ATME College of Engineering

Department of EEE
Emitting Elite Energy

RESEARCH METHODOLOGY & INTELLECTUAL PROPERTY RIGHTS

Course Code: **BMRK557**

Teaching Hours/Week (L:T:P: S) :2:2:0:0

Total Hours of Pedagogy : 50

Credits :03

CIE Marks :50

SEE Marks :50

Total Marks :100

Exam Hours :03

Course Objectives:

CO1. To Understand the knowledge on basics of research and its types.

CO2. To Learn the concept of Literature Review, Technical Reading, Attributions and Citations.

CO3. To learn Ethics in Engineering Research.

CO4. To Discuss the concepts of Intellectual Property Rights in engineering.

Module-1 (5 Hours)

Introduction: Meaning of Research, Objectives of Engineering Research, and Motivation in Engineering Research, Types of Engineering Research, Finding and Solving a Worthwhile Problem.

Ethics in Engineering Research, Ethics in Engineering Research Practice, Types of Research Misconduct, Ethical Issues Related to Authorship.

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Module-2(5 Hours)

Literature Review and Technical Reading, New and Existing Knowledge, Analysis and Synthesis of Prior Art Bibliographic Databases, Web of Science, Google and Google Scholar, Effective Search: The Way Forward Introduction to Technical Reading Conceptualizing Research, Critical and Creative Reading, Taking Notes While Reading, Reading Mathematics and Algorithms, Reading a Datasheet.

Attributions and Citations: Giving Credit Wherever Due, Citations: Functions and Attributes, Impact of Title and Keywords on Citations, Knowledge Flow through Citation, Citing Datasets, Styles for Citations, Acknowledgments and Attributions, What Should Be Acknowledged, Acknowledgments in, Books Dissertations, Dedication or Acknowledgments.

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Module-3(5 Hours)

Introduction To Intellectual Property: Role of IP in the Economic and Cultural Development of the Society, IP Governance, IP as a Global Indicator of Innovation, Origin of IP History of IP in India. Major Amendments in IP Laws and Acts in India.

Patents: Conditions for Obtaining a Patent Protection, To Patent or Not to Patent an Invention. Rights Associated with Patents. Enforcement of Patent Rights. Inventions Eligible for Patenting. Non-Patentable Matters. Patent Infringements. Avoid Public Disclosure of an Invention before Patenting.

Process of Patenting. Prior Art Search. Choice of Application to be Filed. Patent Application Forms. Jurisdiction of Filing Patent Application. Publication. Pre-grant Opposition. Examination. Grant of a Patent. Validity of Patent Protection. Post-grant Opposition. Commercialization of a Patent. Need for a Patent Attorney/Agent. Can a Worldwide Patent be Obtained. Do I Need First to File a Patent in India. Patent Related Forms. Fee Structure. Types of Patent Applications. Commonly Used Terms in Patenting. National Bodies Dealing with Patent Affairs. Utility Models.

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Module-4(5 Hours)

Copyrights and Related Rights: Classes of Copyrights. Criteria for Copyright. Ownership of Copyright. Copyrights of the Author. Copyright Infringements. Copyright Infringement is a Criminal Offence. Copyright Infringement is a Cognizable Offence. Fair Use Doctrine. Copyrights and Internet. Non-Copyright Work. Copyright Registration. Judicial Powers of the Registrar of Copyrights. Fee Structure. Copyright Symbol. Validity of Copyright. Copyright Profile of India. Copyright and the word 'Publish'. Transfer of Copyrights to a Publisher. Copyrights and the Word 'Adaptation'. Copyrights and the Word 'Indian Work'. Joint Authorship. Copyright Society. Copyright Board. Copyright Enforcement Advisory Council (CEAC). International Copyright Agreements, Conventions and Treaties. Interesting Copyrights Cases.

Trademarks: Eligibility Criteria. Who Can Apply for a Trademark. Acts and Laws. Designation of Trademark Symbols. Classification of Trademarks. Registration of a Trademark is Not Compulsory. Validity of Trademark. Types of Trademark Registered in India. Trademark Registry. Process for Trademarks Registration. Prior Art Search. Famous Case Law: Coca-Cola Company vs. Bisleri International Pvt. Ltd.

Module-5(5 Hours)

Industrial Designs: Eligibility Criteria. Acts and Laws to Govern Industrial Designs. Design Rights. Enforcement of Design Rights. Non-Protectable Industrial Designs India. Protection Term. Procedure for Registration of Industrial Designs. Prior Art Search. Application for Registration. Duration of the Registration of a Design. Importance of Design Registration. Cancellation of the Registered Design. Application Forms. Classification of Industrial Designs. Designs Registration Trend in India. International Treaties. Famous Case Law: Apple Inc. vs. Samsung Electronics Co.

Geographical Indications: Acts, Laws and Rules Pertaining to GI. Ownership of GI. Rights Granted to the Holders. Registered GI in India. Identification of Registered GI. Classes of GI. Non-Registerable GI. Protection of GI. Collective or Certification Marks. Enforcement of GI Rights. Procedure for GI Registration Documents Required for GI Registration. GI Ecosystem in India.

Case Studies on Patents. Case study of Curcuma (Turmeric) Patent, Case study of Neem Patent, Case study of Basmati patent. IP Organizations In India. Schemes and Programmes

Continuous Internal Evaluation:

Three Unit Tests each of 20 Marks (duration 01 hour)

1. First test at the end of 5th week of the semester
2. Second test at the end of the 10 th week of the semester
3. Third test at the end of the 15 th week of the semester

Two assignments each of 10 Marks

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be scaled down to 50 marks (to have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the Outcome defined for the course.

Semester End Examination

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (duration 03 hours)

1. The question paper will be set for 100 marks. Marks scored shall be proportionally reduced to 50 marks

2. The question paper will have ten questions. Each question is set for 20 marks.

3. There will be 2 questions from each module. Each of the two questions is under a module (with a maximum of 2 sub-questions).

4. The students have to answer 5 full questions, selecting one full question from each module.

Marks scored by the students will be proportionally scaled down to 50 marks

Suggested Learning Resources:

Textbook

1. Dipankar Deb • Rajeeb Dey, Valentina E. Balas “Engineering Research Methodology”, ISSN 1868- 4394 ISSN 1868-4408 (electronic), Intelligent Systems Reference Library, ISBN 978-981-13- 2946-3 ISBN 978-981-13-2947-0 (eBook), https://doi.org/10.1007/978-981-13-2947-0

2. Intellectual Property A Primer for Academia by Prof. Rupinder Tewari Ms. Mamta Bhardwa

Reference Book:

1. David V. Thiel “Research Methods for Engineers” Cambridge University Press, 978-1-107-03488- 4

2. Intellectual Property Rights by N.K.Acharya Asia Law House 6th Edition. ISBN: 978-93-81849-30-9

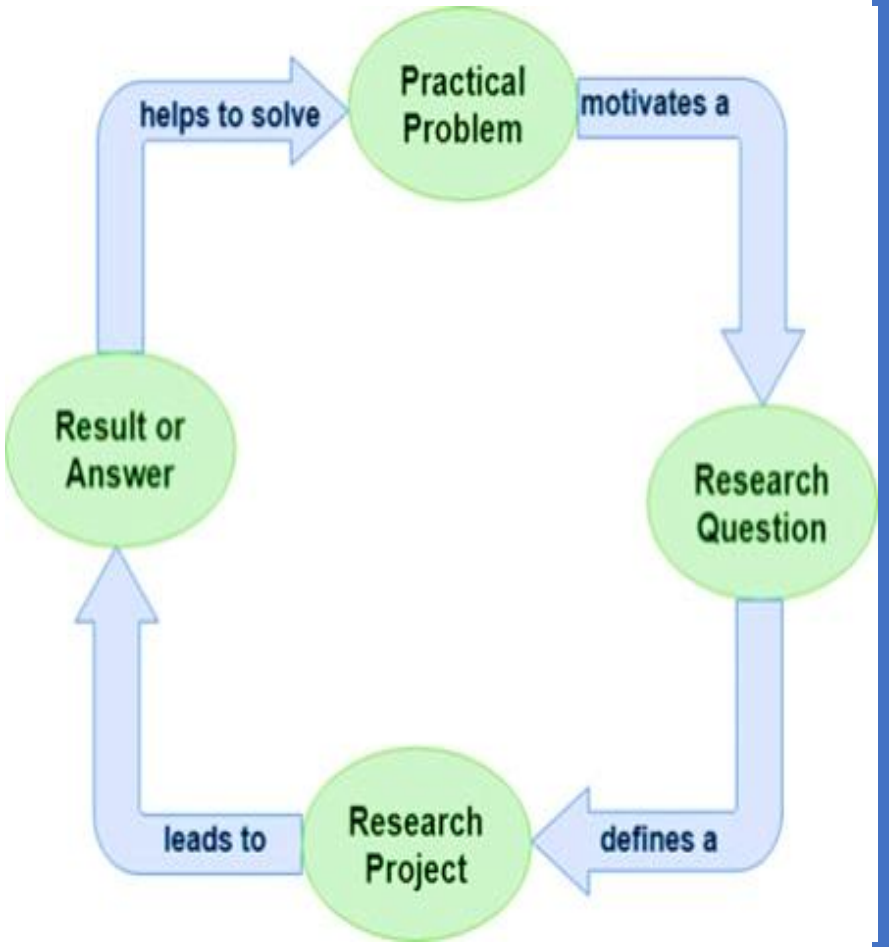
Introduction: What Is Research?

- Research refers to a careful, well-defined (or redefined), objective, and systematic method of search for knowledge.
- Formulation of a theory that is driven by inquisitiveness for that which is unknown and useful on a particular aspect so as to make an original contribution to expand the existing knowledge base.
- Research involves:

1. Formulation of hypothesis (Assumption) or proposition of solutions, data analysis, and deductions and ascertaining whether the conclusions fit the hypothesis.
2. Research is a process of creating, or formulating knowledge that does not yet exist.

The Research Cycle

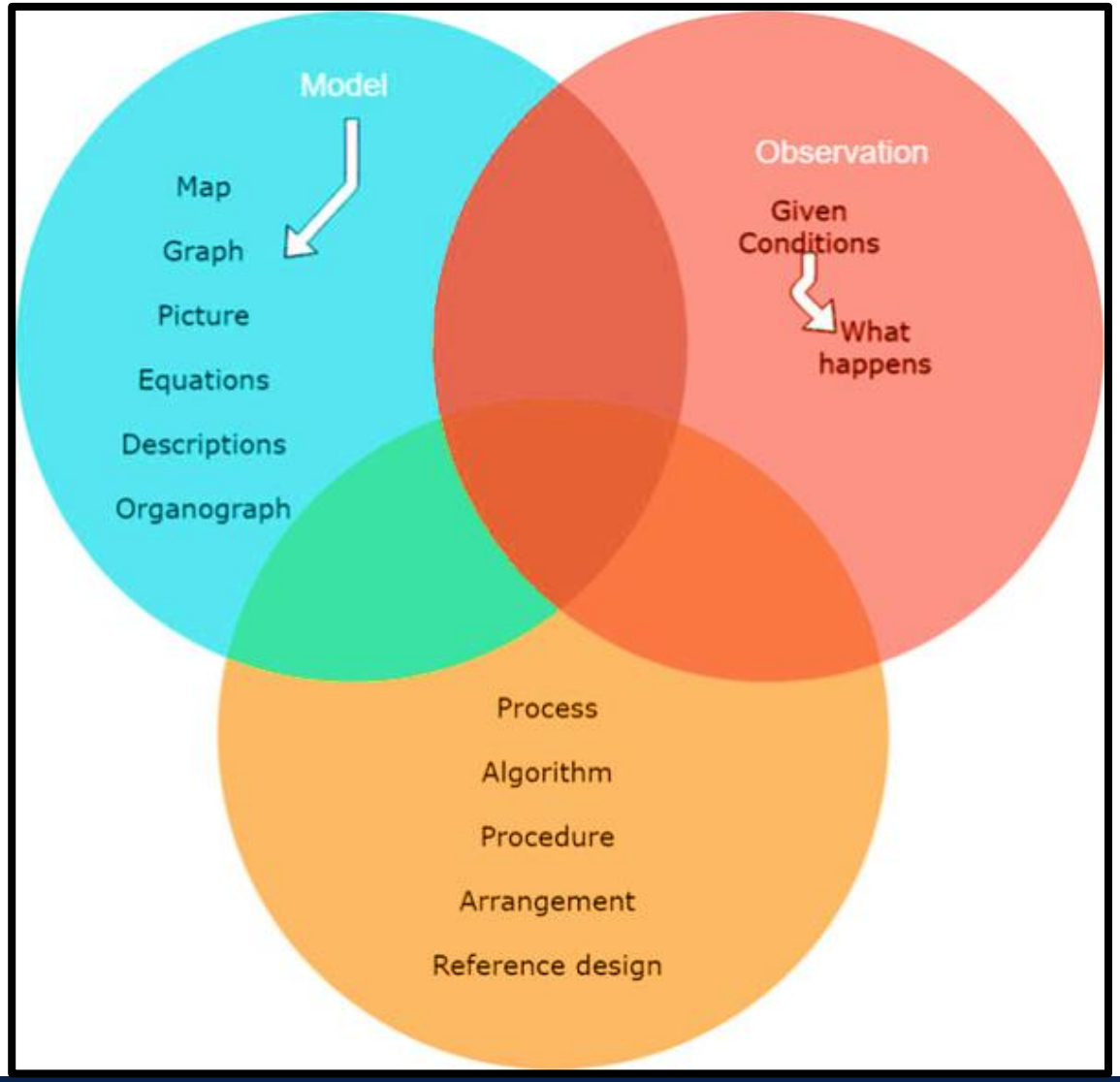
- Research cycle starts with basically a practical problem: one must be clear what the problem being attempted to solve is and why it is important.
- This problem motivates a research question without which one can tend to get lost in a giant swamp of information.
- In turn research question defines a research project which is an activity or set of activities that ultimately leads to result or answer, which in turn helps to solve the practical problem that one started with in the first place as shown in Fig.



** Research is not just about reading a lot of books and gathering a lot of existing information instead adding, maybe small and specific, yet original, contribution to existing knowledge*

Three Categories of knowledge in Research

1. Observation is the most fundamental way of obtaining information from a source and significant in itself.
2. Models are simplified ways of describing very complex interactions in the form of a statistical relationship.
3. The final category is a way of arranging or doing things through processes, algorithms, procedures, arrangements, or reference designs, to get a certain desired result.

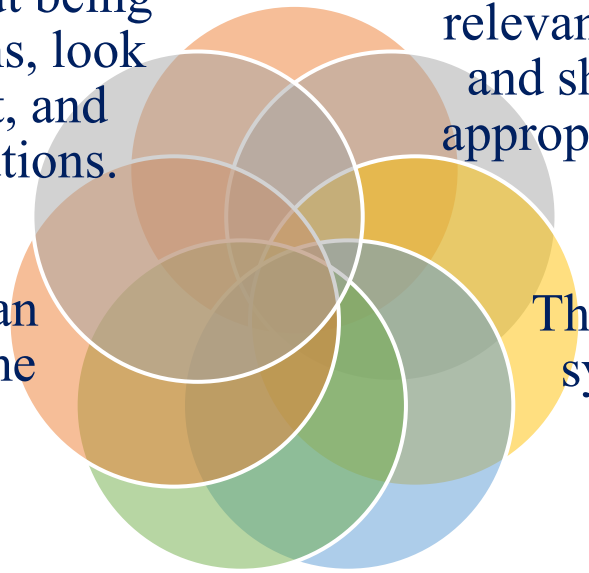


What is the importance of research and how is it done well?

Research aims at contributing to knowledge.

Research is not just about following steps. It's about being able to ask new questions, look at things in a new light, and come up with new solutions.

Research questions should be relevant to the world we live in and should be answered with appropriate time and resources.



Research should be used to create new knowledge that can be written or recorded in some way.

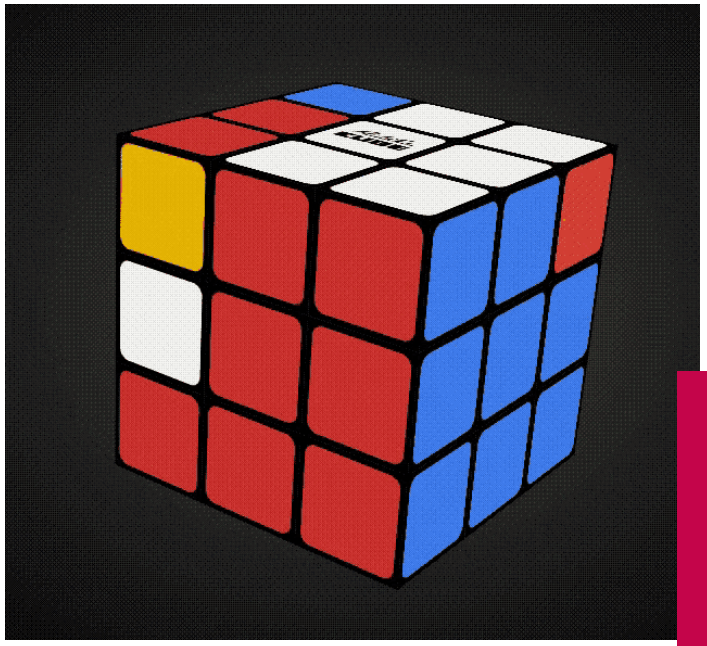
The investigation must be systematic and precise.

Qualitative research questions change throughout the project and can be modified as needed.

The purpose of research is to understand something or solve a problem.

Objectives of Engineering Research

1. **Problem Solving:** The primary objective of engineering research is to address novel and significant problems. Researchers embark on projects with the intention of finding solutions to challenges that are not well-understood or have not been adequately addressed before.



Objectives of Engineering Research

2. Innovation and Discovery: Through circumstantial evidence, intuition, and imagination, researchers make informed guesses about potential conclusions. The aim is to innovate and discover new theoretical or applied knowledge, pushing the boundaries of understanding within the engineering field.

3. Thorough Investigation and Information Utilization: A crucial aspect of engineering research is the ability to conduct thorough investigations and effectively use various types of information. This includes exploring engineering guidelines, standards, and best practices to avoid failures and ensure successful outcomes in both academic and professional settings.

Objectives of Engineering Research

4. **Types of Research Studies**: Engineering research should encompass different types of research studies, such as exploratory or formulative, descriptive, diagnostic, and hypothesis-testing. Each study type is suited to specific approaches, contributing to a comprehensive understanding of the researched area.

5. **Adaptive Objectives and Continuous Contribution**: The objectives of engineering research should be framed flexibly. If the initially desired results are not achievable, the researcher should aim to understand why and contribute valuable insights to ongoing research. This adaptive approach ensures that even failures or negative results contribute to the broader understanding of the problem, fostering continuous progress in the field.

Motivation in Engineering Research

Motivation in Engineering Research

1. Intrinsic motivations like interest, challenge, learning, meaning, purpose, are linked to strong creative performance
2. Extrinsic motivations like rewards for good work include money, fame, awards, praise, and status are very strong motivators, but may block creativity. For example: Research outcome may enable obtaining a patent which is a good way to become rich and famous.
3. Influences from others like competition, collaboration, commitment, and encouragement are also motivating factors in research. For example: my friends are all doing research and so should I, or, a person that I dislike is doing well and I want to do better.
4. Personal motivations in solving unsolved problems, intellectual joy, service to community, and respectability are all driving factors.

Types of Engineering Research

(i) Descriptive versus Analytical

(ii) Applied versus Fundamental

(iii) Quantitative versus Qualitative

(i) Descriptive versus Analytical

Descriptive Research:

Descriptive research focuses on describing a situation or phenomenon without manipulating variables. It aims to provide a snapshot of the current state.

Analytical Research:

Analytical research goes a step further, analyzing existing data to uncover patterns, relationships, or reasons behind observed phenomena.

(ii) Applied versus Fundamental

Applied Research:

Applied research seeks to solve practical problems or address real-world issues. Its goal is to provide solutions and is often more focused on immediate, practical applications.

Fundamental Research:

Fundamental research, on the other hand, is driven by a curiosity to expand knowledge. It doesn't necessarily have an immediate practical application and often explores theoretical concepts.

(iii) Quantitative versus Qualitative

Quantitative Research:

Quantitative research involves the collection and analysis of numerical data. It is focused on measurable variables to establish patterns or relationships.

Qualitative Research:

Qualitative research deals with non-numerical data, often using methods like interviews or observations to explore underlying meanings, attitudes, or perspectives.

Finding and Solving a Worthwhile Problem

Finding a Problem

1. **Identifying a Research Problem:**
   Research students often need to find research problems, either suggested by supervisors or through literature review and theory exploration.
2. **Literature Survey:**
   Conducting a thorough literature survey is crucial to ensure the chosen problem is significant and hasn't been extensively addressed. This step helps acquire essential skills.
3. **Ideas Related to Research:**
   Most of the time, inspiration strikes before extensive reading, perhaps triggered by a conversation on a different subject. These initial ideas can be valuable.
4. **Qualities of a Good Problem:**
   A good research problem is surprising, awaited by the field, simplifies a theory, introduces a new result, or improves existing practices. It must be worth the researcher's time and effort.
5. **Not All Problems Are Equal:**
   Acknowledging that not every problem will be groundbreaking, but solving smaller problems contributes to broader discoveries. Even tackling famously difficult problems can lead to valuable insights.

Finding and Solving a Worthwhile Problem

George Polya (1887–1985) suggested a 4-step procedure for mathematical problem-solving, which is relevant to engineering researchers as well.

The recommended steps to solve a research problem are

(i) Understand the problem, restate it as if its your own, visualize the problem by drawing figures, and determine if something more is needed.

(ii) One must start somewhere and systematically explore possible strategies to

solve the problem or a simpler version of it while looking for patterns.

Finding and Solving a Worthwhile Problem

iii) Execute the plan to see if it works, and if it does not then start over with another approach. Having delved into the problem and returned to it multiple times, one might have a flash of insight or a new idea to solve the problem.

iv) Looking back and reflecting helps in understanding and assimilating the strategy, and is a sort of investment into the future.

Steps to solve a problem

- **Understand it**

Make sure we really get what the problem is about, even try drawing it out

- **Start somewhere-**

Begin by exploring different ways to solve the problem or a simple version of it

- **Try it out-**

Put our plan into action and see if it's works, if not don't worry we can try a different approach sometimes taken breaks and coming back to it can give us new ideas

- **Reflect**

After working on a problem look back and think about what we have learnt this helps us understanding things better and preparations for the future research

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Ethics in Engineering Research

The ethical considerations in research, especially regarding authorship and credit allocation, are crucial. Here are some key points based on the information provided:

1. *Ethical Norms and Interpretation:* Ethics define what is acceptable or unacceptable behavior. While many shared norms exist, interpretation and application can vary among individuals or groups.
2. *Ethics and Laws:* Though ethics and laws are distinct, they often align as laws commonly reflect societal ethics. Ethical principles can guide the creation, interpretation, and evaluation of laws.
3. *Research Ethics:* International standards for ethical research conduct have evolved since the Nuremberg Code in 1947. Authorship and credit issues have a deep-rooted history, notably seen in the establishment of the British Royal Society in the 17th century.
4. *Authorship in Research:* Determining who should be included as an author and the sequence of authorship are essential ethical considerations. Modern challenges include defining contributions in an increasingly collaborative research landscape and addressing the role of individuals involved in the research but not the drafting phase.
5. *University Regulations:* Some institutions now impose restrictions on coauthorship to prevent ethical breaches, such as crediting individuals who did not contribute substantially.

5.1 Ethics in Engineering Research Practice

"Ethics in engineering research involves making responsible decisions due to the impact of technological advancements on people.

For example, when using data in engineering research, privacy and surveillance concerns arise. It's crucial for engineering researchers to consider ethical implications since certain practices, while acceptable to some, may be invalid to others. With abundant data access, ethical guidelines help decide what actions are appropriate. Engineering ethics act as a guidebook, helping decide what should and shouldn't be done with available data.

Engineers' choices significantly affect technology:

1. *Setting Ethical Requirements:* Defining ethical standards shapes the technology's impact.
2. *Design Influence:* Ethical aspects guide prioritizing requirements during the blueprint stage.
3. *Choosing Alternatives:* Engineers must select options mindful of unintended side effects.

Engineers have an ethical responsibility to minimize risks in research outcomes. They aim for inherently safe designs, incorporating safety measures and backup systems to mitigate potential hazards if primary methods fail."

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5.2 Types of Research Misconduct

"Research integrity in engineering involves maintaining fairness, honesty, and safety in the research process. Types of research misconduct include fabrication (creating false data), falsification (misrepresenting or altering data), and plagiarism (using others' work without credit).

1. *Fabrication:* Creating false data due to time pressures or expectations.
2. *Falsification:* Misrepresenting or altering data to support a desired hypothesis.
3. *Plagiarism:* Using others' work without attribution, including verbatim copying or self-plagiarism.

Misconduct damages trust, leads to false data in literature, incurs costs, and delays progress. Detecting plagiarism can happen through original authors, reviewers, or readers. Automated software detects similarities but doesn't guarantee absence of plagiarism.

Ethical research involves citing sources, avoiding verbatim copying, and differentiating original ideas from existing sources. Serious deviations or simultaneous submissions are also considered misconduct. Ethical violations eventually come to light."

How are supervisors, reviewers or editors alerted to plagiarism?

(i) Original author comes to know and informs everyone concerned.

(ii) Sometimes a reviewer finds out about it during the review process.

(iii) Or, readers who come across the article or book, while doing research.

5.3 Ethical Issues Related to Authorship

- Authorship in academic research holds significant value, determining credibility and recognition. Ethical issues related to authorship include 'guest' or 'gift' authorship (adding authors with minimal contribution), career-boost authorship (dubiously adding authors for professional gain), and career-preservation authorship (including administrators for favourable relations).
- Ghost co-authorship involves undisclosed contributors, while reciprocal gestures without genuine collaboration misrepresent authorship. Proper acknowledgment of contributions is crucial. All authors share equal responsibility for the content and should be informed of submissions. However, holding coauthors accountable for misconduct isn't straightforward.
- Double submission, submitting the same paper to multiple journals simultaneously, is ethically problematic. Reputed journals seek original work and strongly discourage this practice to maintain publication integrity."

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Thank You