic should be specific enough to be manageable but general enough to stimulate further research.

- You should not embark on a project for which you lack the necessary time and/or resources.

13.2. SIGNIFICANCE OF THE STUDY

You should indicate how your research will refine, revise, or extend existing knowledge in the area under investigation. Note that such refinements, revisions, or extensions may have either theoretical, or methodological significance.

When thinking about the significance of your study, ask yourself the following questions:

1. What will results mean to the theoretical framework that framed the study?
2. Will results contribute to the solution of problems?
3. What will be improved or changed as a result of the proposed research?
4. How will results of the study be implemented, and what innovations will come about?
5. What suggestions for subsequent research will arise from the findings?

14. RESEARCH PROBLEM AND RESEARCH QUESTION

14.1. RESEARCH PROBLEM

The first and most important step of a research is formulation of the Research Problem. It is like identifying a destination prior to beginning a journey.

The Research Problem refers to an unanswered question that a researcher might encounter in the context of either a theoretical or practical situation, which she/he would like to answer or find a solution to.

Once the general topic or problem has been identified, this should then be stated as a clear Research Problem. That is, taken from just a statement about a problematic situation to a clearly defined researchable problem that identifies the issues you are trying to address.

A research Problem could present itself as a condition to be improved upon, a difficulty or deficiency to be overcome, or a gap in knowledge that exists in literature that is to be filled, or theory that requires meaningful understanding.

A research Problem might be defined as the issue that exists in the literature, theory, or practice that leads to a need for study or further study.

Many topics may prove too wide-ranging to provide a researchable problem. In case the research problem is too wide-ranging, time and resources would make it unfeasible and the results from such a study would consequently lack focus.

The problem should be significant. It is not worth time and effort investigating a trivial problem or repeating work which has already been done elsewhere.

You should be able to state the Research Problem clearly and concisely.

You should be able to obtain the information required. You cannot carry out research if you fail to collect the relevant information needed to tackle your problem, because you lack access to documents or other sources.

When selecting a Research Problem for your study, there are factors which you need to consider. These factors will ensure that your research process is more manageable and you will remain motivated.

The Factors to Consider in Selecting a Research Problem:

- **Interest** - Sustain your interest and stimulate your motivation
- **Relevance** - Potential to make a contribution to body of knowledge
- **Expertise** - Within your range of competencies
- **Data Availability** - Based on obtainable data and scientific literature

For a Research Problem statement to be effective in the planning of applied research, it should have the following characteristics:

1) The problem reflects felt needs
2) The problem is based on factual evidence
3) It should be relevant and manageable
4) It should suggest meaningful and testable hypotheses

14.2. RESEARCH QUESTION

The Research Question is a clear, focused, and concise question around which you center your research.

Research Question is at the center point of any scientific research. Research Question refers to “what is it you are trying to find out?”

In order to develop the Research Design, the Research Topic has to be changed to a Research Question.

The ideal Research Question is one which defines the Research Problem in the form of a question. The Research Question should be specific enough to state the Research Hypothesis.

The Research Question is a question that your research project sets out to answer. These questions are important since they are the focus of your research.

Research Question sets out the framework and the specific terms of inquiry needed to address the Research Problem. Research Question is drawn to reflect the nature of the Research Problem under study.

The Research Question is essentially the Research Hypothesis asked in the form of a question.

The research Question should not be too broad or vague. You can begin with a broad question and then narrow it down to be more specific. Research Questions must be specific enough to be well covered with the available resources.

Research Questions should not be too broad creating an ambiguity in mind of researcher and it should not be too narrow so that nothing is left to carry out research.

15. LITERATURE SEARCH STRATEGY AND LITERATURE SEARCH TECHNIQUES

15.1. LITERATURE SEARCH STRATEGY

The process of conducting a literature search familiarizes you with the body of work related to the Research Topic. Literature review shows what has been done in the research field and how the intended study relates to earlier research.

The Literature Search is a systematic and comprehensive survey of publications and information on a specific topic and Research Problem.

The result of literature search is a ***List of References***.

Systematic Literature Review is a means of identifying, evaluating and interpreting all available literature relevant to a particular Research Question.

The Systematic Literature Review is a literature review focused on a Research Question that tries to identify, appraise, select and synthesize all high quality research evidence relevant to that question.

The Systematic Literature Review ensures that you are at least familiar with the body of research in your field before starting your own investigations.

Reasons for Performing Systematic Literature Search

- To identify any gaps in current research in order to suggest areas for further investigation.

- To provide a framework/background in order to appropriately position new research activities.

Literature Sources

. Peer-reviewed Journals
. Databases (references to journal articles)
. Theses and Dissertations
. Books
. Internet Sources

Primary Sources

These are original materials on which other research is based,
e.g. research articles published in peer-reviewed scientific journals,
and theses.

Secondary Sources

Secondary sources (e.g. review articles, meta-analyses, clinical practice guidelines) describe, interpret, analyse and evaluate the primary sources.

Tertiary Sources

A selection or compilation of primary and secondary sources of information. Examples of tertiary information sources are abstracts, bibliographies, indexes, databases, books, textbooks, handbooks, dictionaries, and encyclopaedias.

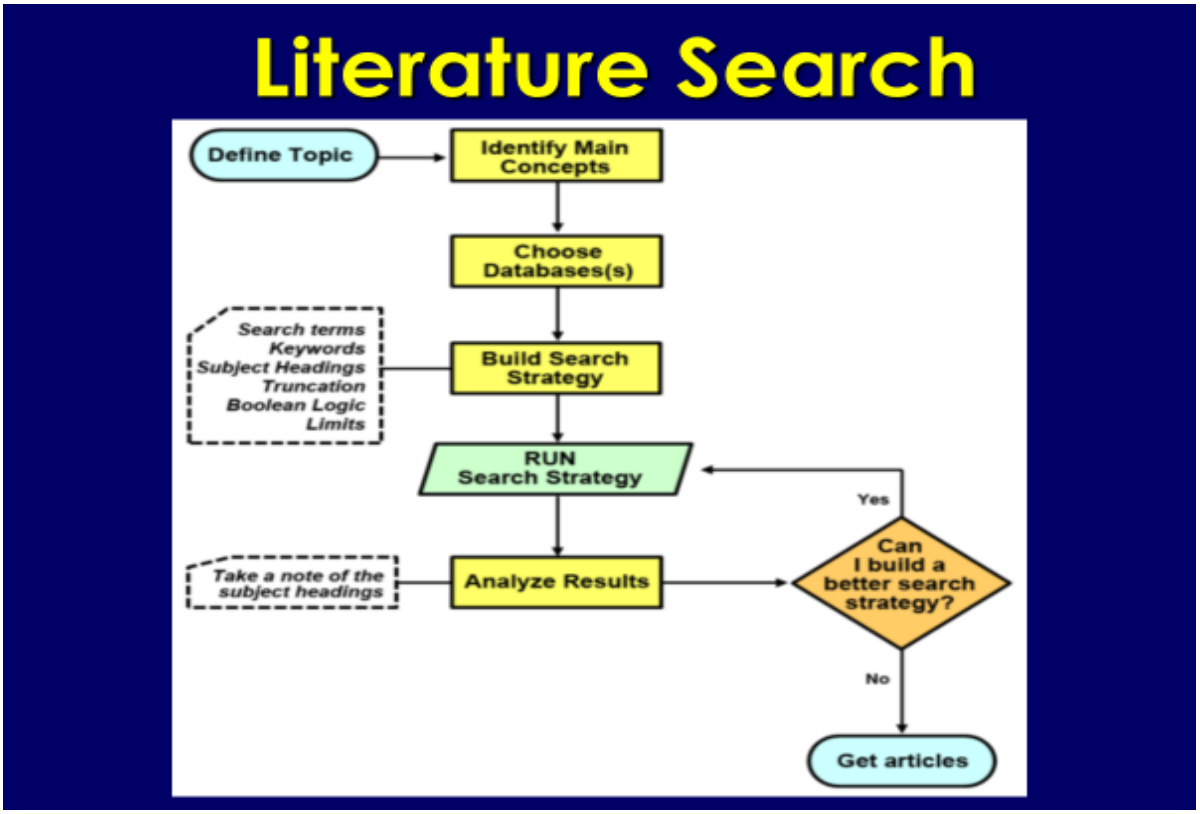
Search Strategy

. Define the topic
. Identify the type(s) of literature
. Select information source(s) to search
. Decide the keywords
(search terms)
. Determine the search tool(s)
(e.g. a search engine, a database)
. Utilize search technique(s)
. Evaluate the results

To Prepare For Your Literature Search:

- Define your topic and write down your research question
- Identify what type of literature you are looking for (e.g. primary research in journal articles, systematic reviews, research reports, books, etc.)
- Identify sources to search - Google Scholar, databases, individual organisations' websites, library catalogues etc.
- Develop keywords / search terms that are logical and relevant to your search
- Critically evaluate the literature searched

15.2. LITERATURE SEARCH TECHNIQUES



. PICO Search

PICO is a format for developing a good clinical research question prior to starting the literature search.

PICO

. **P**atient / **P**roblem
. **I**ntervention
. **C**omparison / **C**ontrol
. **O**utcome

There are a number of variations of ***PICO***:

- ***PICOT*** **(“T”** stands for **“Time Frame”)**

- ***PICOCS*** **(“C”** stands for **“Context”** and **“S”** stands for **“Study Design”)**

Other Literature Search Techniques

. Quotation Marks (“”)

Quotation Marks can be used to identify Phrases.

By using quotations marks, you can tell the computer to only
bring back pages with the terms typed in the exact order you typed them.

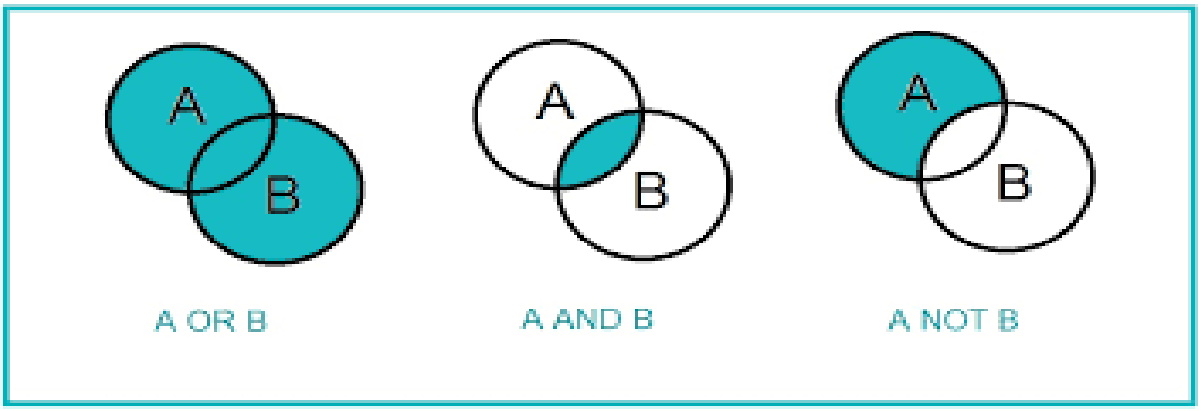
. Boolean Operators

Boolean searching involves adding or subtracting terms to the search
to either broaden or narrow the search.

It uses three terms (AND / OR / NOT) to tell the search engine or database
whether to include or eliminate certain terms.

The principal Boolean operators are:

Boolean Operator		Use for	Examples
AND	**+**	Use **AND** to get fewer search results	cake **AND** chocolate
OR		Use **OR** to get more search results	adolescents **OR** teenagers
NOT	**-**	Use **NOT** to get fewer search results	media **NOT** radio



. Snowballing (Chaining, Reference Harvesting, Pearl Growing)

Snowballing is an effective way of identifying further keywords for literature search.

If an article perfectly matches to the search criteria, the indexed terms that have been assigned to it should be noted.

- **"Backward Snowballing (BSB)"** means using the reference list to identify new papers to include.

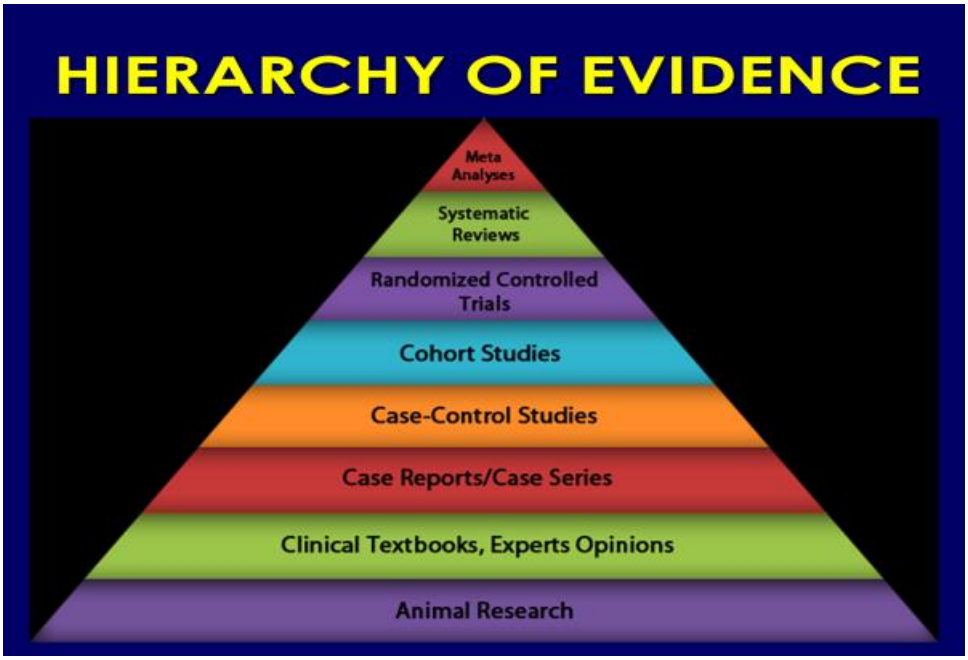
- **"Forward Snowballing (FSB)"** refers to identifying new papers based on citations (those papers citing the paper found).

. Limiters (Filters)

Limiters are used to refine the search – limit by time period, gender, age range, language, type of scientific literature, quantitative / qualitative data, etc.

Limiters restrict the number of results so they focus on specific literature.

16. LITERATURE EVALUATION (CRITICLE APPRAISAL OF "EVIDENCE")



The purpose of critical appraisal is to determine the worth of evidence.

Criticle appraisal of "evidence" is a process of assessing the "evidence" by systematically and carefully considering its ***reliability, validity and relevance*** to the area considered.

Critical appraisal of "evidence" is reviewing each study to determine:

- its level of evidence
- how well it was conducted
- how useful it is to practice

In the case of ***a body of evidence***, critical appraisal also involves judging whether the number of studies and the consistency across studies is sufficient for decision-making.

16.1. LITERATURE EVALUATION (CRITICLE APPRAISAL) CHECKLIST

✓ **The Journal**

Is the journal considered reputable?

Is the journal peer-reviewed?

✓ **The Article**

Is the article recently published?
(within 5 years)

✓ **The Researcher(s) / Author(s)**

Is there any conflict of interest noted?

[Conflict of interest is any circumstance that creates a risk that professional judgment is influenced by an interest]

✓ **Literature Review**

Did the researchers base their work on a thorough literature review?

✓ **Research Question**

Is the research question well-defined that can be answered using this study design?

✓ **The Purpose and The Objectives**

Are the purpose and the objectives of the study clearly stated?

✓ **Inclusion and Exclusion Criteria**

Are the inclusion and exclusion criteria clearly stated, and are they appropriate?

✓ **Sample Size**

What are the rationales for determining sample size and what is the formula of sample size?

✓ **Randomization**

Were the patients randomized to the intervention and control groups by a well-defined method of randomization?

✓ **'Blinding' ('Masking')**

Were the patients / subjects and/or researchers / clinicians / data collectors kept 'blinded' to which treatment was being given?

✓ **Results**

Are the data presented in an appropriate, understandable format?

✓ **Statistical Tests**

What statistics were used to determine if the purpose of the study was achieved?

Are the statistical tests used consistent with the hypothesis of the study?

Are the results statistically significant?

✓ **References**

Are references timely and evidence-based?

Do references cited represent a complete background?

17. RESEARCH HYPOTHESIS

The Research Hypothesis is central to all scientific research, whether qualitative or quantitative.

The Research Hypothesis is a statement that can be tested, i.e. translation of theory into a testable statement.

The importance of the Research Hypotheses lies in their ability to bring direction, specificity and focus to a research study.

At the heart of the scientific method is the process of Hypothesis Testing.

Nature of Research Hypothesis:

- It is a prediction of consequences
- It is neither too specific nor to general
- It can be tested – verifiable or falsifiable

The Research Hypothesis is a specific, clear, and testable proposition or predictive statement about the possible outcome of a scientific research.
It is a tentative assumption put to test.

The Research Hypothesis is a clear statement of what is intended to be investigated. The Research Hypothesis is a statement or explanation that is suggested by knowledge but has not, yet, been proved or disproved.

The Research Hypothesis is a statement pertaining to the relation between two or more variables. The research hypothesis is what the researcher predicts the relationship between two or more variables. It is a formal statement that presents the expected relationship between an independent and dependent variable.

The Research Hypothesis does not have to be correct. While the Research Hypothesis predicts what the researcher expects to find out, the goal of the Scientific Research is to determine whether this “guess” (the Research Hypothesis) is right or wrong. In many cases, the researcher may find that the results of an scientific research do not support the Research Hypothesis.

17.1. Null Hypothesis ("H_0" or "No-Difference" Hypothesis)

In scientific research, the Null Hypothesis is the proposition that ***there is no effect or no relationship*** between phenomena or populations.

The Null Hypothesis is a statement that ***a relationship expected in the research hypothesis does not exist.***

The Null Hypothesis is a type of hypothesis used in statistics that proposes that ***no statistical significance*** exists in a set of given observations.

18. SCIENTIFIC RESEARCH DESIGN

Scientific Research Design is a plan for selecting subjects, research sites, and data collection and analysis procedures to answer the research question(s).

Scientific Research Design is a ***"master plan"*** specifying the scientific methods and procedures for collecting and analyzing the needed information.

The Scientific Research Design is a procedural plan that is adopted by the researcher to answer Research Question(s) validly, objectively, accurately and economically.

Research Design is the ***conceptual structure*** within which research is conducted; it constitutes ***the blueprint*** for the collection, measurement and analysis of data. Thus, Research Design provides ***an outline*** of what the researcher is going to do in terms of framing the hypothesis, its operational implications and the final data analysis.

Decisions regarding ***"what?", "where?", "when?", "how?", and "by what means?"*** concerning an inquiry or a research study constitute the Research Design.

A Research Design is the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose.

One may split the ***Overall Research Design*** into the following parts:

(a) ***The Sampling Design*** which deals with the method of selecting items to be observed for the given study

(b) ***The Observational / Experimental Design*** which relates to the conditions under which the observations / experiments are to be made

(c) ***The Statistical Design*** which concerns with the question of how many items are to be observed and how the information and data gathered are to be analysed

(d) ***The Operational Design*** which deals with the techniques by which the procedures specified in the sampling, statistical and observational designs can be carried out

- Sampling
- Data Collection Techniques
- Data Processing and Analysis

The Scientific Research Design Decisions Include:

1. The nature of the study
2. The purpose of the study
3. The location where the study would be conducted
4. The nature of data required
5. From where and how the required data can be collected
6. What time period the study would cover
7. The type of sample design that would be used
8. The techniques of data collection that would be used
9. The methods of data analysis that would be adopted
10. The manner in which the report / Thesis would be prepared and presented

Scientific Research Design is the arrangement of condition for collection and analysis of data in a manner that aims to generalize the findings of the sample on the population

Scientific Research Design is ***a strategic framework*** for action that serves as a bridge between the Research Question(s) and the execution, that is, the implementation of the research strategy.

Scientific Research Design can be considered ***as the plan, structure, and strategy of research*** which is the "glue" that holds all of the elements in a research project together. It is the planned sequence of the entire process involved in conducting a research study.

The Scientific Research Design should be able to provide answers to the following questions:

1. What is the study about and, what type of data is required?
2. What is the purpose of study?
3. What are the sources of needed data?
4. What time, approximately, is required for the study?
5. What type of sampling should be used?
6. What method of data collection would be appropriate?
7. How will the data be analysed?
8. What should be the approximate expenditure?

19. SCIENTIFIC RESEARCH METHODOLOGY AND METHODS

Scientific Research Methodology is the way in which research problems are solved systematically. It is a science of studying how research is conducted scientifically.

Research Methods include all those techniques / methods that are adopted for conducting research. Thus, research techniques or methods are the methods that the researchers adopt for conducting the research studies.

- **Experimental Studes**

Experimental studies are done in carefully controlled and structured environments and enable the ***causal relationships*** of phenomena to be identified and analysed.

Studies done in laboratories tend to offer the best opportunities for controlling the variables in a rigorous way, although field studies can be done in a more 'real world' environment.

- **Surveys**

Surveys involve selecting a representative and unbiased sample of subjects drawn from the group you wish to study.

The main methods of asking questions are by face-to-face or telephone interviews, by using questionnaires or a mixture of the two.

There are two main types of survey:

- A ***Descriptive Survey***: concerned with identifying & counting the frequency of a particular response among the survey group.

- An ***Analytical Survey***: to analyse the relationship between different elements (variables) in a sample group.

20. STATISTICS AND STATISTICAL ANALYSIS IN SCIENTIFIC RESEARCH

Statistics is used to ***summarize, analyse, and interpret*** a group of numbers or observations.

Statistical Analysis helps in ***hypothesis testing*** to determine whether observed differences between groups or variables are real or occur simply by chance.

20.1. SAMPLING, SAMPLE AND SAMPLE SIZE

All items in any field of inquiry constitute a “Universe” or “Population”.

Sampling is a definite plan for obtaining a sample from a given population.

It refers to the technique or the procedure the researcher would adopt in selecting items for the sample.

Sampling is concerned with the selection of a subset of individuals from within a defined population to estimate characteristics of the entire population. Each individual variable measures one or more properties (such as weight, location, color) of observable bodies distinguished as independent objects or individuals.

The Sampling Process Comprises Several Stages:

- Defining the population of concern
- Specifying a sampling frame (sampling frame is a set of items / a list or map containing all the units from which a sample is drawn)
- Determining the sample size
- Specifying a sampling method for selecting items or events from the frame
- Implementing the sampling plan
- Sampling and data collecting

Characteristics of A Good Sample Design

The following are the characteristic features of a good sample design:

a. The sample design should yield a truly representative sample
b. The sample design should be such that it results in small sampling error
c. The sample design should be such that the systematic bias can be controlled
d. The sample and sample size must be such that the results of the sample study would be applicable to the "universe" ("population of interest", "target population") at a reasonable level of confidence

Sample and Sample Size

A "Sample" is defined as a set of selected individuals, items, or data taken from a population of interest ("target population", "universe").

Sample Size refers to the number of items to be selected from the "universe" to constitute a sample.

Probability Sampling Techniques

Probability sampling is based on ***random selection***.

For a design to be called ***probability sampling or random sampling (chance sampling)***, it is imperative that each element in the population has an equal chance of selection in the sample.

o Simple Random Sampling

In statistics, a "Simple Random Sample" is a subset of individuals (a "Sample") chosen from a larger set (a "Population"). Each individual is chosen randomly and entirely by chance, hence it is categorized as a "Probability Sampling"; such that each individual has the same probability of being chosen at any stage during the sampling process. This process and technique is known as "Simple Random Sampling".

A simple random sample is an ***unbiased surveying technique***.

- **Systematic Sampling**

"Systematic Sampling" is a statistical method involving the selection of elements from an ordered sampling frame.

When the population can be placed in an ordered list, the systematic sampling involves selecting a ***random start point*** and then selecting every k^{th} individual where ***k = population size / sample size***.

- **Stratified Sampling**

"Stratified Sampling" is a method of sampling from a "Population".

When subpopulations within an overall population vary, it is advantageous to sample each subpopulation (stratum) independently by stratifying them.

"Stratification" is the process of dividing members of the population into ***homogeneous subgroups*** before sampling.

- **Cluster Sampling**

The natural groups consisting of the units of interest are called "Clusters".

A sample of clusters may be selected from all available clusters of interest and all the units in the selected clusters are then studied - this is known as "Cluster Sampling".

20.2. DESCRIPTIVE STATISTICS

Descriptive Statistics are used to describe the basic features of the data in a study. They provide summaries about the sample and the measures.

Descriptive Statistics is a branch of statistics that aims at describing a number of features of data usually involved in a study. The main purpose of Descriptive Statistics is to provide a brief summary of the samples and the measures done on a particular study.

Descriptive Statistics are brief descriptive coefficients that summarize a given data set, which can be either a representation of the entire or a Sample of a Population.

Descriptive Statistics are broken down into ***Measures of Central Tendency***, ***Measures of Variability (Measures of Dispersion, Scatter, Spread)***, and ***Measure of Association***.

- **Measures of Central Tendency**

Measures of Central Tendency are the most basic and, often, the most informative description of a Population's characteristics.

There are three measures of central tendency:

. *Mean* - The sum of a variable's values divided by the total number of values

. *Median* - The middle value of a variable

. *Mode* - The value that occurs most often

- **Measures of Variability (Measures of Dispersion, Scatter, Spread)**

. *Range* is the difference between the smallest and largest values in the data set.

. *Variance* is the most commonly used measure of dispersion. It measures how different the numbers are from each other.

It is calculated by taking the average of the squared differences between each value and the mean.

. *Standard Deviation (SD)*, another commonly used descriptive statistic, is the square root of the variance.

It is used to quantify the amount of variation or dispersion of a set of data values. If the data points are further from the mean, there is higher deviation within the data set; thus, the more spread out the data, the higher the standard deviation.

- **Measure of Association**

A ***Correlation Coefficient*** is used to measure the strength of the relationship between numeric variables.

The most common correlation coefficient is **Pearson's r**, which can range from ***-1 to +1***

If ***the coefficient is between 0 and 1***, as one variable increases, the other also increases. This is called a ***positive correlation***.

If ***the correlation coefficient is between -1 and 0***, as one variable increases the other decreases. This is called a ***negative correlation***.

20.3. STATISTICAL TESTS AND SIGNIFICANCE LEVELS

Statistical analysis is a universal method with which to assess the validity of a conclusion. However, the inappropriate use of statistical techniques results in faulty conclusions, inducing errors and undermining the significance of the scientific research.

- **Parametric Tests**

  . (Student's) t Test

  . One-way ANOVA

- **Non Parametric Tests**

  . Mann-Whitney U Test

  . Wilcoxon Signed Rank Test

  . Kruskal-Wallis Test

  . Chi-Square Test

  . Kolmogorov-Smirnov Test

- **Significance Levels**

'p-value' is a measure of probability.

Traditionally, researchers have used either ***the 0.05 level (the 5% level)*** or ***the 0.01 level (the 1% level)***.

If the ***probability (p-value) is less than the significance level***, then the Null Hypothesis is rejected and the result (the outcome of research) is said to be ***statistically significant.***

If the p-value is less than 0.05 ($p<0.05$), it means that the probability that the result was due to chance is less than 5 % (a ***'statistically significant'*** result).

The significance level is the probability of rejecting the Null Hypothesis when it is true. For example, a significance level of 0.05 indicates a 5% risk of concluding that a difference exists when there is no actual difference.

21. STRUCTURING THE GRADUATION THESIS

When you are ready to write your Graduation Thesis, you may find it helpful to think about structuring your Thesis in the following way:

Preliminary Material (Preliminary Pages)

- Title Page
- Dedication / Acknowledgements
- Ethical Declaration Page
- Table of Contents
- List of Tables and List of Figures
- List of Abbreviations
- List of Appendices
- Abstract (Synopsis)

Main Text (Body of Thesis)

- Introduction
- Literature Review
  (sometimes included in the “Introduction” Section)
- Methodology, Materials and Methods
- Results
- Discussion
- Conclusion
- Recommendations
  (sometimes included in the “Conclusion” Section)

Supplementary Material (Supplementary Pages)

- References (Literature, Bibliography)
- Appendices

ORDER OF WRITING THE GRADUATION THESIS

METHODS
↓
RESULTS
↓
DISCUSSION
↓
CONCLUSIONS
↓
INTRODUCTION
↓
ABSTRACT

DIVISIONS AND SECTIONS OF THE GRADUATION THESIS

21.1. PRELIMINARY PAGES

The preliminary pages, which appear before the main body of text, are numbered with lower-case Roman Numerals, except the first page, which is not numbered.

They must be in the following order:

- Title Page
- Dedication (optional)
- Acknowledgments (optional)
- Ethical Declaration Page
- Table of Contents
- List of Tables (required if there are two or more tables)
- List of Figures (required if there are two or more figures)
- List of Abbreviations
- List of Appendices
- Abstract (Synopsis)

21.1.1. TITLE PAGE

The Title is a specific, informative summary of the results of your research.

This should reflect clearly and with the fewest possible words (7-10 words) the contents of the Graduation Thesis.

There must be a Title Page which will have the following information:

a. The full Title of the Graduation Thesis and the subtitle, if any
b. The full name of the Student
c. The qualification for which the Thesis is submitted
d. The name of the Thesis Supervisor
e. The name of the Institution in which the research was conducted
f. The month of the year of submission

The title must be single-spaced, in all capital letters, and should begin at 3.5 cm from the top of the page.

21.1.2. DEDICATION (optional) / ACKNOWLEDGMENTS (optional)

Dedication

This part is a source to offer warmest gratefulness of the writer (the Student) towards any other person for whom she/he wish to pay honor.

Dedicating the dissertation to someone is a way to honor her/him.

Acknowledgments

You may acknowledge the assistance given to you by your Thesis Supervisor, and any other person or organisation that has helped you in the planning, conduct, analysis or reporting of your Graduation Thesis.

21.1.3. ETHICAL DECLARATION PAGE

I hereby declare that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct.

I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work.

Name, Last name :
Signature :

21.1.4. TABLE OF CONTENTS

Tables of Contents may be ***quite brief***, including only chapter headings, ***or more detailed***, including major subheadings.

This table indicates on which page a particular topic (heading or subheading) may be found.

The heading TABLE OF CONTENTS appears without punctuation, centered between the text margins, 3.5 cm from the top of the page.

The listing of actual contents begins at the left margin at least three spaces below the heading.

The Table of Contents lists the Chapters, Topics and Sub-Topics together with their page numbers.

Topics and Sub-Topics should be labelled according to the Chapter; e.g., the first Topic in Chapter 1 should be marked 1.1 and the first Sub-Topic, 1.1.1

The use of letters in parenthesis for e.g., (a), (b), (c) is appropriate as a means of differentiating Sub-Topics of the same Topic.

The Following Rules Apply to the Table of Contents:

- The wording of headings in the Table of Contents must correspond exactly to the wording of those headings in the text.

- "Preliminary Pages" with page number references must be listed (except for the Title Page and the Table of Contents themselves).

- Make sure that the levels of headings match in the Table of Contents and the text itself.

- Ellipsis marks (a series of dots), also called "dot leaders," to page number references (lining up dots) are required.

- Do not list individual Tables or Figures in the Table of Contents.

- APPENDICES should be shown in the Table of Contents.

- Continuing pages must be headed, TABLE OF CONTENTS (continued), if the Table of Contents is longer than one page.

21.1.4.1. List of Tables and List of Figures

If your Thesis contains two or more tables, you must create a List of Tables.

Likewise, if you have two or more figures, create a List of Figures.

Format these lists as you would a Table of Contents.

Include these lists in the "Preliminary Pages" section after the Table of Contents.

Make sure titles are identical from text to Table and Figure.

The List of Tables contains the titles of Tables, together with their page numbers, which are listed in the text. The numbering system is according to chapter (e.g. Tables in Chapter 3 are numbered sequentially: Table 3.1, Table 3.2).

The List of Figures is a list contains the titles of Figures, together with their page numbers, which are listed in the text (e.g. Figures in Chapter 3 are numbered sequentially: Figure 3.1, Figure 3.2).

21.1.4.2. List of Symbols and Abbreviations

21.1.4.3. List of Appendices

21.1.5. ABSTRACT (SYNOPSIS)

The objective of the Abstract is to summarize the purpose, results, important conclusions, and recommendations of the Graduation Thesis.

An Abstract is a one paragraph summary of the entire Thesis. It should be short: 250-300 words are usually sufficient.

The Abstract is a short summary of the whole document. It should briefly state:

- Research problem, research question(s) and hypotheses, study's objectives
- Methodology, methods and procedures
- Most significant results
- Most important conclusions

The Abstract should briefly describe the question posed in the paper, the methods used to answer this question, the results obtained, and the conclusions. It should be possible to determine the major points of a paper by reading the abstract.

This is a synopsis of your study question, aims and objectives, background literature, methods, results, key conclusions and recommendations. This should be very clear and easy to follow.

It concisely summarizes the reason for the research (from the "Introduction" Section), the general methodology used in the experiment ("Methodology, Materials and Methods" Section), the main findings ("Results" Section) and the implications of those findings ("Discussion" Section).

The abstract requires clear, concise and quantitative statements of what was done, what was found, and what it means.

Writing an abstract requires a great deal of thought and is best done after completion of the other sections of the manuscript. Although it is located at the beginning of the Thesis, it is easiest to write the abstract after the Thesis is completed. This section of the scientific paper is commonly written last, after the rest of the Thesis.

21.2. BODY OF THESIS (TEXT PAGES)

"IMRAD" Structure (**"IMRAD"** Layout):
Introduction, **M**ethods, **R**esults, and **D**iscussion

These include the body of the Thesis; including the Research Problem, Literature Review, Methodology, Results, Discussion, and Conclusion.

It is usually divided into chapters or sections. If chapters are used, each one starts on a new page. These pages are numbered with Arabic Numerals, except the first page of text, which is not numbered.

In the ***"Introduction"***, you describe the context of the research.

In the ***"Literature Review"***, you analyse the work of previously published authors and derive a set of questions that needed to be answered to fulfil the objectives of your scientific research.

In the ***"Methodology"*** Section, you show the reader what techniques were available, what their advantages and disadvantages were, and what guided you to make the choice you did.

In the ***"Results"*** Section, you present to the reader the outcome (findings) of the Thesis.

In the ***"Discussion"*** Section, you explain the reason and significance of the findings.

In the ***"Conclusion"*** Section, you summarise the key results and the conclusions that you draw from the results and discussion.

21.2.1. INTRODUCTION AND LITERATURE REVIEW

In this section of your Graduation Thesis, you introduce the subject, provide the background to the topic or problem (i.e. what is already known), outline the Research Question, Research Problem and Hypothesis, and outline the aims and objectives of your study.

A good "Introduction and Literature Review" includes an overview of the problem, a statement of why the problem is important, a summary of relevant literature, and a clear statement of the Research Question(s) and the Hypotheses.

This chapter contains the introduction to the issues in which the research is concerned, the aims and objectives of the study, and the outline of the research approach.

You give your reader the background to understand your question and then present your Research Question in this section.

The "Introduction and Literature Review" Section should (i) describe the Research Question tested by the study and experiments described in the Thesis, (ii) explain why this is an interesting or important question.

Problem statement, background, justification, and significance provide a general introduction to the issue or research topic. State the Research Problem and provide background information. Explain why the Research Problem is significant.

Give specific reasons why your proposed research is important and how it will contribute to the discipline.

This chapter surveys previous literature and studies relevant to the field of study.

The literature review should be comprehensive and include recent publications.

Include a Literature Review that highlights how past research has addressed the problem and note similarities or differences in methods or findings.

The structure of the "Introduction and Literature Review" is often an ***"inverted pyramid"***, starting with a broad description of the background and narrowing down to the particular question being asked.

The structure of this section should ***funnel down*** from a broad perspective to the specific aim of the study.

Purpose and Objective(s) of the Study

Clearly state the purpose and objective(s) of your research.

Literature Review and Literature Citation

This is a review of the literature on the topic or problem you are studying. It should include a review of any other studies or projects similar or relevant to yours, and a review of the literature on the method that you have chosen.

Drawing on literature in the discipline and related disciplines, discuss the work of previous scholars that supports, and provide a context for your study.

Literature should be cited regarding all research variables to be explored in the study. An effective literature review is not a mindless set of citations linked together ("Smith said," "Jones noted"). Instead, it frames and contextualizes the topic.

Research Question(s) and Hypothesis(es)

Form an understanding of the Research Problem and related literature, develop concisely phrased Research Question(s) and Hypothesis(es) that will be studied and tested.

21.2.2. METHODOLOGY, MATERIALS AND METHODS

This section includes the methodology of your research.

It describes and explains the Research Methodology used in the study.

This section of the Thesis should describe, in logical sequence, how the study was designed and carried out.

The Sub-Topics for this chapter include the key ***Research Question(s)***, the ***Scientific Research Design***, and the ***Research Procedures*** adopted.

It should also indicate ***Sampling Methods, Research Instruments and Statistical Analyses*** employed. The purpose of this is to inform the reader on the methods used to collect and analyse the data reported.

In this section, you describe ***the procedures*** you followed and ***the techniques*** you used to perform your study and experiments.

1. Description and justification of the chosen methodological approach
2. Description and justification of the data collection methods
3. Analysis and Statistical Analysis strategies and techniques

It will cover such issues as:

- The study design
- The study population, sampling frame and sample size, and sampling method
- Scientific research design
- Survey or data collection instruments
- Protocol for obtaining data
- Ethical issues and how they are addressed
- Information letters, consent forms
- Data management and analysis methods
- Statistical analysis and tests

You have to include enough detail so that someone familiar with basic scientific research techniques could reproduce your study and experiments.

Describe your research methods, providing enough detail so that other researchers can replicate or evaluate your work. This is critically important as the obtained results should be reproducible if they are to be of scientific merit.

You also should name any statistical tests you performed to analyze your results.

The statistical method section should describe how the data were analysed, with specific details of the statistical tests and the statistical computer packages (software) that were used.

If a statistical test that is not simple or well known is used, a reference to the method and an explanation of why it is used is required.

Provide the same methodological information in the "Graduation Thesis Proposal".

21.2.3. RESULTS (FINDINGS, OUTCOMES)

In this section you present the results (data and findings) of your research.

Results are commonly presented in the form of ***Text, Tables, Figures, and Graphs*** complete with ***data analysis, including statistical analysis***.

Break up your results into logical segments by using Subheadings.

This section includes such information as descriptive data dealing with your study population, response rates etc. and results of statistical analysis.

Usually experiments or surveys either demonstrate the viability of a method or technique, or demonstrate that a method or technique provides better performance than those that exist.

The results are actual statements of observations including statistics, Tables, Figures and Graphs. Describe the results of experiments or surveys that provide evidence in support of your Thesis.

Mention negative results as well as positive results.

Summarizing Results in Tables and Figures

Most "Results" sections contain data in Tables or Figures (Figures may consist of Diagrams, Graphs, Maps, or Photos).

Tables, Figures and Graphs are an excellent means of presenting this sort of information. All Tables, Figures and Graphs, should be numbered consecutively throughout the whole report, and labelled with a clear and concise descriptive title.

Explain Tables Figures, and Graphs; don't assume your readers will interpret them the way you do.

When referring to a particular Table or Figure, they should be capitalized (e.g., Table 1, Figure 6, etc.). The text of the "Results" section should provide the reader with a summary of the results of each Table or Figure.

Tables should be sequentially numbered. Each Table should have a title which is shown above the Table.

For headings of Tables, use capitals for the first word only (e.g. Table 1 Incidence of hospital-acquired infections).

Each Table should be numbered consecutively with an Arabic numeral, according to the order in which they are mentioned in the main text. A Table should have a title followed by any explanatory legend containing all of the information needed to understand the material presented in the Table.

Tables must have a Table Caption above the Table and Figures must have a Figure Caption below the Figure.

Figures should be sequentially numbered. Each Figure should have a title which is shown below the Figure.

For headings of Figures, use capitals for the first word only (e.g. Figure 1 Factors that affect patient satisfaction).

Each Figure should also be numbered consecutively with an Arabic numeral, according to the order in what they are mentioned in the text. Figures also have a title followed by an explanatory legend, but these should be placed below the Figure itself.

Not all results deserve a separate Table or Figure. As a rule of thumb, if there are only a few numerical results or a simple conclusion, describe the results in the Text instead of in a Table or Figure.

It is not necessary to repeat in paragraphs what you show in a Chart.

Text should lead the reader to the Chart or Table, not repeat what can already be seen.

All Tables and Figures must be placed within the specified margins (refer to ***Chapter 22. "Formatting and Style Guidelines – 22.6. Margins"***).

An allowable format is to put each Table or Figure on a separate page and include these pages at the end of the Thesis.

Analyzing Data

"Raw data" are typically not presented in a scientific paper; if statistical analyses are used, these are briefly described in the "Methodology, Materials and Methods" section (refer to ***Chapter 20. "Statistics and Statistical Analysis in Scientific Research"***).

This is not a presentation of raw data, but a presentation of the numbers or facts determined from the analysis.

If you are using a Hypothesis, this is where you state whether you accept or reject that Hypothesis.

Do not include any statement regarding interpretation of the data; that is, only include statements regarding actual observations.

This section is used to present findings in a clear and concise manner; it is not a place to explain or interpret data, that should be done in the "Discussion" Section.

While you do not interpret or explain your results in this section (that happens in the "Discussion" Section), you can use this section to focus your reader's attention on the aspects of your results which are most important to you.

21.2.4. DISCUSSION

This section contains the interpretation of the results.

The "Discussion" Section answers your reader's question ***"What do these findings (mentioned in the "Results" Section) mean?"***

Do not simply restate the results. Explain your interpretations of the "Results (Findings)" Section.

This is the section used to interpret data. This section should be detailed but as concise as possible.

Discuss possible significance, trends, or correlations of your results. Explain whether or not you accept or reject your Hypothesis and why, using you analyzed data as support.

In this Section, you should avoid repeating what you showed in the "Results (Findings)" Section.

In this section you interpret your results and discuss their implications, with reference to other published research. The findings of the research should be compared with those of previous studies presented in the "Introduction and Literature Review" Section.

This chapter develops analytic and critical thinking on primary results and analysis with reference to theoretical arguments grounded in the literature review. You should try to highlight where there are major differences and similarities from the literature.

Provide a systematic analysis of the results of your study.

Provide an overall analysis and integration of your thesis research considering the current research in the field.

State how the results relate to your Research Question(s) and Hypothesis(es).

Do not include any statement regarding actual observations; that is, only include statements regarding interpretation of research data (statements regarding research findings should be done in the "Results" Section).

The first paragraph could focus on the general picture of what the results of the study are really all about. It would be helpful to explain how the findings can add to current scientific knowledge.

Offer generalizations, principles, or relationships. Develop paragraphs based on critical themes and trends revealed in the findings. Identify points that lack correlation or offer exceptions.

Show how your research agrees or disagrees with similar or prior studies. Do your results agree/disagree or correlate with the results of previous work?

The next paragraph could address the strengths and limitations of the Scientific Research Design and Research Methodology. Comment on strengths and limitations of your research.

It should be continued by explaining how the results agree or disagree with other studies or related theories. If conclusions differ from those reached by other researchers who have conducted similar studies, one should try to explain why this has happened.

Any limitations in your research methodology should be referred to here. Examiners expect you to acknowledge these limitations as an integral part of the evaluation of your Graduation Thesis.

Also discuss potential sources of error in your experiment/research and how they could have affected your results.

Consider the Following Questions:

- Do the results support the Hypothesis? Why or why not?
- How do the results compare to previous work? (Refer back to information cited in the "Introduction and Literature Review" section.)
- What relationships, trends, and generalizations did you discover among the results?
- What went wrong? What could have been done better? What are possible sources of error?
- What future experiments should be conducted?

21.2.5. CONCLUSION (sometimes combined with the "Discussion" Section)

This section summarises the key results and the conclusions that you draw from the results and discussion.

Avoid repeating your "Abstract", "Introduction and Literature Review", "Results (Findings)", or "Discussion" Sections of your Graduation Thesis word-for-word.

Be careful not to make claims that are not substantiated from the "evidence" (findings) you have presented in the "Results" Section.

Initial research plan has been addressed in such a way that conclusions may be formed from the "evidence" (findings) of the Thesis.

Summarize how your findings compare to the literature and prior research.

No new material or references should be placed here.

The conclusions should make a statement on the extent to which each of the aims and objectives of the Thesis has been met. You should bring back your Research Questions and state clearly your understanding of those questions.

There should also be a short statement of the limitations of the research. Where appropriate, identify additional limitations of the study that were unexpected and encountered during the research process.

State the conclusions regarding Goal(s) and Hypothesis(es) of your Thesis that were presented in the "Introduction and Literature Review" Section, and the overall significance and contribution of your Thesis research.

Summarize what was learned and how it can be applied.

Explain any broader implications of your study/experiment.

1. Given the results, what are your conclusions?
2. Which possible solutions do you propose?
3. How has your work helped to advance the science (from a theoretical, conceptual, methodological and/or empirical perspective)?

If you feel that new Research Problems and new Research Questions arose that require further research, then mention them. Then, briefly describe the new problems and questions. Always keep in mind that you must communicate the "significance" and "value" of problems, questions, ideas, solutions, etc.

Discuss the implications of your study and possibilities for further research. Suggest further research that could be done to expand on your work.

A good "Conclusion" should restate ***your answer to your Research Question and Hypothesis***, or primary claim based on your findings. It should also make ***recommendations for further research*** or changes that should be made in practice.

21.2.6. RECOMMENDATIONS

It is good research practice to make recommendations or to suggest directions for further research or actions as a result of your research findings.

You should include a short subsection on any suggestions for further research for colleagues who might wish to undertake research in this area in the future.

21.3. SUPPLEMENTARY PAGES

21.3.1. REFERENCES (LITERATURE, BIBLIOGRAPHY)

The "References" Section lists the scientific literature you cited in the main text of your Thesis. This is the section where you list your references.

This is a list of all the references and sources you used in your literature review, methodology and discussion.

This includes journal articles, books (monographs), letters, abstracts, conference and symposium papers, media articles, and any form of published literature.

This also includes citations for computer analysis packages, online literature and sources, and any audiovisual resources you may have researched or cited.

It is important that every claim of scientific fact you make is supported by a ***valid, relevant, accessible reference***, and that every idea or argument, and every verbatim quotation or paraphrase of ***someone else's work is correctly attributed to its source***.

When Should You Cite A Reference In Your Thesis?

- When you quote directly from the source, or closely paraphrase the source.
- Whenever ideas, facts, or data mentioned in your report are taken from another source.
- Whenever you make a statement of fact or opinion that is not common knowledge, and is not supported by your own data and arguments.

For ***in-text citations***, use "author and publication year format": Author's surname and date of publication (e.g. Doe 2019).

Your 'References' Section should include all the sources cited for which you have cited within the text, and only those sources.

Any source cited in the text should be included in the reference list. Nothing should be included in the reference list that is not cited in the text of your Thesis.

21.3.1.1. Referencing Style

Academic referencing includes:

1. **In-Text Citation**
2. **Reference List (Bibliography)**

21.3.1.1.1. Standard Referencing Styles

- **Harvard System of Referencing Style**
- **APA (American Psychological Association) Style**
- **MLA (Modern Language Association) Style**
- **CBE (Council of Biological Editors) Style**

The **Harvard System ("Author-Date System")** for listing references should be used.

The Harvard System requires your list of references to be presented in **Alphabetical Order**: An alphabetized list of all of your sources, cited properly, in the specified format. List in alphabetical order according to the surname of the first Author.

21.3.1.1.2. In-Text Citation

Throughout your Thesis, you must acknowledge the sources you have used.

e.g. Toohey and Mahon (1999) argue that curriculum design became increasingly student-centered in the last decade of the twentieth century.

e.g. Doe (2019)

suggests/argues/states/believes/concludes/proposes that ---
expresses/holds the view that ---
draws attention to ---
describes x as ---
describes how ---
refers to ---
takes the stance that ---
emphasises/stresses the need to/the importance of---

e.g. According to Doe (2019) ---
As stated/suggested/argued/proposed by Doe (2019) ---
There is a view/theory/argument that --- Doe (2019)
It has been suggested/stated/argued/proposed that --- Doe (2019)
One view / theory / argument / suggestion / proposal is that --- Doe (2019)

21.3.1.1.3. Reference List (Bibliography)

After the citation in the text, all items are listed in ***alphabetical order of first Author's surname*** in the Reference List (Bibliography) at the end.

Journal Article:

1. Surnames(s) with the initials of the first name(s) of Author(s)
2. Date of the Journal (in round brackets)
3. Full title of the Article (in quotation marks)
4. Title of the Journal
5. Volume number
6. Part number (in round brackets)
7. Page numbers in full

Book:

The Author's surname with the initials of the first name, year of publication (in round brackets), full title of the book, the edition - if other than the first, the place of publication, the publisher.

Book Chapter:

Author of the Chapter/Section, year of publication (in round brackets), title of Chapter/Section (in "quotation marks") 'in' Author/Editor of book, full title of the book (in *italics*), place of publication, publisher, page reference.

Webpage:

In citing an electronic work such as a webpage, elements include Author's / Editor's surname and initials, year of publication, title, the word 'online' [in square brackets], edition details, place of publication.

The web address and the date the page was accessed should also be included:

Web address <in angled brackets> and date viewed

e.g. [viewed day month year], <https://www. ...>
or [accessed day month year], <https://www. ...>

BIBLIOGRAPHY OR WORKS CONSULTED (optional)

A bibliography is a list of all the books, articles, Web sites, and so on that you read as part of your research, even if they are not cited in your thesis.

21.3.2. APPENDIX OR APPENDICES

In some Graduation Theses, it may be desirable to include certain additional reference materials, e.g., text forms, blank survey forms, detailed descriptions of apparatus, and extensive tables of raw data, etc., which include information that is too detailed or lengthy to be included in the "Text Pages (Main Body)" of the Graduation Thesis.

These are documents that support information in the text.

Such materials should be included in the "Appendix" Section that follows the "References (Literature, Bibliography)" Section.

An appendix might include:

- Data-gathering instruments or questionnaires
- Supplemental data or information from a secondary source
- Letter approving use of human or animal subjects
- Any pertinent correspondence, such as permission letters

Format for Appendix / Appendices:

- If there is more than one Appendix, the first page of the Appendix section should be a cover sheet on which the word "APPENDIX" or "APPENDICES" is centered.

- Appendices are labeled with capital letters, not numbers (e.g., Appendix A)

- Each Appendix must have a specific title (e.g., Appendix B: Survey Form)

- Center and position the appendix name at the top of the page text area followed by two lines of space. Then, center the appendix title using title case.

- The first appendix should be headed APPENDIX A, and continuing pages must be headed APPENDIX A (continued). The second appendix should be labeled APPENDIX B, and so.

• Appendix information must have margins within the limits of the thesis text (refer to ***Chapter 22. "Formatting and Style Guidelines – 22.6. Margins"***).

• Sheets larger than the Thesis papar size must be reduced to the required size by photocopying methods.

Appendix Numbering

Appendixes are paginated consecutively from the preceding pages; that is, the page number of Appendix A should be the next number in sequence from the last page number of the "References (Literature, Bibliography)" Section.

22. FORMATTING AND STYLE GUIDELINES

Academic writing follows standard styles and protocols.

A Graduation Thesis is a ***"formal" document*** and there are ***"rules" that govern the way in which it is presented***.

Your Graduation Thesis must follow those standards, methods of citation, and be formatted in a manner recognizable and accepted by the academic community.

22.1. PAPER

Manuscripts should be printed on high quality ***A4 paper (201 X 297 mm)***, ***80 gsm (Grams per Square Meter : Grammage)***.

22.2. PRINTING AND PRINTING QUALITY, AND DUPLICATING

Printing and Printing Quality

Print on only one side of the paper: do not print on both side

A high quality Laser or Ink-Jet printer should be used for the printing.

Duplicating

The final manuscript, in hardbound copies, must be typed and duplicated by printing or good quality photocopying.

22.3. WORD LENGTH (WORD COUNT)

The approximate number of words will vary considerably across disciplines, and according to the topic and the other means of conveying thought such as charts, formulae etc.

As a general guide, a Graduation Thesis is around ***15.000-18.000 words*** (approximately ***60-70 pages***).

The Length of the Structural Parts of the Graduation Thesis

Title page	1 page
Contents page	1 page
Abstract	1 page
Introduction	3-5 pages
Literature Review	10-15 pages
Research Results	25-30 pages
Discussion	5-7 pages
Conclusion	1-2 pages

22.4. PAGE SIZE AND PAGE FORMAT

Page Size

General text pages are set in "portrait" vertical position (210 x 297 mm).

Page Format

Pages may be set in "landscape" horizontal position (297 x 210 mm) for Tables, Figures, or other visual materials that do not fit optimally in "portrait" position.

22.5. PAGINATION (PAGE NUMBERING)

You should always insert page numbers in your Thesis.

Roman Numerals

Lower-case Roman Numerals (i, ii, iii etc) should be used in the "Preliminary Pages".

There is no page number on the "Title" page (although it is considered to be page i).

Preliminary Pages (after the "Title" page, and before the "Body (Main Text)"; this includes pages up to the "List of Tables" and/or "List of Figures" and "Abstract") are numbered in lower-case Roman Numerals.

The numbers are not followed by a period or enclosed in hyphens or parentheses:

avoid	use
ii.	ii
-ii-	ii
(ii)	ii

Arabic Numerals

Arabic Numerals (1, 2, 3 etc.) are used on the pages of the text, starting with the “Introduction” page and “Supplementary” Section.

The first page of the “Main Body (Text)” is page 1, but it is not numbered.

For the “Main Body (Text)” of the entire Thesis and the “Reference List (Literature, Bibliography” and “Appendices”, use consecutive page numbers in Arabic numerals at the bottom of the page.

Page numbers should be positioned in the same location on every page. Even if you use a horizontal layout for a large-size Table or Figure, the page number is still positioned in the same place as if the page were the normal vertical layout.

All pages must contain text or images. If you wish to include a blank page for some reason, please print “Page intentionally left blank” centered in the middle of the page to clearly indicate your intent, and use the proper page number at the bottom.

All page numbers should be printed 1.0 cm from the bottom margin (bottom margin: 2.5 cm)

22.6. MARGINS (TOP, BOTTOM, LEFT, RIGHT)

The text should have the following margins:

Top: 2.5 cm
Bottom: 2.5 cm
Left: 4.0 cm (for binding)
Right: 2.5 cm

All typing, except the page numbers, must be within the margins.

All Tables and Figures must be placed within the specified margins.

Absolutely nothing must appear in the margins. This means that headings, page numbers, text, tables, illustrations, etc. must all be contained completely within the area bounded by the margins.

22.7. FONT TYPE AND FONT SIZE

The font type and font size must be consistent throughout the thesis.

Sections must be typed using Times New Roman, font size 12.

It is best to limit the pages to a specific number of words ***(250-300 per page in Times New Roman 12 p, double space)***.

Only use one font in the text. In headlines you can use a different font, but be consistent throughout levels of Headlines (Chapters and Sections) and use the same font in all Headlines.

22.8. SPACING AND LINE SPACING

Spacing

- **Triple-Space (three lines of space)**
  . before and after a Table or Figure in the text
  . before and after other Visual Materials in the text

- **Double-Space (two lines of space)**
  . Body (Main Text)
  . Headings (Chapters / Sections)
  . Subheadings
  . between last line on a page and the page number

- **Single-space (one line of space)**
  . Table of Contents
  . Abstract
  . References with multiple lines
  . Table Captions (Titles) and Tables
  . Figure Captions (Titles)

Line Spacing

The text should be typed with double-spacing (two lines of space).

The only exceptions to this are for the “Table of Contents”, “Abstract”, and “List of References” Sections and Table / Figure Captions (Titles), where a line spacing of 1.0 (one line of space) must be used.

22.9. CHAPTERS / SECTIONS AND SUBHEADINGS

The titles at the same hierarchical level should be formatted in the same manner (font type and size).

Chapters, Sections, and Subsections should be numbered using Arabic numerals (1, 2, 3.1, 3.2, 3.3, etc.).

Number the sections and headings /subheadings using the ***Decimal Point Numbering System***:

Chapters / Sections

1.0 Title of First Main Chapter / Section
- 1.1 First Subheading
- 1.2 Second Subheading
  - 1.2.1 First Sub-subheading
  - 1.2.2 Second Sub-subheading
    - 1.2.2.1 ……
    - 1.2.2.2 ……

Numbering of Subsections with more than three numerals (e.g. section 4.2.3.4) should be avoided. Alternatively, use font effects such as *italics* for subsection titles to further structure your text.

Each Chapter with a main heading number (1.; 2.; etc.) should start from a new page. All chapters or major sections should begin on a new page.

A subsection heading should not be the last line at the bottom of a page.

Subheadings

Subdivisions within chapters or sections do not begin on a new page.

The style used for different levels of Subheadings must be consistent throughout the manuscript.

First-order Subheadings may be typed in all upper-case letters provided they are placed flush left.

Subdivision headings are typed in upper and lower case letters and may be either centered or flush left.

Main Headings (i.e. of Chapters/Sections) should be in **bold type**.

Bold type or *italics* may be used for all other levels of Subheadings.

Bold type should not be underlined.

Sub-Subheadings should not be in **bold type**.

Full capitalization is used for main Headings such as Chapter/Section Headings (e.g. 2.0 Methodology, Materials and Methods).

For the next levels down (Subheadings and Sub-Subheadings), the first word is capitalized (e.g. 2.1 Volume data sets)

A Subsection Heading should not be the last line at the bottom of a page.

A Subheading at the bottom of a page must have one line of text under it.

22.10 PARAGRAPH SPACING

You should leave two empty rows between the end of a paragraph and the beginning of the next Main Heading.

You should leave one empty row between a Heading and the paragraph beginning after that.

22.11. TABLES AND FIGURES

Tables and Figures should be included either each one where it is referred to within the text, or all together at the end of the "Main Body (Text)" Section with their positions indicated in the text ('Table 3 about here').

For headings of Tables, use capitals for the first word only (e.g. Table 1 Incidence of hospital-acquired infections).

Tables should be inserted into the text as soon as possible after they are first mentioned. Place them directly into the text (in or between paragraphs), or on a separate page with no text above or below.

If a Table is alone on one page with no narrative text, it should be centered within the horizontal and vertical page margins.

If the table is too large to follow immediately the part of the text relating to it, the text should be continued and the Table placed on the page that follows.

A table should be separated from the text both above and below it by approximately three single-spaces (triple space, three lines of space), or placed on a separate page, depending on the size of the table.

Tables larger than one-half page should be placed on a separate sheet.

A table of one page or less in length should not be divided on two pages.

Tables running longer than one page should be started on a new page and may be continued on one or more pages, as needed. The continuing page(s) for the table must include the Title and Column Headings.

22.12. NUMBERS

All single-digit numbers (1, 2, …, 9) should be written as words when used in a sentence.

Use single-digit numbers with units of measurement (5 mg, 7 cm), time, dates, ages, scores, points on a scale, data in Tables and Figures .

Include one space between the numeral and the unit.

avoid	use
5mg	5 mg

Never begin a sentence with a number in any case. Either a) write the number as a word, or b) restructure the sentence to enable use of the number.

When using a decimal value of less than one (1) in a sentence, always precede the decimal point with a zero.

avoid	use
.8	0.80
.13	0.13

22.13 ABBREVIATIONS

Abbreviations of Latin phrases in common usage such as cf., et al., e.g., i.e., in vivo, in vitro, etc. need not be italicized or underlined.

No abbreviations should appear in Chapter Headings or Subheadings.

23. GRAMMAR IN THESIS WRITING

23.1. WE / I

Because scientific writing should be objective, one should avoid the first person singular pronoun "I".

23.2. PASSIVE / ACTIVE VOICE

Academic (scientific) writing must be in the passive voice, in the interests of objectivity.

Writing style is the ***third person singular passive***.

Passive voice is formed by a ***conjugation of "to be" (is, am, are, was, were, been, be, being) + a past participle (basically a past tense verb)***.

e.g. are being written; will be worked on.

Passive voice emphasises what was done and is generally conceived to be more objective (and, thus, to be more "scientific"), but it is also considered to be impersonal, wordy, and often boring.

Be sure you know whether to write in passive or active voice.

- **Active voice**: "We analyzed the data."
- **Passive voice**: "The data was analyzed."

Putting Forward Your Own Opinion Using The Passive Voice

. The evidence suggests that…….
. It will be argued…….
. The findings indicate……..
. These findings suggest…….

23.3. TENSES

- ✓ When stating what has been done, use the ***simple past tense***.

  e.g. “Smith (2018) reviewed the work of Black (2015) and concluded that ...”

- ✓ Use the ***present tense*** for statements of fact.

  e.g. “Developmental biology is the study of the growth of an organism.”

Third person, past tense should be observed in writing the science paper.

You should, whenever possible, ***avoid direct reference to yourself***.

Incorrect: “I then devised a new method ...” (First person, past tense.)

Correct: “A new method was then devised ...” (Third person, past tense.)

Besides the time frame (past, present, future), the verb tenses you use in your Thesis also reveal whose idea is presented (yours or someone else's) and how general or specific your description is.

- ✓ Write in ***present tense*** for the “Introduction and Literature Review”, “Discussion”, and “Conclusion” Sections.

- ✓ Write in ***past (perfect) tense*** for the “Abstract”, “Results”, and “Methodology, Materials and Methods” Sections.

The Following Tenses are Commonly Used in Scientific Texts:

. Simple Present Tense

Simple present tense is in general used to describe an action that that occurs now or on a regular basis. In scientific writing, this tense is used to describe a generally accepted scientific fact or an own statement. Therefore, it is typically applied in the “Introduction and Literature Review” Section, in which you give a literature review or statements of main ideas.

. Past Tense

Past tense emphasises the completed nature of a past activity or event. This tense is used to describe such past activities or events.

Past tense is usually used only in technical or scientific papers to describe experiments performed and results found.

. Present Perfect Tense

Present perfect tense is used to describe unfinished actions that started in the past and continue to the present.

In scientific texts, the use of this tense is usually limited to the introduction section (literature review) to indicate that research in the area is still continuing or still has immediate relevance.

23.4. SPELLING

British System	(North) American System
programme	program
centre	center
metre	meter
fibre	fiber
litre	liter
sulphur	sulfur
ageing	aging
sizeable	sizable
insure	ensure
analyse	analyze
realise	realize
labelling	labeling
fulfil	fulfill
skilful	skillful
tumour	tumor
defence	defense
arguement	argument
judgement	judgment
learnt	learned

23.5. IMPRECISE WORDS

Do not use words like “quite”, “some”, “considerable”, “a great deal”, “the majority”, etc. in scientific writing.

Be quantitative!

23.6. CONTRACTIONS

Avoid contractions.

avoid	use
we’ve	we have
can’t	cannot
won’t	will not

23.7. LINKING WORDS (CONJUNCTIONS)

They are also called “Sentence Connectors” if they are placed at the beginning of a sentence or transition words if they connect paragraphs.

Linking Words emphasize the connection between ideas, so they help readers follow your line of reasoning or see relations that might otherwise be misunderstood or missed.

Linking Words or phrases mostly consist of conjunctive adverbs and are used to link ideas from one sentence or paragraph to the next.

Linking Words such as: ‘moreover’, ‘additionally’ and ‘furthermore’ are useful when joining two clauses together which agree with each other.

Conjunctions such as: ‘however’, ‘yet’, nevertheless’, and ‘notwithstanding’ are helpful in linking two clauses which disagree.

Useful Linking Words Are:

- ***Illustration:*** as shown by, e.g., especially, for example, for instance, in particular, namely, particularly, specifically, such as, that is, to illustrate.

- ***Comparison:*** also, in the same manner, likewise, similarly.

- ***Addition:*** again, and, also, besides, equally important, first (second, etc.), further, furthermore, in addition, in the first place, moreover, next.

- ***Contrast:*** although, and yet, at the same time, but, despite, even though, except, however, in contrast, in spite of, nevertheless, on the contrary, on the other hand, regardless, still, though, unlike, whereas, yet.

- ***Logical Relation:*** accordingly, as a result, because, consequently, for this reason, hence, if, otherwise, since, so, then, therefore, thus.

- ***Temporal Relation:*** after, afterward, as, as long as, as soon as, at last, before, during, earlier, finally, formerly, immediately, later, meanwhile, next, since, shortly, subsequently, then, thereafter, until, when, while.

- ***To Summarize or Conclude:*** in conclusion, in summary, on the whole, that is, therefore, to conclude, to sum up.

24. GRADUATION THESIS CHECKLIST

Assess your Graduation Thesis in the following areas:

- ***Content***
- ***Structure***
- ***Format / Style***

- Is the word length of your Graduation Thesis within the allowable limit?
- Have you checked that the presentation of your Graduation Thesis meets ***"Content, Format, and Style Guidelines" of the GAU School of Pharmacy***?
- Have you received your ***Thesis Supervisor's feedback*** on the final draft?

24.1. CHECKLIST TEMPLATE

Clear Objective and Focus

Thesis is clear
Thesis has point of view
Thesis answers research question
Thesis is original
Thesis has no errors
Purpose of paper is clear
Every paragraph relates to thesis
Every paragraph supports thesis

Organization

Clear introduction, body, conclusion
Connections between paragraphs
Clear, logical order of paragraphs
All sentences connect to each other

Title Page

- Is it brief?
- Is it specific?
- Does it contain key words such as the independent and dependent variable?

Introduction

Catches attention
No too general statements
Enough background information about the topic
Section ideas explained in introduction

Body (Main Text)

Each paragraph has only one point
Meaningful sentences in every paragraph
Topic sentences relate to thesis
No repetition of ideas
No irrelevant ideas or information
Supporting points are in logical order

Acknowledgements

- Have you acknowledged all sources of help?

Table of Contents

- Have you listed all the main sections in sequence?
- Have you included the List of Tables, List of Figures, List of Symbols and Abbreviations, and List of Appendices?

Abstract

- Does it state the research question and hypothesis?
- Is the methodology briefly explained?
- Does it include the main results and conclusions?

Introduction and Literature Review
(Why was the study undertaken? What question was studied?)

- Does it state the problem/issue?
- Does it mention relevant literature and what is already known about the research problem (a brief background)?
- Have you cited this literature?
- Does it include the purpose of the experiment?
- Does it state what your expectations of the outcomes are and what alternatives you might expect (hypothesis)?

Methodology, Materials and Methods
(How was the problem studied?)

- Have you stated equipment, facilities, chemicals used and data collection tools and survey instruments utilized?
- Have you included the statistics and statistical analysis of data?
- Have you given detailed information for someone to repeat your study?

Results
(What were the findings?)

- Are all of the relevant results included?
- Have you statistically analysed the data?
- Have you included data in the form of Tables, Figures, Graphs etc?
- Do the Tables, Figures and Graphs have an explanatory Caption (Title)?
- Are your Tables, Figures, and Graphs clear and simple?
- Do they relate closely to the text?

Discussion
(What do these findings mean?)

- Have you identified key issues?
- Have you commented on how the results met with your expectations?
- Have you interpreted the results i.e. trends, cause and effect?
- Have you suggested explanations for your findings?
- Have you cited the literature that support your results?
- Have you explained your interpretation with the literature?
- Do your own results or the results of others support your interpretation?
- Are there errors in your results?
- What effect do these errors have on your data?
- Have you stated real world applications of your results?

Conclusion and Recommendation(s)

- Have you avoided any new information?
- Have you drawn together all of your main ideas?
- Are any recommendations clear and concise?

References (Literature, Bibliography)

- Are your references evidence-based?
- Have you listed all references alphabetically?

Appendices

- Have you only included supporting information?

25. PROOFREADING (CHECKING FOR MISTAKES)

Careful proofreading for grammar, punctuation, spelling and general consistency is essential.

Check the spelling of all words in your Graduation Thesis, including those in your bibliography, using a good ***spelling checker***.

Do not rely on the spelling checker to pick up errors.

It is also a good idea to have someone else read through your work to pick up any mistakes that you may have overlooked.

26. GRADUATION THESIS SUBMISSION AND RESUBMISSION

Submission

Three hard copies of the dissertation, written in the approved manner, together with ***a copy on CD-Rom (using MS Word format)*** should be submitted to the Dean's Office of the GAU School of Pharmacy.

The Graduation Thesis submission deadline will be strictly observed.

One of the learning aims of the Graduation Thesis is to demonstrate the ability to manage a complex piece of scientific work within the available time frame.

The Graduation Thesis can be submitted earlier.

Resubmission

In case of an initial fail, the extent of improvements that will be allowed for resubmission are ***minor editorial corrections*** to the dissertation.

- **Minor Editorial Corrections**

Minor corrections of English, spelling, statistical errors, incomplete list of references, poorly justified or described methodology, some reorganising of materials in the literature review, or results or findings fall under this heading.

Where a dissertation has ***major deficiencies*** then no further revisions will be permitted.

- **Major Deficiencies**

This may reflect a literature review limited by the extent and/or the quality of materials, inappropriate or inadequate research design, substantially inaccurate or inadequate data analysis, and lack of conclusions and understanding.