BRMK557

Research Methodology & Intellectual Property Rights

Contents

Module 1 Introduction

Syllabus

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, and Ethical Issues Related to Authorship **Textbook :**

1.1 Meaning of Research:

1.1.1 What is Research? :

Research refers to a careful, well-defined (or redefined), objective, and systematic method of search for knowledge or 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 can be defined as the search for knowledge or as any systematic investigation to establish facts. Research is like a careful and organized journey to find new informa- tion or create new knowledge. It involves setting a clear goal, asking questions, forming hypotheses (educated guesses), analyzing data, and making sure your conclusions match your initial ideas.

Example: Imagine you are curious about why plants in your garden grow differently. Your research could involve observing, making guesses (hypotheses), collecting data about sunlight, soil, and water, and then figuring out why plants grow differently.

1.1.2 Starting a Research Cycle:

The research process (or research cycle) basically begins with a **practical problem** or an existing gap in knowledge or practice. This could be a practical challenge, an unanswered question, or an area that needs improvement.

Once the problem is identified, researchers formulate a clear and concise problem state- ment. From the formulated problem statement, researchers then develop specific research questions. Building on the **research questions**, researchers set clear objectives for the study. Objectives outline what the research aims to achieve and contribute to solving the identified problem. They serve as a roadmap for the **research project**.

Based on the research questions and objectives, researchers design a methodology to gather relevant data and conduct the investigation. This may involve selecting research methods, data collection techniques, and analytical tools suitable for addressing the re- search questions. Researchers collect data according to the defined methodology.

This data is then analyzed to derive meaningful insights and **results or answers** to the research questions. The results of the analysis are interpreted in the context of the research questions and objectives. The final step involves translating research findings into practical implications. This helps to solve the practical problem that one started with in the first place, as shown in the following figure.
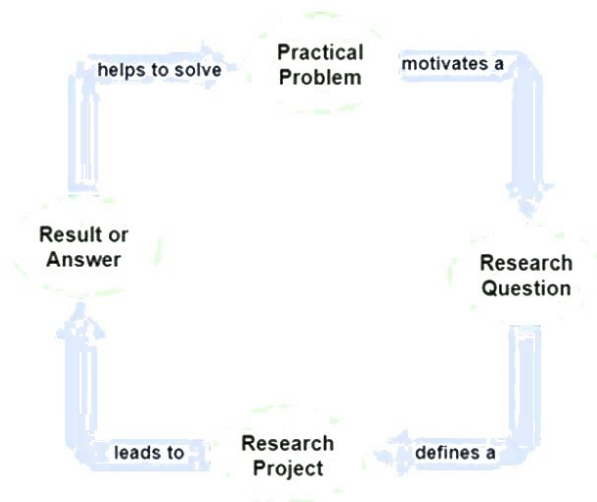
Example: If you notice your plants are not growing well, the problem is the poor plant growth. Your research question might be, "What factors affect plant growth in my garden?"

1.1.3 Building Background:

The building up of background for doing good research includes connecting different areas or different pieces of knowledge. The purpose is to prepare the mind for active work. as opposed to becoming a repository or an encyclopedia. Research is not just about reading a lot of books and gathering a lot of existing information. It is about adding our own ideas to what we already know. It involves critical thinking, analysis, and the generation of new insights. Research is about asking questions that matter in the real world and then finding answers through a careful and organized approach. It involves systematically exploring, investigating, and understanding topics that are relevant to our lives.

The purpose is to prepare the mind for active work as opposed to becoming a repository or an encyclopedia. Research is not just about reading or gathering a lot of existing information. It is instead adding, maybe small and specific, yet original, contribution to that existing body of knowledge.

Example: Before fixing your garden, you might learn about soil types, sunlight needs, and plant nutrition. Instead of just gathering facts(existing information), you aim to contribute something new and specific.

1.1.4   Ways of Developing Knowledge:

The ways of developing and accessing knowledge come in three, somewhat overlapping, broad categories. They are observation (seeing things), models (simplified descriptions or equations), and processes (methods or designs).
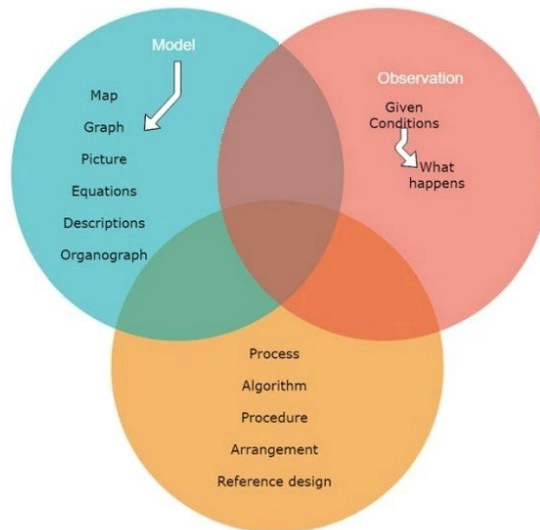
(i) Observation: Observation is described as the most fundamental way to gather information. It becomes particularly important when the subject being observed is unusual, exciting, or challenging to study. Observation can take various forms, ranging from traditional measurements in a laboratory setting to conducting surveys among a group of subjects.

(ii) Models :   After making observations, the collected data often needs to undergo some form of processing, which leads to the second category of knowledge, which is the "model". **Models** are described as approximated and simplified representations in the form of a statistical relationship, a figure, or a set of mathematical equations. Models help us understand and interpret observed phenomena more abstractly, providing a way to analyze and make sense of the data.

(iii) Processes and Algorithms: The final category involves methods for organizing and doing things to achieve a specific result. This category includes processes, algorithms, procedures, arrangements, or reference designs.

Example 1: In gardening research, observation involves directly watching and recording

how plants respond to sunlight. This may include noting changes in leaf color, growth patterns, or flowering times. For instance, you might observe that certain plants thrive in direct sunlight, while others prefer shaded areas.These direct observations form the foundation of your understanding of the plants' behavior in different light conditions. You might create a simple model to predict growth based on sunlight hours. This could involve developing a simple equation or chart that correlates the number of sunlight hours with plant growth. For example, your model might suggest that plants receiving more sunlight tend to grow taller or produce more flowers. The model serves as a tool to generalize and make predictions about how plants are likely to respond to varying sunlight conditions. Finally, you develop a process (a watering schedule) to achieve the desired plant growth. Your process could involve adjusting the frequency and amount of water based on the observed sunlight levels. This systematic approach ensures that your gardening efforts are aligned with the knowledge gained from observation and modeling, ultimately aiming for the desired plant growth.

Example 2 : Let us consider an example related to the development of a smartphone:

Engineers observe user interactions with existing smartphones, studying how people use different features, how they hold the device, and identifying common issues such as battery life and durability concerns. This observation helps engineers understand user behavior and preferences, as well as identify potential problems or areas for improvement.

Based on the observed data, engineers create models to simulate the behavior of various smartphone components. These models help predict factors like power consumption, sig- nal strength, and heat dissipation, influencing design choices.

Engineers follow a detailed development process for manufacturing the smartphone. This involves procedures for designing the circuit board, arranging hardware components such as the battery, processor, camera, and sensors within the device, implementing algorithms for software functionalities, and adhering to reference designs to ensure compatibility with industry standards.

1.1.5 Good Research :

Good research involves a systematic approach to collecting and analyzing information. Good research includes systematically collecting and analyzing information. It goes beyond existing knowledge, attempting to add valuable discoveries. The research journey in engineering typically starts with a broad research area (e.g., computer science and engineering) and narrows down to a specific topic (e.g., machine learning algorithms for image recognition), ultimately focusing on a well-defined problem (e.g., enhancing accuracy in image recognition systems). This progression from area to topic to problem showcases the gradual refinement of research focus.

Example: In gardening research, after applying your watering schedule, you analyze plant growth data. If you discover a new and effective way to make plants thrive, you have made an important discovery.

1.1.6 Engineering Research:

In engineering, research involves recognizing, planning, designing, and executing investigations to improve knowledge and skills.

Engineering research is the process of developing perspectives and seeking improvements in knowledge and skills to enable the recognition, planning, design, and execution of research in a wide range of forms relevant for engineering and technology investigations and developments. In other words, engineering research is a systematic and disciplined process aimed at discovering new knowledge or improving existing knowledge in the field of engineering.

Example: If you are an engineer wondering why a machine works a certain way, your research might involve studying its parts, creating models to understand interactions, and eventually suggesting ways to make it work better.

1.2   Objectives of Engineering Research

The primary goal of engineering research is to address new and significant problems. While the ultimate conclusion is unknown at the start, the process begins with educated guesses based on circumstantial evidence, intuition, and imagination. A guess gives a target to work toward. and after initial attempts, it may turn out that the guess is incorrect.

Engineering research serves various important objectives, contributing to the advancement of knowledge, technology, and societal well-being. Some key objectives of engineering research include the following:

(i) **Innovation and Advancement:** Engineering research aims to push the boundaries of current knowledge and technology. By exploring new ideas, concepts, and methodologies, researchers seek to innovate and advance the field, leading to the development of new technologies and solutions.

(ii) **Problem Solving:** Engineering research often focuses on solving real-world problems. Researchers aim to address challenges and issues faced by industries, communities, or individuals, seeking practical and effective solutions through the application of engineering principles.

(iii) **Optimization:** Research in engineering aims to optimize existing processes, systems, and products. This involves improving efficiency, reducing costs, enhancing performance, and minimizing environmental impacts.

(iv) **Knowledge Expansion:** One of the primary objectives of research is to expand the body of knowledge in engineering. Through experimentation, analysis, and documentation, researchers contribute to the understanding of fundamental principles and phenomena in various engineering disciplines.

(v) **Interdisciplinary Collaboration:** Many engineering challenges require a multi-disciplinary approach. Research objectives may involve collaboration between engineers, scientists, and professionals from other fields to address complex problems that span multiple domains.

(vi) **Education and Training:** Engineering research contributes to the education and training of future engineers and scientists. The dissemination of research findings through publications, conferences, and other channels helps educate the next generation of professionals.

(vii) **Technological Transfer:** Research often leads to the development of new technologies and methodologies. The objective is not only to create knowledge but also to transfer this knowledge to industry, enabling the practical application of research findings for the benefit of society.

(viii) **Societal Impact:** Many engineering research projects are driven by a desire to have a positive impact on society. This could involve improving infrastructure, addressing environmental issues, enhancing healthcare technologies, or promoting sustainable practices.

(ix) **Quality and Safety Improvement:** Engineering research aims to enhance the quality and safety of products, processes, and systems. This is particularly important in fields such as aerospace, healthcare, and transportation, where safety standards are crucial.

(x) **Global Challenges:** Engineering research often addresses global challenges such as climate change, resource scarcity, and public health issues. The objective is to contribute to solutions that can have a positive impact on a global scale.

1.3 Motivation in Engineering Research

Motivation in engineering research plays an important role in driving researchers to ex- plore new frontiers, address challenges, and contribute to the advancement of knowledge and technology. Motivations can broadly be categorized into intrinsic, extrinsic, and sometimes a blend of both. The combination of both intrinsic and extrinsic motivators can shape the overall motivation of individuals engaging in engineering research. The possible motives may be the result of one or more of the following desires:

1.3.1 Intrinsic Motivations

Intrinsic motivations refer to the internal factors that drive a person to engage in an activity,

(i) **Curiosity and Intellectual Interest:** Many researchers are motivated by a natural curiosity and a genuine interest in understanding how things work. Studies have shown that intrinsic motivations like interest, challenge, learning, Meaning and

purpose are linked to strong creative performance.

Example: An engineer may be naturally curious about the functioning of renewable energy systems. This curiosity drives him to explore innovative approaches to harnessing solar energy, leading to research in the development of more efficient solar panels.

(ii) **Personal Fulfillment:** For some researchers, the pursuit of knowledge and the satisfaction of contributing to the greater body of human understanding are personally fulfilling. The intrinsic rewards of research, such as personal growth and a sense of accomplishment, can be powerful motivators. Personal motivation for solving unsolved problems, intellectual joy, service to the community, and respectability are all driving factors.

Example: An environmental engineer driven by a sense of purpose to address pollution may engage in research on innovative waste management solutions. The meaningful impact on the environment serves as a driving force.

(iii) **Passion for Technology:** Individuals with a genuine passion for engineering and technology may find motivation in the joy of working with and contributing to the development of advanced technologies.

Example: An engineer with a deep passion for robotics may initiate research to enhance the capabilities of autonomous robots. The joy and satisfaction derived from contributing to the field of robotics serve as intrinsic motivators.

1.3.2 Extrinsic Motivations

(i) **Career Development:** Engaging in research can contribute to career advancement in academia, industry, or both. Researchers may be motivated by the desire to establish themselves as experts in their field, gain recognition, and open up new opportunities for professional growth. Extrinsic motivating factors like rewards for good work, such as money, fame, awards, praise, and status, are very strong moti- vators but may block creativity.

Example: Research outcomes may enable a researcher to obtain a patent, which is

a good way to become rich and famous, opening up opportunities for career growth
and recognition.

(ii) **Competitive Drive:**The desire to be at the forefront of a field or to compete with
other researchers and institutions can drive motivation. The pursuit of excellence
and the aspiration to be recognized for outstanding contributions can be strong
motivating factors.

(iii) **Influences from others:** Influences from others, like 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, be doing well and I want to do better.

1.3.3   Mix of Extrinsic and Intrinsic Motivations

The following factors would be a mix of extrinsic and intrinsic aspects in
Engineering Motivation:

(i) **Wanting to do better than what has been achieved in the world:** This is an
intrinsic motivation, driven by personal motivation and a desire for self-improvement &
excellence, and a sense of internal fulfillment.

(ii) **Improve the state of the art in technology:** The pursuit of advancing technol-
ogy is typically motivated by an intrinsic interest in innovation, curiosity, and the
internal satisfaction derived from pushing the boundaries of knowledge and capabil-
ity.

(iii) **Contribute to the improvement of society:**This comes under both intrinsic and
extrinsic types of motivation. It arises from an internal sense of purpose and the
desire to make a positive impact on society and address societal challenges. It may
also be influenced by external factors such as recognition, social approval, or a sense
of duty.

(iv) **Fulfillment of the historical legacy in the immediate socio-cultural con-
text:** This is a mixed type of motivation. The fulfillment of a historical legacy
may be driven by intrinsic factors, such as personal meaning and connection to the

historical and cultural context, emphasizing a sense of identity and continuity. Simultaneously, external factors like societal expectations or recognition may also play a role.

(v) **Government directives and funding opportunities:** This represents a mixed type of motivation, influenced by external factors such as government policies and financial incentives. The motivation to align research with targeted areas for funding is primarily driven by external rewards like financial support. Simultaneously, it supports researchers in pursuing projects that align with their personal interests, curiosity, and passion for contributing to knowledge and innovation.

(vi) **Terms of employment:**This represents an extrinsic type of motivation. Terms of employment, including benefits, salary, promotions, or job security, are exter- nal factors that can motivate individuals to engage in specific activities, including engineering research.

1.4   Types of Engineering Research

The different types of research are :

1.4.1   Descriptive versus Analytical:

A **descriptive type** of research aims to describe the characteristics of a phenomenon through fact-finding inquiries to effectively describe the present state of art. It involves observing, recording, and reporting without manipulating variables. Descriptive research can be further classified into comparative (comparing different groups or conditions) and correlational (examining relationships between variables) methods. The researcher holds no control over the variables but rather only reports them as they are. Descriptive research also includes attempts to determine causes, even though the variables cannot be controlled.

On the contrary, **analytical** research involves critically evaluating existing information and analysing it to gain a deeper understanding.

Example: Research Topic: Traffic Congestion in Urban Areas.

The following comparison gives us a clear understanding of how descriptive research aims to provide a comprehensive overview, while analytical research explores the underlying causes and potential solutions.

Descriptive Research:	**Analytical Research:**
Objective: Describe the current state of traffic congestion in a specific urban area.	*Objective:* Analyze the factors contributing to traffic congestion and propose potential solutions.
Methodology: Conduct surveys and collect data on traffic patterns, peak hours, and congestion levels. Use traffic cameras and sensors to gather real-time information. Analyze historical data to identify trends.	*Methodology:* Use statistical methods to identify correlations between variables such as population growth, urban development, and traffic congestion. Analyze the impact of specific interventions or traffic management strategies. Compare the effectiveness of different approaches through modeling and simulation.
Findings: Present a detailed description of the current traffic congestion situation, including statistics on peak congestion times, affected areas, and common causes.	*Findings:* Provide insights into the root causes of traffic congestion and propose analytical solutions. For example, the research may suggest optimizing traffic signal timings, implementing public transportation improvements, or introducing congestion pricing.

1.4.2   Applied versus Fundamental:

Research can either be applied research or fundamental (basic or pure) research.

Applied research is practical and problem-oriented. It is conducted to address specific issues or problems faced by organizations or industries. In Applied research, the goal is to find solutions that can be implemented in real-world situations. Research to identify social or economic trends, or those that find out whether certain communications will be read and understood are examples of applied research. The primary objective of applied research is to determine a solution for compelling problems in actual practice, while basic research is aimed at seeking information which could have a broad base of applications in the medium to long term.

Fundamental Research is also known as basic or pure research. Fundamental research is driven by a desire to expand knowledge and understanding rather than to solve a prac- tical problem. It focuses on concerned with generalizations and formulation of a theory,

contributing to the development of a broader knowledge base. Research concerning natural phenomena or relating to pure mathematics are examples of fundamental research.

Example :

Research Topic: Treatment for a Specific Disease (e.g., Diabetes)

The following comparison demonstrates how engineering research can contribute to the development of practical solutions (Applied Research) and, at the same time, deepen the scientific understanding of the disease at a fundamental level (Fundamental Research).

Applied Research:	**Fundamental Research :**
Objective: Develop a new drug or treatment protocol for managing diabetes in patients.	*Objective:* Investigate the molecular mechanisms underlying insulin resistance in diabetes to deepen our understanding of the disease.
Methodology: Conduct clinical trials with diabetic patients to test the effectiveness and safety of a new drug or treatment approach. Collect data on blood sugar levels, side effects, and overall health outcomes. Analyze the results to determine the practical benefits and risks of the proposed treatment.	*Methodology:* Use molecular biology techniques to study the interactions of insulin with cells and identify the factors contributing to insulin resistance. Explore the genetic and biochemical aspects of diabetes at the cellular level.
Findings: Provide a treatment option that can be immediately applied in clinical settings to improve the management of diabetes.	*Findings:* Contribute to the broader scientific knowledge of the cellular and molecular basis of diabetes. While the immediate application might not be evident, the research lays the foundation for future therapeutic approaches and a deeper understanding of the disease.

1.4.3   Quantitative versus Qualitative:

Quantitative research involves the collection and analysis of numerical data, using sta- tistical observations of a sufficiently large number of representative cases to draw any conclusions. It aims to quantify relationships and patterns, making use of measurable variables. Surveys, experiments, and statistical analyses are common in quantitative re- search.

Qualitative Research focuses on a few non-representative cases or verbal narrative in behavioral studies such as clustering effect in intersections in Transportation engineering to make a proposition. Qualitative methods include interviews, focus groups, observations, and content analysis. It provides in-depth insights into the complexity of human behavior and social phenomena.

Example:

Research Topic: Evaluation of an Online Learning Platform for Engineering Education

The following table effectively illustrates how student satisfaction with a learning platform for engineering education can be approached using both quantitative and qualitative research methods.

Quantitative Research:	Qualitative Research :
Objective : Measure overall satisfaction levels of engineering students using a numerical rating scale.	*Objective :* Explore detailed feedback and experiences of engineering students using open-ended questions.
Methodology : Administer a satisfaction survey with quantifiable rating questions tailored to engineering coursework. Collect numerical data on satisfaction scores. Use statistical analysis to identify trends and overall satisfaction levels specific to engineering education.	*Methodology :* Conduct interviews or open-ended surveys with engineering students to gather qualitative responses. Analyze qualitative data thematically, focusing on aspects relevant to engineering education.
Findings : Provide numerical insights into the average satisfaction level and key trends specific to the engineering learning context.	*Findings* Offer rich, detailed descriptions of engineering student's experiences and capture refined feedback that quantitative measures might miss, shedding light on unique challenges and opportunities in online engineering education.

1.5   Finding and Solving a Worthwhile Problem :

1.5.1   Finding a Research Problem :

A researcher may start with problems stated by the Supervisor or posed by others that are yet to be solved. Alternately, it may involve rethinking basic theories or formulating ideas from provided information or need to be formulated or put together from the information provided in a group of papers suggested by the Supervisor. Research scholars face the task of finding an appropriate problem to begin their research.

1.5.2   Skills Needed:

Skills required for finding a research problem are crucial but often not explicitly taught. Critical thinking about possible implications is important.

1.5.3   Identifying a Problem:

Once the problem is identified, the process of literature survey and technical reading takes place to further ascertain the significance and validity of the intended problem.However, An initial spark is ideally required before the process of literature survey may duly begin. The process may involve an initial spark from an oral presentation by somebody which is followed by asking questions or introspection provides this perspective oral presentation, asking questions, or introspection. Developments in other subjects may produce a tool or a result which has direct implications to the researcher's subject and may lead to problem identification.

1.5.4   Attributes or characteristics of a Worthwhile Research Problem:

Once a potential research problem is identified, the researcher faces the critical task of evaluating its worthiness. A worthwhile research problem possesses one or more attributes, such as being nonintuitive(something that goes against common intuition) or counterin-

tuitive(does not align with what one might naturally expect based on prior knowledge or experience), even to someone familiar with the area. These attributes include:

(i) Addresses a topic that the research community has been anticipating.

(ii) Simplifies a central part of theory.

(iii) Introduces a new result, initiating a new subject or area.

(iv) Offers a novel method or enhancements to existing methods with practical applications.

(v) sometimes, provides a result that stops further work in a particular area.

1.5.5   Decision to Tackle a Problem:

The researcher must be thoroughly convinced that the problem is worthwhile before initiating the investigation. Optimal efforts come when the work is worth doing, and the problem and/or solution has a better chance of being accepted by the research community.

It is essential to recognize that not every solved problem needs to be of great importance or impact. Sometimes major advancements are made through solutions to small problems dealt with effectively. Some problems are universally considered hard and open, and have deep implications and connections to different concepts.

Majority of researchers may not engage with such problems during their careers. How- ever, hard problems get solved only because people take them seriously as challenging problems and **tackle** them with willingness and with determination. Such people have a mindset that embraces complexity and uncertainty in the pursuit of solutions. They approach problems with a mindset that welcomes complexity and uncertainty in the quest for solutions.

Even if the attempt to solve a challenging problem is unsuccessful, there might be partial or side results that can still fulfill the immediate requirement of generating content for the dissertation.

1.5.6 Problem-Solving Methodology: Polya's Approach :

George Pólya (1887–1985) proposed a **4-step procedure** for mathematical problem-solving, which has been found to be applicable to engineering researchers. Recent studies have affirmed the relevance of these recommendations. The suggested steps to solve a research problem are:

1. **Understand :** Understand the problem, Restate the problem in your own words , and visualize the problem by drawing figures, and determine if additional information is needed.

2. **Explore Strategies :** Explore various strategies to solve the problem, systematically. Look for patterns that might lead to a solution.

3. **Implement :** Implement the chosen strategy(plan) to solve the problem, to see if it works. If the plan doesn't work, start over(iterate) with another approach. Having engaged with the problem extensively and revisiting it multiple times, one may develop a new idea to solve the problem.

4. **Reflect :** After completing the problem-solving process, take the time to look back and reflect on the journey. This practice aids in understanding and assimilating the strategy. Such reflective practice serves as an investment in the future for continuous improvements in problem-solving and personal growth.

1.6 Ethics in Engineering Research

Ethics in engineering research is focused on the ethical considerations within the research process. Ethics refers to a set of rules distinguishing acceptable and unacceptable conduct, distinguishing right from wrong. Most people learn such norms in their formative years but moral development continues through different stages of growth. Although ev- eryone recognizes common ethical norms, there can be differences in interpretation and application.

1.6.1 Historical Evolution of Research Ethics:

Nuremberg Code :

International norms for the ethical conduct of research have a deep-rooted history, dating back to the adoption of the **Nuremberg Code** in 1947. The Nuremberg Code, is a set of ethical principles for human experimentation. It originated in response to the Nuremberg Trials, where Nazi doctors were prosecuted for conducting inhumane experiments during World War II. Researchers must obtain informed consent from participants, especially in studies involving human subjects.

Influence of the British Royal Society on Research Credit:

The issues associated with research credit find their roots in the seventeenth-century establishment of the British Royal Society (BRS), which aimed at refining the methods and practices of modern science. BRS played a crucial role in shaping the timing and credit issues related to research results. According to this, priority for publication was given to whoever first submitted findings, rather than focusing on determining who had first made the discovery.

1.6.2 Ethical Considerations in Authorship :

Two simple but significant questions to address the tricky issue of authorship in research are :
(i) who should be included as an author and
(ii) the appropriate order of listing authors.
In today's interconnected world, the issue of coauthorship is very relevant to all re- searchers, challenging the contributions during different phases of research.There are is- sues around individuals may be actively involved in the research process but may not contribute to the drafting phase. Moreover, certain universities have imposed restrictions on coauthorship to prevent malpractices.

1.6.3 Distinguishing Research Ethics and Responsible Conduct of Research in Engineering :

Government bodies, and universities worldwide have adopted certain codes for research ethics. However, there is a common misconception regarding the interchangeable use of two terms: research ethics and responsible conduct of research. Research ethics and the responsible conduct of research are related but not interchangeable. Research ethics looks at the ethical application of research outcomes, while Responsible Conduct of Research addresses the ethical considerations in how the research work is undertaken.

Research Ethics:
Research ethics primarily focuses on the moral principles and guidelines governing the conduct of research. It focuses on ensuring integrity, honesty, and fairness in the research process. Key areas include the treatment of research subjects, confidentiality, data handling, and ethical communication of research outcomes. In essence, research ethics addresses the ethical implications of the research itself.

Responsible Conduct of Research(RCR) :
Responsible Conduct of Research is a broader concept that extends beyond the ethical dimensions of the research itself. It encompasses the entire research process, emphasizing ethical behavior in interactions, collaborations, and the dissemination of results. RCR aims to maintain high standards of integrity and professionalism throughout the research process.

Research Ethics	Responsible Conduct of Research (RCR)
Research ethics involves moral principles governing the conduct of research. For example, in engineering, it ensures the fair treatment of participants in a hu- man subjects study, protection of intel- lectual property, and honest reporting of results.	Responsible Conduct of Research is a broader concept that extends beyond the ethical dimensions of the research it- self. In engineering, this includes main- taining integrity in project management, acknowledging collaborators' contribu- tions, and avoiding the fabrication or fal- sification of data.
Key areas include the treatment of research subjects, confidentiality, data handling, and ethical communication of research outcomes.	RCR aims to maintain high standards of integrity and professionalism through- out the research endeavor. It involves ethical considerations in how the re- search work is undertaken, including in- teractions and collaborations.

Example: Consider a project focused on developing driverless(autonomous) cars. During testing, researchers uncover vulnerabilities that could be exploited for malicious purposes.
Research ethics considerations in this scenario might involve:

(i) What ethical considerations should guide the development of such technology?

(ii) How can the team prevent the misuse of autonomous vehicles for harmful activities?

(iii) Are there ethical guidelines for the responsible development of autonomous systems?

Responsible Conduct of Research Now, consider how the research is carried out. It involves challenges such as:

(i) Are researchers actively engaged in developing safety measures for autonomous cars?

(ii) Do they collaborate with cybersecurity experts to secure the technology?

(iii) How do they communicate potential risks to the public and regulatory bodies?

In this way, research ethics addresses the broader implications and applications of the research outcomes, while the responsible conduct of research focuses on the integrity and methodology of the research process itself.

1.7   Ethics in Engineering Research Practice

Ethics in engineering research practice extends beyond the laboratory or research setting to encompass the ethical challenges faced by engineers in the practical application of their

knowledge and skills.

1.7.1   Ethical Concerns in Technological Developments:

Technological progress in engineering introduces ethical considerations, especially regarding privacy and data in surveillance systems. Engineering researchers bear the responsibility of making ethical decisions, and they are answerable for the consequences arising from their research outcomes.

Data Collection and Privacy

Ethics is crucial in engineering research, especially when working with data, as it directly influences human well-being. For example, Research involving data collection, especially personal or sensitive information, requires respect for individuals' privacy and obtaining informed consent.

Example: A mobile weather app that requests location data for accurate forecasts. Ethical concerns arise if the app shares this data without explicit user consent or uses it for purposes beyond weather predictions.

Acceptability and Validity

Certain practices may be acceptable in specific situations, but the reasons for their unacceptability can be valid. Engineering ethics serves as our rulebook, offering guidance on determining what is ethically acceptable and and what is not, providing a framework for responsible data use.

Example: The use of facial recognition in smartphones for unlocking devices might be acceptable for convenience, but concerns arise if the technology lacks accuracy and wrongly denies access to users based on facial features.

1.7.2   Ethical Decision-Making in Technological Choices

Engineering research is closely interconnected with ongoing technological developments, and researchers make numerous choices that hold ethical significance, influencing the impact of technology in various ways.

Setting Ethical Requirements

At the outset of a project, engineering researchers can shape the effects of the developed technology by establishing ethically sound requirements. This initial step sets the stage for the responsible technological advancements.

Example: Engineers working on smart home devices may set ethical requirements for user privacy, ensuring that devices like voice-activated assistants only record and transmit data when explicitly activated by users.

Influencing Through Design

Influence may also be applied by researchers through design, which is a process that translates the requirements into a blueprint to fulfill those requirements. During the design process, decision is to be made about the priority in importance of the requirements tak- ing ethical aspects into consideration.

Example: In the design of automobiles, engineers may prioritize safety features such as collision avoidance systems and advanced driver assistance. Ethical considerations involve protecting occupants and other road users from potential accidents.

Choosing Alternatives

Throughout the research journey, engineering researchers have to choose between different alternatives fulfilling similar functions, considering their ethical implications.

Example: When developing packaging materials, engineers might choose between tra- ditional plastics and biodegradable alternatives. Ethical considerations include the envi-

ronmental impact and long-term sustainability of each option.

1.7.3   Minimizing Unintended Consequences

Research outcomes can have unintended and adverse side effects. It is important for researchers to ethically address these issues by minimizing the hazards and risks associated with their technologies. This involves considering safer alternatives, incorporating inher- ent safety features in designs, implementing safety factors, utilizing multiple independent safety barriers, and establishing supervisory mechanisms to take control if the primary process fails. This commitment to safety demonstrates a careful approach to mitigating potential negative consequences from research outcomes.

Example: Agricultural engineers developing autonomous farming machinery consider unintended consequences, such as potential impacts on employment in rural communities. Ethical considerations involve implementing strategies to support affected workers and communities.

1.8   Types of Research Misconduct

Engineering research should be undertaken with the primary goal of advancing the current state-of-the-art technologies. **Research integrity** plays a crucial role in achieving this objective and involves fair dealings with others, honesty in presenting methods and results, and replication of findings whenever possible to minimize errors. Additionally, upholding the welfare of research subjects, ensuring laboratory safety, and addressing other ethical considerations are integral aspects of research integrity. In order to prevent mistakes and enhance the quality of research, peer reviews should take place before the research output is published.

To prevent errors and enhance the quality of research, it is imperative to subject research outputs to peer reviews before publication. This practice guarantees that the research undergoes thorough examination by subject-matter experts, contributing to the overall reliability and credibility of the research findings.

Serious deviations from accepted conduct is construed as **research misconduct**. Differ-

ent types of research misconduct are :

1.8.1   Fabrication (Illegitimate Creation of Data)

This involves the act of creating data or experiments with preconceived notions about the expected conclusions. This unethical practice may arise when there are time constraints imposed by supervisors or customers, leading researchers to generate data rather than waiting for genuine results.

Example: Imagine a student conducting a science experiment on the growth of plants under different light conditions. Due to a lack of time, the student decides to fabricate the data by recording measurements that were never actually taken. The fabricated data might show consistent and impressive growth differences between plants subjected to various light conditions.In this case, the fabrication involves making up experimental results instead of honestly recording the actual outcomes of the plant growth experiment. This kind of behavior is unethical and goes against the principles of honesty and integrity in research.

1.8.2   Falsification (Inappropriate Alteration of Data)

:Falsification involves the inappropriate alteration of data or experiments, including mis-representation, misinterpretation, or illegitimate changes to support a desired hypothesis. This unethical practice occurs even when the actual data obtained from experiments indicate a different outcome. Falsification undermines the credibility and reliability of scientific research by presenting distorted information to align with a preconceived notion or agenda.

1.8.3   Consequences of Fabrication and Falsification

Negative impacts of fabrication and falsification include:

Percolation of False Data

When researchers engage in falsification or fabrication, it hampers engineering research, and inaccurate results (conclusions) may find their way (percolate) into published literature. This compromises the reliability of existing knowledge and can mislead other researchers who rely on this information for their work.

Wrecking Trustworthiness

Unethical practices wreck the trustworthiness of individuals (researchers) involved, damaging their reputation.

Additional Costs

Discovering falsification or fabrication often requires extensive investigations and corrective actions, leading to additional financial burdens.

Impeded Progress and Delays in Technical Advancement

Unethical practices, like falsification and fabrication, slow down research progress by injecting false information into the body of knowledge. This misguides other researchers, leading to actual delays in technical advancement.

Hurt to Honest Researchers

Fabrication and falsification create a challenging environment for honest researchers. When dishonest or misleading data is already published due to misconduct, it can set a false standard. Honest researchers may face challenges in getting their legitimate work recognized and published if it falls short of the falsely elevated standards created by misconduct.

Publication Barriers

The presence of fraudulent or manipulated data in the published literature can create barriers for honest researchers. This can make it harder for legitimate research to be accepted and published.

Establishment of Misconduct

Until misconduct is established and proven, the fraudulent data may remain in the published literature. This process can take time and may involve investigations and retractions. During this period, the misleading information continues to influence the research community. The retraction may not fully erase the impact of the false data on the scientific community.

Engineering researchers are often perceived as objective truth seekers. They can prevent misconduct by independently reproducing results whenever they are interested in doing further work on published material, which is likely to be part of their literature survey.

1.8.4 Plagiarism

Plagiarism is defined as the act of using or reusing someone else's work, including text, data, tables, figures, illustrations, or concepts, without proper attribution. It involves presenting the work as if it were one's own without explicit acknowledgment.
The concept of **self-plagiarism** occurs when researchers verbatim copy or reuse their own previously published work without appropriate citation. This practice is considered unacceptable in scientific literature.

Challenges of Internet Availability

The increasing availability of scientific content on the internet may encourage plagiarism in some cases, but also enables detection of such practices through automated software packages designed to identify similarities between texts.

Detection of Plagiarism

How are supervisors, reviewers or editors alerted to plagiarism?

Original author comes to know and informs everyone concerned.

Reviewers might discover plagiarism during the review process.

Readers conducting research may come across plagiarized content in articles or books.

Plagiarism Detection Tools

Plagiarism Detection Tools: The availability of both free and paid plagiarism detection tools, often accessible through institutional licenses, offers a way to assess the originality of written content. it is important to note that these tools provide a similarity score,indicating the level of similarity between published and unpublished content, rather than a conclusive identification of plagiarism. A similarity score is not conclusive evidence of plagiarism, it only serves as a metric for assessing similarity.

However, a low similarity score doesn't guarantee that the document is plagiarism free. It requires human evaluation to determine whether the content has been plagiarized or not. Additionally, it is essential to consider individual scores of sources rather than just the overall similarity index. Setting a maximum allowable similarity index may be insufficient in utilizing the tool effectively. This is because certain types of plagiarism, such as patchwork plagiarism, where sections of text are strategically rearranged, can be more challenging to detect through automated tools.

Ethical Writing Practices:

To avoid a high similarity count, researchers can use relevant published content by rephrasing or summarizing the content in their own words. This maintains the original meaning without replicating the original text. Whenever using ideas, concepts, or findings from other sources, cite them appropriately. This gives credit to the original authors and demonstrates transparency in acknowledging the use of external information. It is impor-

tant to note that citing a source does not justify verbatim copying. A researcher should practice writing in such a way that the reader can recognize the difference between the ideas or results of the authors and those that are from other sources.

1.8.5 Other Aspects of Research Misconduct

Deception and Damage: Fraudulent Practices

Serious deviations from accepted conduct could be construed as research misconduct. When there is both intentional deception (misleading actions) and damage (negative consequences), the actions are officially recognized as fraudulent, and the term "research misconduct" is often used to describe such behavior. Such ethical violations are likely to be discovered or exposed over time sooner or later.

Simultaneous Submission

Engaging in practices that violate publication policies can be considered research misconduct. Simultaneous submission of the same article to two different journals violates publication policies.

Handling Mistakes in Published Content

If a researcher discovers mistakes in their published work and fails to report or correct them, it may be viewed as a form of research misconduct, unless a researcher takes responsibility for the accuracy of their work, acknowledges the mistake, and is motivated to contribute a corrected version.

1.9 Ethical Issues Related to Authorship

Academic authorship involves communicating scholarly work and establishing priority for their discoveries and building peer reputation. It also comes with an intrinsic burden of accepting responsibility for the contents of the work, serving as the primary basis for

evaluation in areas such as employment, promotion, and other honors. Here

are some common ethical issues related to authorship:

1.9.1   Gift or Guest Authorship

Including "guest" or "gift" authors, where coauthorship is granted to someone with little or no contribution to the work, is misleading and unethical. This practice dilutes the contributions of those who did the actual work, artificially enhances the credentials of the listed authors, and raises concerns about possible research misconduct.

1.9.2   Career-Boost Authorship

Sometimes, the primary author may grant coauthorship in a suspicious way to a junior faculty member or a student with the intention of enhancing their chances of employment or promotion. This practice is referred to as career-boost authorship. This may misrepresent contributions, weaken or diminish the integrity of authorship, and be considered unethical manipulation for personal gain.

1.9.3   Career-Preservation Authorship

This malpractice, termed "career-preservation authorship," involves adding department heads, deans, or other administrators as coauthors in exchange for benefits or maintaining a "good relationship." In such cases, the principal author benefits from a favorable relationship with superiors, while the administrator gains authorship credits without fulfilling the necessary work for it, resulting in a mutually beneficial arrangement. This raises concerns about fairness, transparency, and the actual contributions of individuals listed as authors.

1.9.4   Ghost Coauthorship

Sometimes, an actual contributor may choose not to be included in the list of authors due to an undisclosed conflict of interest (personal or financial) within the organization or

other reasons. Such instances of coauthorship are referred to as ghost coauthorship. This lack of transparency can compromise the integrity and credibility of the research process and findings. Full disclosure of all individuals engaged in the research is essential to enable a comprehensive evaluation based on both the research findings and an assessment of potential influences arising from conflicts of interest.

1.9.5   Reciprocal Authorship

In this form of questionable authorship, researchers may include each other as coauthors in a reciprocal gesture, often without genuine collaboration. The inclusion is based on mutual agreements with an expectation of shared benefits or outcomes. In some cases, there might be minimal collaboration, limited to basic tasks such as reading and editing. This practice lacks genuine engagement in thoroughly reviewing the work, potentially diminishing the credibility of authorship and the research itself.

1.9.6   Misrepresentation of Sole Authorship

Some authors try to present their work as solely authored, even when they depend on significant contributions from others. They choose to acknowledge those contributions only in the form of a general acknowledgment. This approach misrepresents the true extent of the contributions made by those not listed as authors. In this case, the unrecognized contributors are then unavailable to readers for additional clarification or explanation about their role in the research.

1.9.7   Authorial Accountability

All listed authors have full responsibility for all contents within a research article, and so naturally, they should also be made aware of a journal submission by the corresponding author. Obtaining consent from all authors regarding the content and submission of the paper is essential. All listed authors are responsible for the content, but determining individual accountability can be challenging. If one author commits misconduct, it is unclear to what extent other coauthors are responsible. Establishing a method to quantify individual contributions would be beneficial in appropriately recognizing and assessing the degree of associated accountability for each coauthor.

1.9.8   Double Submission

Double submission is an important ethical issue related to authorship, which involves the submission of a paper to two forums simultaneously. This practice is motivated by the desire to enhance the possibility of publication and potentially reduce the time to publica- tion. This practice violates the principle of publishing original work, as reputable journals discourage double submissions to maintain the integrity of the publication process. Rep- utable journals aim to publish original papers — ones that have not been previously published elsewhere— and strongly discourage double submission.

Question Bank-Module 1 :

Meaning of Research:

1. Describe the key steps involved in starting a research cycle.

2. Discuss the significance of building background in the research process.

3. Identify and explain the three broad categories of developing knowledge.

4. Define engineering research. What are the different stages of engineering research?

5. Define research and explain the essential components of starting a research cycle. How does building background knowledge contribute to the research process?

Objectives of Engineering Research

1. Explain, in detail, the diverse objectives of engineering research.

2. Discuss in brief on objectives of engineering research.

3. Outline the primary objectives of conducting research in the field of engineering.

Motivation in Engineering Research

1. Discuss the primary objectives of engineering research. Explore the concepts of intrinsic and extrinsic motivations in the context of engineering research. Provide examples of how motivation influences the research process.

2. Analyze the intrinsic and extrinsic types of motivations. Provide examples of how both types of motivations can influence an engineer's involvement in research.

3. What are the different motivations for engineering research.?

4. Discuss the factors that motivate researchers in the field of engineering.

5. Explain the importance of motivation in sustaining long-term research endeavors.

Types of Engineering Research:

1. Provide an overview of different types of engineering research.

2. Compare and contrast descriptive research and analytical research in engineering.

3. Compare and contrast fundamental research and applied research in engineering.

4. Compare and contrast qualitative research and quantitative research in engineering.

Finding and Solving a Worthwhile Problem:

1. What skills are essential for identifying and solving a research problem in engineering? Explain the attributes of a worthwhile research problem. Discuss the decision-making process when choosing to tackle a specific problem. Explore Polya's problem-solving approach.

2. Explain the process of finding and defining a worthwhile problem in engineering research.

3. Elaborate on the steps involved in finding a worthwhile problem for engineering research. How does the identification of a meaningful problem contribute to the research process?

Ethics in Engineering Research:

1. Trace the historical evolution of research ethics. Differentiate between ethical considerations in authorship and the responsible conduct of research in engineering. Why is maintaining ethical standards crucial in the field of engineering research?

2. Define ethics in the context of engineering research.

3. Discuss why ethical considerations are crucial in engineering research practices.

Ethics in Engineering Research Practice:

1. Identify and discuss ethical concerns associated with technological developments. How does ethical decision-making play a role in technological choices? Explain strategies for minimizing unintended consequences in engineering research.

2. Explain how ethical principles are applied in the practice of engineering research.

3. Discuss potential ethical challenges faced by researchers in engineering.

Types of Research Misconduct:

1. Define and elaborate on the types of research misconduct, including fabrication, falsification, and plagiarism. Discuss the consequences of fabrication and falsification. Explore other aspects of research misconduct and their implications.

2. Define research misconduct and provide examples of different types.

3. Discuss the consequences of research misconduct on the scientific community.

Ethical Issues Related to Authorship:

1. Discuss ethical considerations in determining authorship of research papers.

2. Explain how issues related to authorship can impact the credibility of research.

3. Discuss the ethical issues surrounding academic authorship.

Module 2

Literature Review and Technical Reading

Syllabus

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, Concep- tualizing 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, Ac- knowledgments and Attributions, What Should Be Acknowledged, Acknowledgments in Books Dissertations, Dedication or Acknowledgments.

2.1 Significance of Literature Review and Technical Reading :

The term "literature" is commonly used to refer to the body of written works on a particular subject or within a specific field of study. A literature review, is a systematic and critical analysis of existing scholarly works, literature, and research relevant to a specific research topic.
The primary goals of literature review are :

Identification of Vaguely Known Problem: To know the use of content, ideas, or approaches in the literature to correctly identify the problem that is not clearly known before delving into existing research.

Advocating a Specific Approach: The literature review enables researchers to advocate for a specific approach or methodology in understanding and addressing the identified problem.

Assessing Methods Used: Researchers evaluate and assess the methods used in the literature to address similar problems.

Ensuring Contribution of Something New and Innovative: The literature review helps researchers in clearly understanding that their proposed research(the research to be undertaken) will contribute something novel and innovative.

Evaluating the Quality of a Literature Review: The quality of such a review can be determined by evaluating whether it includes the appropriate breadth and depth of the area under study, clarity, rigor, consistency, and effective analysis.

2.2 New and Existing Knowledge

New knowledge in research can only be interpreted within the context of what is already known, and cannot exist without the foundation of existing knowledge.

Foundation of Existing Knowledge: New knowledge is built upon the foundation of existing knowledge. Understanding what is already known is is essential or very impor- tant in the context of academic writing or research and to support and understand new findings.

Constructing the Foundation:

Constructing a strong foundation involves reading and surveying literature, both historical and recent. Existing knowledge provides context, significance, originality, and tools necessary for new research.

Sources of Existing Knowledge:

Where does this existing knowledge come from? Normally, one finds this knowledge by reading and surveying the literature in the field that was established long ago, as well as more recent knowledge, which is always changing.

(i) **Textbooks:** Literature survey involves reading textbooks on one's topic for established knowledge. Textbooks serve as a starting point for understanding basics. Reading a textbook is not too difficult because it is written as a teaching instru- ment. The author of the textbook normally starts from the basics and takes the reader through everything needed to understand that topic.

(ii) **Research Papers:** Research papers contain newer work but assume prior knowledge. Normally, the goal of a research paper is to present a small piece of new knowledge. A research paper contributes newer work but assumes a certain level of prior knowledge in the field from the reader.

Review Process:

The Literature review process explains how a research item builds on existing work, providing a clear and detailed explanation or clarification of the technical development. A good literature survey provides a convincing answer to why the research is undertaken.

An effective review of the literature ensures a firm foundation for advancing knowledge, facilitates theoretical growth, and identifies gaps for future work.

An efficient literature review focuses on concepts rather than authors.

Generally, a good literature survey is the first expectation of a supervisor from the research student, and when done well can create a good impression that the state of art in the chosen field is well understood.

Steps for a Literature Survey:

A good literature survey is typically a two-step process as given below:

(1) **Identification:** Identify major topics, subtopics, or concepts relevant to the research subject under consideration.

(2) **Categorization:** Organize the topics by placing citations of relevant sources(article/website/data, etc.) in the correct category of concepts.

Effective Reading and Note-Taking:

In the process, Highlight important sections and then write about them without copy- ing. Writing about highlighted parts helps shape and integrate the knowledge into the researcher's foundation. It helps the stay focused on key points and enhances your un- derstanding of the material.

Continuous Learning and Writing :

To build a strong understanding of a subject, continuous reading and learning are essen- tial. When reading, marking key sections with an asterisk, highlighting or underlining is a form of active engagement. Beyond marking, expressing one's understanding in writ- ing or taking notes in the margins or in a separate notebook solidifies your understanding.

Comprehensive Literature Survey:

The literature survey serves as the foundation for your research by providing a **compre- hensive overview** which involves a thorough analysis and synthesis of existing scholarly work. This includes articles, books, conference papers, and other archived materials rel- evant to the chosen topic. By reviewing existing methodologies used in previous studies, the literature survey aids in the identification of suitable research methodologies for your own investigation, provides a firm foundation for a topic of interest, and demonstrates that the proposed work would make a novel contribution to the overall field of research.

2.3   Analysis and Synthesis of Prior Art

After collecting the sources, usually articles, intended to be used in the literature review, the researcher is ready to break down each article and identify the useful content in it, and then synthesize the collection of articles. **Breaking Down Each Article:**
A researcher should analyze the relevant information

(i) **Understanding the Hypothesis :** Clearly comprehend the main hypothesis or research question addressed in each article. **(ii)Understanding Models and Experi-**

Table 2.1: Literature Survey Grid

TOPIC\Source	Source 1	Source 2	⋯	Source M
Topic 1		✓		
Topic 2	✓	✓		
.				
.		✓		
Topic N		✓		✓

mental Conditions: Gain insight into the models and experimental setups used in each study. (iii)**Making Connections:** Identify commonalities, patterns, or trends across the articles.

(iv) Comparing and Contrasting: Highlight similarities and differences among the articles.

(v) Finding Strong Points and Loopholes: Evaluate the strengths and weaknesses of each article, acknowledging areas of robust evidence and potential limitations.

Critical Analysis :

(i) **Being Suspicious of Claims:** Approach the information with a critical mindset, especially when encountering bold claims.

(ii) **Avoiding Blind Acceptance:** Resist accepting information at face value; critically analyze and question the data.

Literature Survey Goal:

(i) **Identifying Unsolved Issues:** Recognize gaps or unresolved issues in the existing literature.

(ii) **Determining Problems in Models or Designs:** Evaluate flaws or limitations in current models and experimental designs.

(ii) **Presenting Novel Ideas and Recommendations:** Aim to contribute something new by suggesting innovative ideas or proposing recommendations.

Critical Evaluation of Information: Here are a few criteria that could help the re- searcher in the evaluation of the information under study.

Authority: Assess the author's credentials and affiliation, as well as the publisher of the information.

Accuracy: Verify the credibility of the information based on existing knowledge and the presence of citations to support claims.

Scope: Determine if the source is at an appropriate comprehension or research level.

Additional Criteria:

Currency: Ensure the information is up-to-date.

Objectivity: Assess the neutrality and impartiality of the information.

Purpose: Understand the goal or intention behind the information.

Avoiding Extremes: It is important to ensure that the search question is neither too narrow nor too broad, striking a balance for effective exploration.

2.4 Bibliographic Databases

Bibliographic databases are referred to as "abstracting and indexing services." **Purpose:** They play a crucial role in collecting citation-related information and abstracts of research articles from scholarly literature. **Accessibility:** The gathered information is made available through search functionalities, aiding researchers in retrieving relevant literature efficiently.

Example Databases: IEEE Xplore, Engineering Village, Scopus etc.

Advantages of Simultaneous Searches:

Diversification: Simultaneous searches across large databases help avoid excessive dependence on any individual database.

Limitation Mitigation: This approach helps researchers to overcome or bypass the inherent limitations or shortcomings associated with a specific database, thereby significantly enhancing the overall quality of their research.

Criteria for Database Selection

Swift Identification: Researchers should be capable of quickly identifying databases relevant to their research.

Tailored Selection: The selection of databases should be based on the specific ideas or problems the researcher intends to explore.

2.4.1 Web of Science

Web of Science (formerly known as ISI or Thomson Reuters) includes multiple databases, as well as specialized tools. It is a good search tool for scholarly materials requiring institutional license and allows the researcher to search in a particular topic of interest. Search criteria include the fields that are available in drop down menu such as such as title, topic, author, address, etc. The tool also allows sorting by number of citations (highest to lowest), publication date etc.

Effective Searching Techniques :

Use quotes around phrases for precise search.

Add more keywords to refine results.

Utilize the "Refine Results" panel on the left for advanced filtering.

Explore options such as peer-reviewed journals, date, language, etc.

Broaden the search outcomes by taking into account alternative word forms, variations in word endings, and incorporating alternate search terms related to the research topic and connecting them with **OR**.

Example: (for a structured approach) :

Research Topic: Graph Theory and Network Analysis.

Search Criteria: Title, Topic, Author.

Keywords: Graph theory, network analysis, connectivity, algorithms.

Refine Results: Select peer-reviewed journal articles, published within the last 3 years.

Cited Reference Search :

"Cited Reference Search" option enables a researcher to trace articles which have cited a formerly published paper.

Using this element, it is possible to find how a familiar idea has been applied, improved, or extended subsequently.

Example : Discover how a particular concept has evolved over time.

Example: (for Cited Reference Search)

Research Focus: Influential papers in Graph Theory.

Search: Cited references for a classic paper in Graph Theory.

Outcome: Identify newer papers citing the classic work, exploring advancements or applications.

Structured Search for Optimal Results

Structured searches enable narrowing and refining of results. Based on the re- searcher's need the search result can be broadened or narrowed down using the built-in fields provided in the web of science website.

This method is effective and ensures relevance and well-utilized time.

When clicked on any of the search results, this website provides the title of the paper, authors, the type of journal, volume, issue number and year of publication, abstract, keywords, etc., so that the researcher has enough information to decide if it is worthwhile to acquire the full version of the paper.

Example: (for Structured Search) :

Objective: Recent developments in network connectivity algorithms.

Structured Search: Use drop-down menus for precise selection (e.g., Topic: Network Analysis, Sorting: Citations - Highest to Lowest).

Outcome: Access a list of highly-cited articles on recent developments in network connectivity algorithms.

2.4.2 Google and Google Scholar

Google is a starting point for research. It is useful for finding freely available information from various sources such as reports from governments, organizations, companies, and so on However, there are limitations:

(i) It is a "Black box" of information, It searches everything on the Internet, with no quality control -one does not know where results are coming from.

(ii) There are limited search functionality and refinement options.

Google Scholar Focuses one's search to scholarly literature . However, there are limitations:

(i) Some of the results are not actually scholarly. An article may look scholarly at first glance, but is not a good source upon further inspection.

(ii) Not comprehensive as some publishers do not make their content available to Google Scholar.

(iii) There is limited search functionality and refinement options.

Search Operators in Google and Google Scholar There are search operators in Google and Google Scholar that can be used to help narrow down the results. These help one find more relevant and useful sources of information. Here are some basic search operators:

(i) **OR**- Broadens search by capturing synonyms or variant spellings of a concept.
Example: Synchronous OR asynchronous will find results that have either term present.

(ii) **Brackets/Parentheses ( )** - Gathers OR'd synonyms together, while combining them with another concept.
Example: RAM (synchronous OR asynchronous).

(iii) **Quotation marks " "**- Narrows the search by finding words together as a phrase instead of separately.
Example: RAM (synchronous OR asynchronous) "Texas Instruments".

(iv) **Site** - limits the search to results from a specific domain or website. This operator is helpful when searching specific websites such as the BC government.
Example: RAM(synchronous OR asynchronous) "Texas Instruments" site: http://ieexplore.ieee

(v) **Filetype**- Limits the search to results with a specific file extension. One could look for pdf's, PowerPoint presentations, Excel spreadsheets, and so on.
Example: RAM (synchronous OR asynchronous) "Texas Instruments" site: http:// ieeexplore.ieee.org, filetype: pdf.

Search Tools and Other Options The Search Tools button at the top of the Google results gives you a variety of other options, such as limiting the results by date. There are other operators and tools that one can use in Google and Google Scholar. Google is just one among many available search tools. Researchers are advised to consider other options beyond Google, for comprehensive research.

Challenges and Considerations:

It can be hard to carefully examine (Sift) through numerous results in Google or Google Scholar, especially when seeking scholarly resources within a specific subject area.

To find the best resources on a topic, one should search in **academic databases**, in addition to Google. Databases provide access to journal articles and conference proceedings, as well as other scholarly resources.

One should choose databases based on subject area, date coverage, and publication type. Interfaces vary between databases, but the search techniques remain essentially the same.

2.5   Effective Search : The Way Forward

Scholarly and popular publications play distinct roles in sharing information in the field of engineering. A thorough understanding of their unique characteristics and knowing where to locate relevant information is essential for conducting research effectively.

Scholarly Publications:
Scholarly publications are authored by researchers in a specific field of skill. Such work cites all source contents used and is generally peer-reviewed for accuracy and validity before publication. The audience for such works is fellow experts and students in the field. The content is typically more complex and advanced than those found in general magazines.

Scholarly publications contribute to the academic knowledge base and are often a result of original research or in-depth analysis. They adhere to a formal structure, including abstracts, methodologies, results, and conclusions.
Example:

Title: "Advancements in Robotics: A Comprehensive Review"

Authors: Dr. Engineer, Prof. Researcher

Published in: Journal of Robotics

Popular Publications :
Popular publications are informal and aim to reach a large number of readers, including experts and enthusiasts. They focus on news and trends, making them suitable for general

reading.

Popular publications serve as a bridge between experts and the general public, providing accessible information on current developments in the field. They may include interviews, case studies, and discussions that make the content more approachable.

Example:

Title: "The Future of Sustainable Energy"

Author: Science Enthusiast

Published in: Engineering Today Magazine

Search Strategies :

Conducting a comprehensive search is essential for researchers. No single source provides all information needed, so various search tools should be utilized. Information may not be solely online. Researchers should consider the type of information needed and its availability, including print resources. Remember to explore various sources and iterate through different methods to get comprehensive results in your research.

Iterative Searching Process:

Searching is an iterative process involving experimenting with keywords and operators. evaluating results, and modifying searches. Once results are generated, carefully evaluate and assess them, utilizing filters to refine the relevant information. If the initial search doesn't yield the desired outcomes, be ready to modify your search terms based on ini- tial results. Additionally, explore citations and references in relevant articles for further sources.

Critical Reading:

Following the initial search, engaging in **critical reading** becomes a crucial step in the literature review process. Through this critical reading, researchers are able to make careful observations of salient points within the selected sources. The next steps involve summarizing the key findings extracted from the literature and conducting a detailed comparison and contrast of these findings. This iterative process of observation, summarization, and comparison enhances the depth of understanding and provides a foundation for synthesizing information from various sources. After the search, critical reading is crucial. Observations, summarization, and comparison of findings are part of this process.

Continuous and Cyclical Process :

Conducting a literature survey is not a one-time event but rather an ongoing process that

evolves with the expanding body of knowledge. It is a continuous and cyclical process, involving multiple iterations and a thorough understanding of the problem.

Skill Development:

Parsing math-heavy articles, especially those laden with complex equations and algebra, may not be an inherent skill for everyone at the beginning of their research journey. Successful researchers cultivate this skill over time through a combination of extensive reading, seeking assistance when needed, and engaging in relevant coursework. it is cru- cial to dedicate sufficient time to digest the content and develop one's ideas based on a thorough understanding of the literature. A caution is issued against losing focus of the purpose during an extensive search, underscoring the importance of active reading and the development of ideas.

Ph.D. Research Stage :

Ph.D. scholars are required to undertake the preparation of a synopsis and a compre- hensive literature survey as integral components of their research journey. Specifically, during the synopsis stage, scholars are required to undertake an extensive literature sur- vey, using archived journals and bibliographies as primary sources. Acknowledging the iterative nature of the research process, scholars are encouraged to engage in a continuous back-and-forth exploration until the completion of the project.

2.6   Introduction to Technical Reading

Technical reading is a vital skill for researchers, allowing them to remain well-informed and efficient in exploring research literature.

Significance of Technical Reading in Research:

For any active researcher, staying abreast(up-to-date) with the latest research findings in their field is now absolutely necessary. However, locating the right work to read can be challenging due to the vast and fragmented nature of the literature, with knowledge scattered across various sources. This highlights the need for systematic approaches to gather, synthesize, and comprehend dispersed information effectively. Knowing where to read is crucial, and relying on refereed journals and books from reputable publishers is preferred over easily accessible but potentially less reliable web articles. When reading an engineering research paper, the primary goal is to understand the technical contributions made by the authors.

Efficient Reading Strategies:

Given the abundance of journal articles, adopting a purposeful and efficient reading approach is crucial. Technical reading requires multiple readings, it is not the same as reading a newspaper. It often requires spending many hours on a single paper, needing multiple readings for a thorough understanding. Determine the worthiness of a paper through an initial Skimming to decide whether it is worth careful reading. A simple, efficient, and logical approach is described in the next section for identifying articles and reading them suitably for effective research.

Time investment through Initial Skimming:

Determining how much time to invest in reading a paper begins with an initial skimming process. During this process, one typically glances through Title and Keywords, subheadings, introductory and concluding paragraphs, and any highlighted or emphasized text. The goal of initial skimming is to quickly assess the document's structure, main points, and relevance without delving into the details. It helps readers decide whether the paper merits a more in-depth and careful reading.

Effective Skimming Techniques:

When initiating the skimming process, begin with the title and keywords, as these elements are initial attention grabbers. If, upon reading these, it does not seem sufficiently interesting, it is better to stop reading and look for something else to read. One should then read the abstract to get an overview of the paper in minimum time. Again, if it does not seem sufficiently important to the field of study, one should stop reading further. If the abstract is of interest, one should skip most of the paper and go straight to the conclusions to find if the paper is relevant to the intended purpose. If found relevant, focus on reading the figures, tables, and captions, providing a broad understanding of the paper's content.

Effective Research Paper Reading Strategy for Students:

If the paper has continued to be of interest, delve into the Introduction section to grasp the background information about the work and understand why the authors conducted that particular study and how it contributes to the field. The next sections to read are the Results and Discussion sections which is really the heart of the paper. One should really read further sections like the Experimental Setup/Modeling, etc., only if one is really interested and wishes to understand exactly what was done to better understand the meaning of the data and its interpretation.

Continuous Search for Relevant Literature : Balancing Content and Author Reputation :

While working through the literature in this way, it is essential not only to consider the knowledge that is written down but also to take into account the reputation of the authors who contributed to that knowledge. As a researcher, staying updated with relevant literature is an ongoing necessity. For smaller projects, advisors might guide the reading process by assigning a single important paper to read. But larger projects often require independent literature searches. For this, developing a reading strategy for effective re- search is absolutely necessary for researchers.

2.7 Conceptualizing Research

In formulating research objectives, the focus lies in its ability to centralize new knowledge, gaining acceptance and recognition within the research community. However, the journey begins with the conceptualization of the research itself. Besides being original and significant, a good research problem should also be solvable or achievable. This necessitates consideration of the methods and tools that can be used to obtain that new knowledge effectively. Significance, originality, and the theoretical framework, along with the methods and tools required to address a problem, usually come from the existing documented literature and knowledge in the field.

Complexities of Formulating Research Objectives :

Coming up with a good research objective, conceptualizing the research that meets all of these requirements is a tough thing to do. It means that one must already be aware of what is in the literature.Achieving this demands a thorough understanding of existing literature. A well-defined research objective indicates an advanced level of expertise, particularly at the cutting edge of knowledge. For those engaged in Ph.D. level research or beyond, the task of conceptualizing the research becomes a personal responsibility. This step is particularly challenging as it demands an extensive knowledge of the literature in the field.

Crafting Expertise in Ph.D. Research :

When working at the Ph.D. level, one needs to be prepared to cultivate expertise. Undertaking research at the Ph.D. level requires a readiness to cultivate expertise. It involves a continuous engagement with literature so as to bring together the three parts:

(i) identifying a significant problem,

(ii) acquiring the knowledge to address it and

(iii) a possible way to generate that new knowledge.

The convergence of these three aspects varies uniquely for each researcher and across different fields. However, the only way to become an expert is by continuously reading literature and knowing about what already exists in the field.

Expert Guidance in Literature review:

When tackling a research project of a smaller scope, such as a master's thesis, the task of conceptualizing the research is possibly too tough to do, particularly when time is a limiting factor. Achieving expertise in a limited timeframe may not be feasible. In these cases, seeking guidance becomes essential. The supervisor, typically an expert and active researcher in the field, can guide on defining a meaningful research objective.

The Essence of Research as Knowledge Creation in Engineering :

While engineers enjoy building things, the fundamental goal of research lies in the creation of knowledge. When research involves building something, a critical inquiry is necessary to determine if it is indeed contributing to the formation of new knowledge. When engag- ing in research endeavors, it is important to prioritize uniqueness. Even if a researcher building something new, there's a risk of the work being labeled obvious and rejected as insufficient for the label of genuine research.

Example: If the research involves building a new device, ensure it contributes novel insights beyond what is obvious to experienced engineers.

2.8   Critical and Creative Reading

Reading a research paper is a critical process. The reader should not be under the as- sumption that reported results or arguments are correct. Rather, being suspicious and asking appropriate questions is in fact a good thing.

Asking the Right Questions:

The reader should ask the following questions during research paper analysis:

(i) **Problem Solving:** Have the authors attempted to solve the right problem?

(ii) **Consideration of Alternatives:** Are there simpler solutions that have not been considered?

(iii) **Limitations:** What are the limitations (both stated and ignored) of the solution?

(iv) **Missing Links:** Are there any missing links or gaps in the presented work?

(v) **Reasonable Assumptions:** Are the assumptions made by the authors reasonable?

(vi) **Logical Flow:** Is there a logical flow to the paper, or are there flaws in the reasoning?

These questions need to be ascertained apart from assessing the relevance and importance of the work, through careful reading.

Judgmental Approach:

Use of judgemental approach and boldness to make judgments is needed while reading. Flexibility to discard previous erroneous judgments is also critical for unbiased analysis.

Correctness of Data: Ascertain whether the data presented in the paper is accurate and supports the argument.

Gathering and Interpretation: Ascertain whether the data was gathered and inter- preted in a correct manner.

Alternative Datasets: Decipher whether an alternative dataset would have been more compelling.

Critical Reading vs. Creative Reading:

Critical reading is relatively easier, focusing on finding mistakes, whereas creative reading is more challenging and requires a positive approach in search. In creative reading, the idea is to :

Search for Other Applications: Actively look for other applications beyond the stated scope.

Generalizations and Extensions: Explore interesting generalizations or extended work that authors might have missed.

Practical Challenges: Identify plausible modifications that may present important practical challenges.

Research Considerations : Determine if the paper suggests areas for extended research and and what should be the immediate next aspect to focus upon.

2.9   Taking Notes While Reading

Effective reading is essential for good writing in research. The process of taking notes during and after reading serves as a bridge between reading and writing.

Importance of Note-Taking and methods:
Building Knowledge: Notes aid in building on acquired knowledge.
Memory Aid: There is a well-known saying that the faintest writing is better than the best memory, and this holds true for researchers who need to read and build on acquired knowledge.**Marginal Notes:** Many researchers take notes on the margins of their copies of papers or even digitally(annotate) on an article.
Contents to Highlight: In each research paper, there are a lot of things that one might like to highlight for later use such as Definitions, explanations, key concepts, questions, and criticisms.
Long-Term Benefits : Efforts in note-taking become particularly significant when revisiting and rereading the material after a long time.

Concluding a Thorough Reading:
summary: On completing a thorough reading, a good technical reading should end with a summary of the paper in a few sentences describing the paper's contributions
Elucidating Technical Merit: Elucidate on the importance of understanding the technical merit by comparing the paper with existing works in the same area.
Evaluation of Innovation: Assess whether the paper introduces new ideas or implements existing ones in innovative ways. **Novel Framework:** Evaluate if the paper introduces new ideas, or implements existing ideas through experiments or in a new application ones in new ways, or consolidates different ideas under a novel framework.
Determining Contribution through Comparative Analysis : The true contribution of a paper is better understood by considering other papers in the same area. Research students should thoroughly analyze how the paper stands out when compared to existing works in the field.

2.10   Reading Mathematics and Algorithms

Mathematics serves as the foundation for new advances in engineering research, for evolution and development of engineering research and practice.

Importance of Meticulous Reading:
Engineering researchers often encounter mathematical derivations and proofs as integral components of their research work. Mathematical derivations and proofs form the heart of any technical paper. Therefore, one should avoid skimming them. After identifying the relevance of the paper, by meticulous reading of the proofs or algorithms, one can develop a sound understanding of the problem that the authors have attempted to solve.

Selective Skimming in Technical Sections:
While engaging with technical sections, a balanced approach involves selective skimming based on familiarity, relevance, and practical considerations. However, there are excep- tions to this approach. Some instances where skimming is acceptable include:

(i) **Known Concepts or Advanced Material:** It's acceptable to skim a technical section if it explains something already known or if it is too advanced for the research at the present moment and needs additional reading to be understandable

(ii) **Specialized Content Consideration:** Sections too specialized and seemingly un- necessary for the current research may be skipped temporarily and revisited later if needed.

Example: A researcher studying a novel optimization algorithm may meticulously read the mathematical proofs to understand the underlying principles. However, if a section delves into advanced mathematical concepts beyond the current scope, they may choose to skim it and revisit it later.

Algorithm Implementation:

(i) **Error-Prone Algorithm Implementation:** Implementing intricate algorithms in programming languages like C, C++, or Java is error-prone, even if the researcher is confident. Quick coding may be necessary to verify functionality.

(ii) **Practical Testing of Algorithms:** Despite the researcher's confidence in the paper and belief in the algorithm's functionality, there's a fair chance it may not work. Quick coding becomes essential to promptly verify its actual functionality.

2.11 Reading a Datasheet

Researchers in various engineering fields encounter different types of documents essential to their work. For instance, mechanical and civil engineers may need to read drawings, while those in the field of electronics often need to read datasheets. Datasheets, in partic- ular, serve as instructional manuals for electronic components, offering insights into their functions and applications. Each discipline requires specific reading skills. On occasions, researchers in other fields may also need to incorporate a certain electronic part in which case careful reading of the datasheet is imperative for a thorough understanding of the component's specifications and applications.

In this context, the importance of mastering the art of reading such documents, beyond traditional technical papers or books, becomes evident.

Navigating Datasheets: A Guide for Engineers:

1. **Importance of Datasheets:** Datasheets serve as instruction manuals for elec-tronic components, providing details on the component's functionality and usage. Datasheets enable a researcher (or a working professional) to design a circuit or debug any given circuit with that component.

2. **First Page Overview:** The initial page of a datasheet typically summarizes the part's function, features, and basic specifications. It often includes a functional block diagram illustrating the internal functions of the component.

3. **Initial Skimming:** Apply principles of initial skimming to datasheets to determine the need for further careful reading.

4. **Datasheet Components:** Datasheets typically include information on function, features, specifications, functional block diagrams, pinouts, performance graphs, safe operating regions, truth tables, timing diagrams, and package dimensions.

5. **Significance of Pinout:** A pinout provides the physical location of a part's pins, with special mark for pin 1 so that the part can be correctly plugged into the circuit.

6. **Performance Graphs and Safe Regions:** Some parts also provide graphs show-ing performance versus various criteria (supply voltage, temperature, etc.), and safe region for reliable operation which should be carefully read and noted by the re-searcher.

7. **Truth Tables and Timing Diagrams:** Lookout for truth tables which describe what sort of inputs provide what types of outputs, and also timing diagrams which lay out how and at what speed data is sent and received from the part(data transmission).

8. **Package Dimensions for PCB Layout:** Datasheets end with with accurate dimensions of the packages a part is available in, essential for PCB(printed circuit board) layout.

9. **Importance of Datasheet Reading:** When working with a new part or selecting components, carefully reading the datasheet is recommended that may potentially save many hours later on.
   Example: When undertaking an electronic project, a researcher needs to select a microcontroller. This involves a meticulous reading of the microcontroller's datasheet to comprehend its features, pin configuration, and operating conditions.

10. **Beyond Datasheets - Diverse Reading Materials:**While utilizing datasheets as an illustrative example, the authors' objective is to emphasize the importance of mastering the art of reading various documents. Researchers need to broaden their document literacy beyond technical papers and books, recognizing the diverse range of materials integral to their field.

2.12   Attributions and Citations: Giving Credit Wher- ever Due :

Academic writing, by definition, must follow certain rules and conventions. Among the most important of these are the rules and conventions about citing, referencing, attribut- ing, and acknowledging the works of others. That means giving proper credit wherever due.

Citing: Citing is the practice of quoting from, referring to other authors' works and ideas in the text of our work in such a way that the context is clear to the reader.

Referencing: Referencing is the listing of the full publication details of a published work that is cited so as to give background information to the readers.

Attribution: Properly crediting the contributors for their contributions.

Acknowledgment: Acknowledgment in research publications indicates contributions to scientific work.

However, acknowledgment, attributions, and citations differ in the manner of their application. Acknowledgment is arguably more personal, singular, and simply an expression of appreciations and contribution.

In the upcoming sections, we will delve into the various challenges and considerations associated with attributions and citations in academic writing.

2.13 Citations: Functions and Attributes

Role of Citations (References):

Citations credit others for their work, providing readers the means to trace the source publication if necessary. In any new document, any borrowed portion of someone else's work or ideas, be it in papers, patents, or presentations, must be clearly cited to avoid plagiarism. This rule applies to all written sources, encompassing texts, images, sounds, etc. and failure to do may be considered plagiarism. One should avoid distress and em- barrassment by learning exactly what to cite. Depending on the exact type of material, the researcher must appropriately credit the creator of the original source.

Knowledge Growth and Proper Acknowledgment in Research :

The Growth of Knowledge : The growth of knowledge in any field, especially in technological fields, is incremental. Researchers build upon prior information as they contribute to the field's development and must ensure proper acknowledgment of existing knowledge.

Dissemination of Knowledge : Established means of preventing and spreading knowledge include patent publications, conference papers, peer-reviewed journal papers, articles, textbooks, and classroom education.

Leveraging Prior Art: While researchers need to leverage existing knowledge in their research areas for further development, it is equally important to ensure proper acknowledgment and credit for that pre-existing knowledge.

Citations as Connectors: Establishing Credit and Ethical Responsibility
Establishing Connections through Citations: When a researcher includes a bibli- ography of previously published patents or papers in their new works, it establishes a connection between the new and previous work.

Providing Due Credit: In relevance to the context, researchers give due credit through citations. Citations allow readers to verify the quality and importance of the new work, and justification of the findings.

Ethical Responsibility: Citations serve as a way to inform readers that certain material in the researcher's present work is sourced from another, and as an ethical responsibility, appropriate credit has been given to the original author or writer.

Types of Citable Materials: Materials that can be cited include journal papers, conference proceedings, books, theses, newspaper articles, websites, other online resources, and personal communication.

Placement of Citations: Ideally, citations should be provided at the end of a sentence or paragraph. Each citation must contain sufficient details for readers to easily locate the referenced material.

Dual Citation Practice: In-Text and References:

Dual Citation Requirement: A researcher is required to cite each source twice:

(i) In-Text Citation: Within the text of the article, precisely where the source is quoted or paraphrased.

(ii) References: A second time, typically at the end of the chapter, book, or research article.

Consistency in Citation Styles:

While most citation styles share similar elements, they differ in the order of elements and layout. Unless otherwise specifically required by a particular journal or a book, researchers can choose any style as long as consistency is maintained.

Differences in Citation Elements:

The citation elements differ and so what is to be recorded can differ from one source to another, and it is crucial to adhere to the specific requirements of each source.

Inclusion of Publication Date:

It is important to include the publication date of the source. For web content, the researcher may also need to mention the specific date it was accessed by him.

LaTeX: Efficient Document Preparation in Engineering Research :

LaTeX as a Document Preparation System: LaTeX, a document preparation sys- tem frequently employed by engineering researchers, is highly efficient in automatically formatting documents according to standard requirements. It proves effective in tracking

and updating citations.

Learning Curve and Technical Writing: LaTeX comes with a steep learning curve but is extensively utilized in this book to address various issues related to technical writ- ing, which is intricately linked with research for engineers.

Functions of Citation :

Citations serve three main functions: verification, acknowledgment, and documentation.

(i) **Verification Function:** Authors can identify intentional or unintentional distortion of research or misleading statements through citation. Citation offers the readers Citation allows readers to ascertain if the original source is justified in the present work.

(ii) **Acknowledgment Function:** Researchers receive credit for their work through citations, which plays a crucial role in the promotion of individual researchers and their continued employment. Many Reputed organizations and institutes often pro- vide research funding based on the reputations of the researchers. Citations help all researchers to enhance their reputation and provide detailed background of their research work.

(iii) **Documentation Function:** Citations are used to document scientific concepts and the historical progress of any particular technology over the years.

Citations: Currency of Credit and Intellectual Acknowledgment :

Citations as Currency of Credit: Citations serve as the currency that authors would wish to accumulate, gives them credit for these contributions. When other authors make citations, they honor those who initiated the ideas.

Demonstration of Comprehension Skills: Authors demonstrate their comprehension skills by identifying, estimating, and incorporating other's research work and then create and express their own ideas precisely while acknowledging ownership of ideas through citation.

Significance of Citing Sources: Enhancing Understanding and Avoiding In- fringement :

Significance of Citing Sources:

Authors should cite sources to indicate the significance of the work to the reader. Relevant citations assist authors in developing an easily understandable argument, avoiding the need for readers to navigate through irrelevant work outside their areas of interest.

Infringement on Researcher's Rights: Failure to cite appropriately infringes on the

rights of the researcher who conducted the original work.

Inappropriate Citations: Types and Consequences :

In certain instances, references fail to fulfill the intended goals of citations and acknowledgments, resulting in a lack of benefit to the reader. Various types of ineffective references exist, each with its own implications. This section investigates various types of inappropriate citations, examining instances where references may not effectively serve their intended purpose.

1. Spurious Citations:

Spurious Citations: In certain cases, when a citation is not required or an appropriate one is not found, including one anyway is considered a spurious citation. These citations lack value for the reader in terms of properly understanding the paper.

Impact: Such actions result in the loss of the reader's or reviewer's time, searching for a cited paper that is otherwise not relevant. Just as due credit should be given to a paper through citation, inappropriate credit must be avoided to maintain the credibility of a research work or the journal/conference proceedings where the paper is published.

2. Biased Citations:

Biased Citations: When authors cite the work of their friends or colleagues without a significant connection between the two works, or when they deliberately avoid citing work of genuine significance to withhold credit from certain individuals, these actions are classified as biased citations.

Impact: Bias extends to neglecting citations to prior work whose conclusions or data contradict the current work.

3. Self-Citations:

Self-Citations: Citing one's prior work is acceptable if the citation is genuinely relevant. Self-citation of previous papers is natural, especially when the latest paper is part of an ongoing research project. It can benefit the reader by consolidating related works of the same author in one paper, reducing the reader's effort in finding the full versions of those papers. However, it is helpful and ethical only if all the cited papers are genuinely relevant to the present work.

Impact: However, inappropriate and irrelevant self-citations can have a negative impact on both the journal and individual researchers. In such cases, self-citations may be considered spurious, biased, or both. Editors of journals who overlook such types of citations and allow them, either due to negligence or other reasons, to be included in published

materials may directly or indirectly alter the impact factor of those publications.

4. Coercive Citations:

Coercive citations: Despite their shortcomings, impact factors remain a primary method of quantifying research. One side effect is the creation of an incentive for editors to engage in coercion, pressuring authors to add citations to the editor's journal. Even if not explicitly stated, the implied message is that the author could either add citations or risk rejection. Such coercive demands consequently diminish the reputation of the journal.

Impact: Diminishes the reputation of the journal.

From the above discussions, it is clear that the author(s) must maintain a balance between too few and too many citations. At the same time, author(s) must give credit whenever due even if it is their own work.

2.14 Impact of Title and Keywords on Citations

The citation rate of a research paper is influenced by various factors, including journal significance, publication types, research area, and the importance of the published work. Additionally, factors such as title length, type, and selected keywords impact citation count.

Significance of Research Paper Titles:

The title is the most important attribute of any research paper. It is the main indica- tion of the research area or subject and is used by researcher as a source of information during literature survey. Title plays important role in marketing and makes research pa- pers traceable. A good title is informative, effectively represents the paper to readers, and gains their attention. While some titles may be informative, they might not engage readers, and some titles might be attractive but not informative or related to the readers' research area. The download count and citation of a research paper can be influenced by its title. There are three different aspects which provide a particular behavior to the title:

(i) types of the title,

(ii) length of the title, and

(iii) presence of specific markers. The title is a crucial attribute of any research paper, influencing its traceability and attention from readers.

Studies on Title Characteristics :

Research by Stremersch et al. analyzed papers published between 1990 and 2002, in the

area of research and studied relationship between title characteristics and citation, which concluded that title length positively affects the number of citations.

In another study, Sagi and Yechiam, found that highly amusing titles have fewer citations and pleasant titles have no significant relation to citation counts.

Another study by Jacques and Sebire, observed a strong association between title length and citation rates, with highly cited articles having more than twice as many words in the title compared to lower cited papers.

Jamali and Nikzad analyzed several open access papers and found that articles with question-type titles are downloaded more but cited less compared to the descriptive or declarative titles.

Analysis by Habibzadeh and Yadollahie [14] also indicated a strong association between longer titles and higher citation rates. Longer titles mainly include the study methodology and/or results in more detail, and so attracts more attention and citations.

General Observations :

In general, titles containing a question mark, colon, or reference to a specific geographical region tend to be associated with lower citation rates. Titles that describe results typically receive more citations than those describing methods. Additionally, review articles and original articles usually receive more citations than short communication articles. Including at least two keywords in the title can increase the chance of finding and reading the article as well as get more citations.

Significance of Keywords in Research Articles :

Keywords represent essential information as well as main content of the article, which are relevant to the area of research. Search engines, journal, digital libraries, and indexing services use keywords for categorization of the research topic and to direct the work to the relevant audience. Keywords are important to ensure that readers are aware about research articles and their content. If maximum number of allowable keywords are used, then the chance of the article being found increases and so does the probability of citation count of the article. Usage of new keywords should be minimal as such keywords may not be well known to the research community and so may lead to low visibility of the article.

2.15 Knowledge Flow Through Citation

Knowledge flows through various channels such as verbal communications, books, documents, video, audio, and images. In the research community, this flow is instrumental in generating new knowledge.

Forms of Knowledge Flow:

Verbal communications, books, documents, video, audio, and images. This plays a powerful role in research community in promoting the formulation of new knowledge.

Knowledge Flow in Engineering Research:

In engineering research, Knowledge flow occurs through books, thesis, articles, patents, and reports. Citing a source is important for transmission of knowledge from previous work to an innovation.

Production of Knowledge:

Production of knowledge can be related to the citation network. Knowledge flow happens between co-authors during research collaboration, among other researchers through their paper citation network, and also between institutions, departments, research fields or topics, and elements of research.

Illustrative Relationship:

The following figure shows the relationship between citations, knowledge flow, and elements such as researchers, papers, journal publications or conferences, and institutions. If paper A is cited by paper B, then knowledge flows through citation networks across institutions.
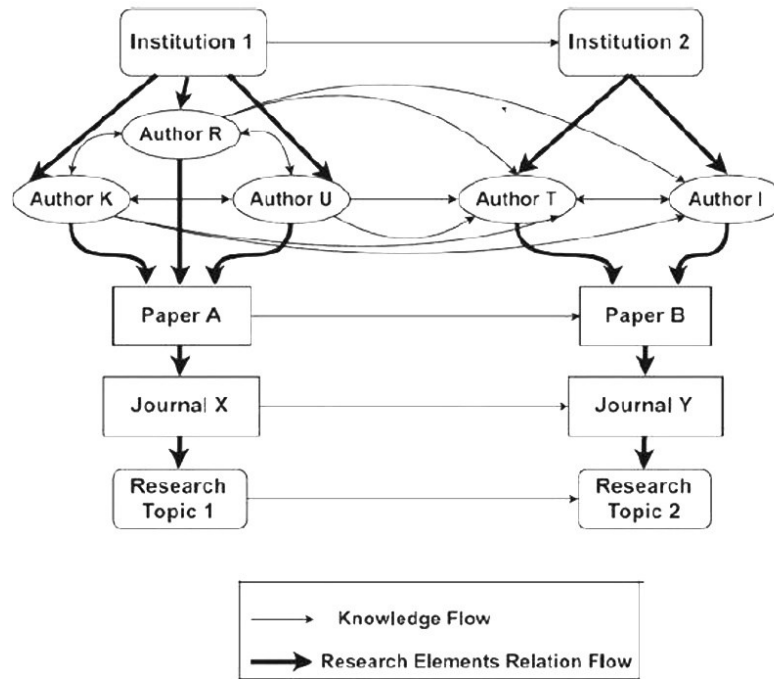
Interdisciplinary Nature of Research :

The complex interdisciplinary nature of research encourages scholars to cooperate with each other to grab more advantages through collaboration, thereby improving quality of the research. Soorya Moorthy, examined the citation impact of the South African publications among different collaboration types, discipline and sectors, and observed that co-authored publications had more citations than single author paper and there was a positive co-relation between number of authors and the number of citations. Following figure shows a relationship between co-authorship and different types of citations.
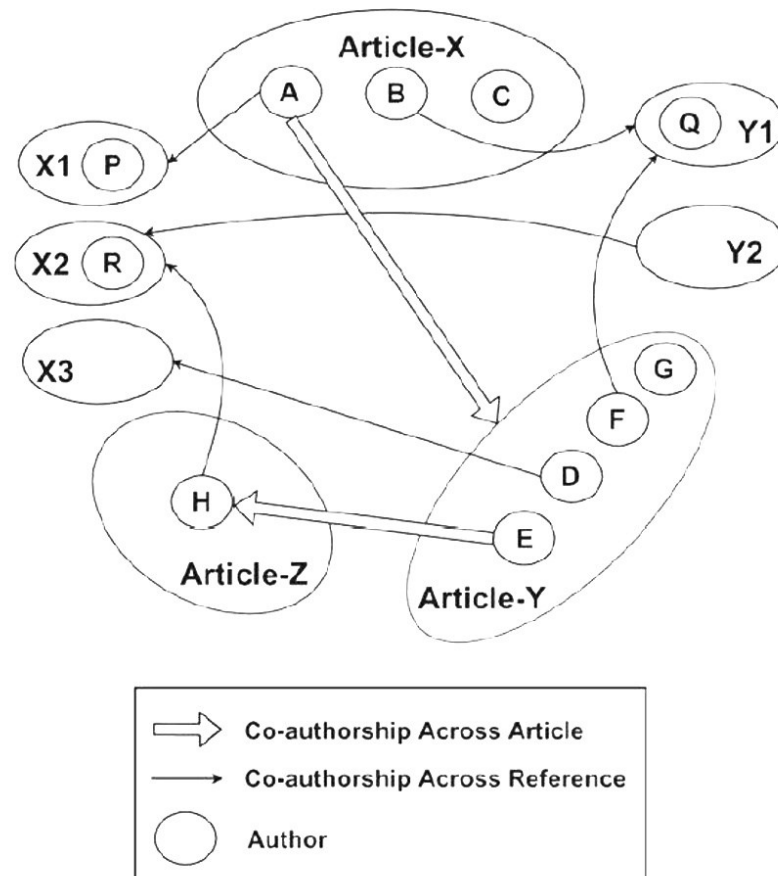
Three articles (X, Y, and Z) and five references (X1, X2, X3, Y1, and Y2) of article X and Y, respectively, are considered. A, B, and C are authors of article X, and D, E, F, G, and also A are authors of article Y. Article Z has two authors H and E. References X1, X2, X3, Y1, and Y2 have authors (A, P), (H, R), (D), (Q, B, F), and (R), respectively.

Based on co-authorship citation network, references X1 and Y1 are considered self-citation, reference X3 is a level-1 co-author citation because author of articleYis direct collaborator of author A, reference X2 is a level-1 co-author network because author A is collaborator of E who collaborated with H. We conclude that papers which frequently cite collaborators will also often cite collaborators of collaborators. Collaborations certainly impact citation counts.

2.15.1   Citing Datasets

Engineering research relies heavily on data. Data citations credit dataset creators, ensuring legal attribution and aiding in future retrieval.

Ownership of Data :

Ascertaining the ownership of data can be a complicated issue especially with large datasets, and issues of funding can also make it a difficult matter. A researcher should obtain necessary permission for using data from a particular source.

Citation Information:

Citations related to datasets should include enough information so that a reader could find the same dataset again in the future, even if the link provided no longer works. It is proper to include a mixture of general and specific information to enable a reader to be certain that the search result is the same dataset that was sought.

Examples

Examples:
1. Historical Data, Sotavento (Wind Farm), Corunna, Spain (July 2016): [Accessed: 4 Oct. 2016] Retrieved from http://www.sotaventogalicia.com/en/real-time-data/historical
2. Deb, D (2016). [Personnel survey]. Unpublished raw data.

2.15.2   Styles for Citations :

Citation styles differ primarily in the order, and syntax of information about references, depending on difference in priorities attributed to concision, readability, dates, authors, and publications. Some of the most common styles for citation (as well as other aspects of technical writing) used by engineers are as follows:

1. ASCE Style(American Society of Civil Engineers):
(a) Reference list:
This part is to be placed in the bibliography or references at the end of the article or report. A template with example for the same is given below:
Template for books:
Author Surname, Author Initial. (Year). Title: Publisher, City, Pages Used.
Example: Wearstler, K., and Bogart, J. (2004). Modern glamour. Regan Books, NY. **Template for Websites :**
Author Credentials and Company Name (Year). 'Title'. [Website URL (Accessed: Date)].
Example: Blade cleaning services (2015): [Website URL (Accessed: Oct. 29, 2016)].

Template for Journal Publications :
Author Surname, Author Initial. (Year). 'Title'. Publication Title, Volume (issue), Pages.
Example: Johnston, L. (2014). "Inconvenient Truth Expanded The Climate Change Dialogue". 1–160.

(b) In-text citation for journals or books:
The following part is to be placed right after the reference to the source of the citation assignment:
Template :
(Author Surname/Website URL Year Published)
Examples:
i. Citation is a very important part of technical writing. (Deb 2016)
ii. Engineers create devices to monitormountains so that nearby inhabitants can bewarned of impending eruptions. (Teachengineering.org 2014)

2. IEEE Style (Institute of Electrical and Electronics Engineers):
IEEE style is standard for all IEEE journals and magazines, and is frequently used for papers and articles in the fields of electrical engineering and computer science. The IEEE style requires endnotes and that references be cited numerically in the text.
Those submitting to an IEEE publication should see guidelines for the specific journal or magazine and may also refer to the complete IEEE editorial style manual. Some examples of IEEE styles of citations for different types of sources are enumerated below:
Chapter in an edited book example:
[1] A. Rezi and M. Allam, "Techniques in array processing by means of transformations," in Control and Dynamic Systems, Vol. 69, Multidimensional Systems, C. T. Leondes, Ed. San Diego: Academic Press, 1995, pp. 133-180.

3. ASME Style (The Association of Mechanical Engineers) Encloses references numerically in brackets within the text.

2.16 Acknowledgments and Attributions

The acknowledgment section is a place to provide a brief appreciation of the contribution of someone, an organization, or a funding body to the present work. If no particular guideline is available for the intended publication, then it can be introduced at the end of

the text or as a footnote. Acknowledgment is a common practice to recognize persons or agencies for being responsible in some form or other for the completion of a publishable research outcome.

Acknowledgment displays a relationship among people, agencies, institutions, and research. In some cases, certain individuals may help in the research work but may not deserve to be included as authors. As a sign of gratitude, such contributions should be acknowledged. We can classify acknowledgment into six different categories like moral, financial, editorial, institutional or technical, and conceptual support.

Categories of Acknowledgment :

1. **Moral Support:** Recognition of individuals or entities providing encouragement or emotional support.

2. **Financial Support:** Acknowledging funding bodies or organizations that financially supported the research.

3. **Editorial Support:** Recognition for contributions in editing or reviewing the manuscript.

4. **Institutional or Technical Support:** Acknowledgment of institutions or individ- uals providing technical assistance.

5. **Conceptual Support:** Recognizing contributions to the conceptual development of the research.

Importance of Acknowledgments in Publications :

Acknowledgments and attributions are crucial in the publications of journal or conference papers. Giving proper credit wherever it is due is very important, and even if the contribution is minor, it should not be neglected. A researcher should always recognize the proprietary interest of others. Whenever possible, the author shall give the names of persons who may be responsible, even if nominally, for designs, inventions, writings, or other accomplishments. Given the importance of work published, authorship is also significant.

Engineering Research Acknowledgments:

In engineering research, acknowledgments are meant for participating technicians, stu- dents, funding agencies, grant numbers, institutions, or anyone who provides scientific

inputs, shares unpublished results, provides equipment, or participates in discussions.

Examples:

1. "The authors would like to express their gratitude to Dr. Smith for his invaluable conceptual support during the initial phase of this research."

2. "This work was financially supported by the XYZ Foundation (Grant Number: ABC123)."

3. "We acknowledge the technical assistance provided by the engineering team at Institution XYZ."

2.16.1 What Should Be Acknowledged?

Every author should know what should and should not be acknowledged. Authors should acknowledge quotations, ideas, facts, paraphrasing, funding organizations, oral discussions or support, laboratory, and computer work.

1. **Quotations :** In technical writing such as in the field of engineering, quotes are used very rarely. Quotations are of two types:

   (a) **Direct Quotations:** Direct quotations are used when author use actual words or sentences in the same order as the original one. Author should use quotation marks for the words or sentences with proper acknowledgment.

   (b) **Indirect Quotations:** Indirect quotation summarizes or paraphrases the ac- tual quote. In such cases, it is important to acknowledge with proper name and date.

2. **Contributions :** Authors should acknowledge people who give appropriate contributions to their research work. Non-research work contributions are not generally acknowledged in a scientific paper but may be in a thesis. Persons must be acknowledged by authors who provided scientific or technical guidance, participated in discussions, or shared information. Authors should acknowledge assistants, students, or technicians, who helped experimentally and theoretically during the research work.

3. **Funding Support :** If the researcher received a grant from a funding agency, and if those funds were used in the work reported in the publication, such support should always be acknowledged by providing full details of the funding program and grant

number in the acknowledgment section.

Authors should gratefully acknowledge the use of services and facilities of any center or organization with which they are not formally affiliated.

Example: An example of acknowledgment of grant received is as follows:

Acknowledgments: This research work was funded in part by the Extra-Mural Research Funding 2014–17 (Individual Centric) of the Department of Science and Technology (DST), Govt. of India.

If there are concerns that providing acknowledgment information may compromise anonymity, authors may withhold this information until the submission of the final accepted manuscript. Many technical journals explicitly discourage authors to thank the reviewers in their article submissions. This could be construed as favoritism or an attempt to encourage reviewers to accept their manuscript for reasons other than scientific merit.

4. **Acknowledging that results have been presented elsewhere:** If the results were presented as an abstract in a journal, then there should be a suitable citation. If the results were presented as part of scientific meeting, symposium, or other gathering, then some relevant information should be provided. At the very least, the name of the gathering and year should be cited. Other helpful items include the location of the gathering (city and state or country) and the full date of the occasion.

By acknowledging all help received in one's research work, the author(s) demonstrate integrity as a researcher, encouraging continued collaboration from those who helped out in different ways.

Acknowledgment is no longer simply a means of expressing gratitude. Funding agencies often require acknowledgment and explicitly state the required information for publication resulting from the funded project. Failure to acknowledge funding may result in the discontinuation of current funding and/or ineligibility to receive future funding.

Unless the information can be considered "common knowledge," proper attribution of an idea, algorithm, computational methodology, or experimental design is required even if a journal operates with double-blind review.

2.16.2   Acknowledgments in Books/Dissertations

A page of acknowledgments is usually included at the beginning of a thesis/dissertation, immediately following the table of contents. These acknowledgments are longer than the one or two sentence statements in journal papers or articles in conference proceedings. Detailed acknowledgments enable the researcher to thank all those who have contributed to the completion of the research work. Careful thought needs to be given concerning those whose inputs are to be acknowledged and in what order. Generally, one should express appreciation in a concise manner and avoid emotive language. The following are often acknowledged in these types of acknowledgments: main supervisor, second supervi- sor, peers in the lab, other academic staff in the department, technical or support staff in the department, colleagues from other departments, other institutions, or organizations, former students, family, and friends.

Sample Acknowledgment in Thesis :

I wish to express my sincere appreciation to my supervisor Prof. Gang Tao for the useful comments, remarks, and encouragement throughout this thesis work. Furthermore, I wish to express my thanks to Prof. Jacob Hammer for introducing me to the topic and for the support along the way. Also, I would like to thank my peers in the Adaptive Control Lab such as Yu Liu and Shanshan Li, who have shared their precious time during many lively technical discussions. I would like to thank my family members who have supported me throughout this journey in many different ways.

2.16.3   Dedication or Acknowledgments?

Dedication is almost never used in a journal paper, an article in a conference proceedings, or a patent. It is used exclusively in larger documents like books, theses, or disserta- tions. While acknowledgments are reserved for those who helped out with the document in some way or another (editing, moral support, etc.), a dedication is to whomever the author would like it to be dedicated to, whether it is the author's mother, best friend, pet dog, or Almighty God. It is possible to dedicate something to someone while also mentioning them in the acknowledgments. For example, one may dedicate a book to one's spouse but acknowledge them for being the moral support and putting up with when one got very stressed.

The acknowledgments in technical books can sometimes be as brief as the ones in journal articles. The acknowledgment section of a technical report may be a paragraph longer than a journal paper but shorter than dissertations. Generally, the length of the acknowledgment may have some correlation with the length of the document.

Question Bank

1. Describe the process of synthesizing knowledge from a variety of sources when performing literature review. Discuss any difficulties you might have faced while synthesizing the information.

2. Describe the process of analyzing and synthesizing prior art in a literature review

3. Explain the essential steps in analyzing and synthesizing prior art during literature review

4. What is the role of bibliographic databases in academics and research? Provide examples.

5. Describe your search strategy when using Web of Science or Google Scholar for literature review.

6. Which are the steps to effectively search for a given topic in a bibliographic database.

7. What factors should be taken into account when taking notes while reading technical documentation?

8. Explain the role of effective note-taking in the context of research literature, emphasizing its significance as a bridge between reading and writing.

9. Analyse and infer key points from a given mathmatical or algorithm-based scholarly article.

10. Explain the steps involved in Reading Mathematics and Algorithms

11. Explain the key strategies and considerations involved in navigating datasheets effectively.

12. How does acknowledging and attributing work in the academic world affect the knowledge flow?

13. Examine the functions and attributes of citations in academic writing, emphasiz- ing their significance in acknowledging sources, maintaining scholarly integrity, and contributing to the credibility of a research work. Provide examples to illustrate how proper citation practices enhance the quality of academic writing and uphold ethical standards.

14. What are the effects of keywords and titles on paper citation? Discuss with exam- ples.

15. Discuss the factors influencing the citation rate of a research paper, with a specific focus on the impact of title characteristics (length and type) and the selection of keywords.

16. Explain how styles for citations differ and how does it impact your work?

17. Examine the dynamics of knowledge flow through citation in the research commu- nity.

18. Explore the dynamics of knowledge flow through citation, focusing specifically on citing datasets and the various citation styles employed in academic writing.

19. Examine the different categories of acknowledgment in academic publications, dis- cussing their significance in recognizing contributions, fostering collaboration, and maintaining scholarly integrity.

20. What should be acknowledged in a research paper and why? Discuss with examples.

21. Explain the significance of technical reading for researchers and how it enhances their ability to navigate research literature effectively.

22. How do citations contribute to the knowledge flow through different research papers?

23. Discuss the critical elements involved in conceptualizing research, with a focus on the importance of formulating research objectives, ensuring the solvability of a research problem, and the role of existing literature and knowledge in shaping the theoretical framework and methods.

24. Compare the concepts of "Asking the Right Questions," a "Judgmental Approach," and the distinction between "Critical Reading" and "Creative Reading" in the con- text of research literature engagement.

25. Why is it important to acknowledge the sources of information in research and what should be acknowledged?

26. How can the impact of title and keywords on citations be determined?

27. What are the effects of citing datasets in research?

28. Discuss the integral relationship between existing and new knowledge in research, exploring the construction of a strong foundation through literature review, the influence of background and perception, and the challenges presented by diverse sources such as textbooks and research papers.

29. Discuss the importance of a literature review in research. How does it contribute to the understanding of existing knowledge and the formulation of new ideas? Explain the role of technical reading in this process, highlighting key strategies for effective technical reading.

30. Explore the challenges and strategies associated with reading mathematical content, algorithms, and datasheets in technical literature. How do researchers navigate complex technical information in these forms?

31. Examine the nuances of acknowledgments in academic writing, focusing on what should be acknowledged, the specific considerations for acknowledgments in books and dissertations, and the choice between dedication and acknowledgments.

32. Discuss the significance of acknowledgments in academic writing, outlining key elements that authors should acknowledge.

33. Examine the specific considerations and characteristics of acknowledgments in books and dissertations.

Module 3

Introduction to Intellectual Property

Syllabus:

Introduction To Intellectual Property: Role of IP in the Economic and Cultural De- velopment 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 Dis- closure of an Invention before Patenting. Process of Patenting. Prior Art Search. Choice of Application to be Filed. Patent Application Forms. Jurisdiction of Filing Patent Ap- plication. 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. Util- ity Models.

3.1   Introduction To Intellectual Property:

Definition of Intellectual Property : Intellectual Property (IP) is a special category of property created by human intellect in various fields such as arts, literature, science, trade, etc. Since IP is a novel creation of the mind, it is intangible (invisible and indivis- ible) in nature, differing from tangible properties like land, house, gold, and car.

Intellectual Property Rights (IPR): IPR refers to the privileges accorded to the creator or inventor. These rights are given in exchange for revealing the process of creation or invention to the public. The inventor is conferred with special rights to use, sell, distribute, offer for sale, and restrict others from using the invention without prior permission.

Purpose of IPR : The primary purposes of IPR include encouraging innovation and creativity, protecting the rights of creators and inventors, and maintaining a balance between public access and private rights.

Types of Intellectual Property : Broadly, IP comprises two branches: Copyrights and Related Rights, and Industrial Property Rights.

1. **Copyrights and Related Rights :** Copyrights and Related Rights refer to creative expressions such as books, publications, architecture, music, wood/stone carvings, pictures, portrays, sculptures, films, and software/databases.

2. **Industrial Property Rights :** Industrial Property Rights focus on protecting innovations and brands. This category includes patents, trademarks, trade services, industrial designs, and geographical indications.

Key Features of IP Categories:

Copyrights (Creative expressions): Copyright is the right bestowed on the owner or creator in relation to publication, and distribution of a piece of writing, music, picture or related works. Copyright also applies to technical contents such as software, datasheets and related documents.

Patents (Protecting inventions):A patent is a legal record that bestows the holder the exclusive right over an invention as per the claims, in a limited geographical domain and for a limited duration by thwarting possible interested parties from any form of manufacture, use or sale of the product or outcome of the invention.

Trademarks(Brand identity): A trademark is a sign that suitably differentiates the owner's goods or services from those of others.

Trade services: Any services in relation to trade or any trade related financing, lending or other financial accommodation provided(or to be provided) by the bank, including but not limited to issuance/amendment of letter of credit, document ar- rival under letter of credit, application for negotiation and inquiries etc.,

Industrial Designs(Aesthetic aspects): An industrial design protection is re- lated to certain specific ornamental shapes associated with products whose duplica- tion the owner may wish to prevent.

Geographical Indications(Origin-based products):A geographical indication (GI) is a name or sign used on products which corresponds to a specific geographical location or origin. Items that meet geographical origin and quality standards may be endorsed with a government-issued stamp which acts as official certification of the origins and standards of the product.

3.2   Role of IP in the Economic and Cultural Devel- opment of the Society

Creativity and Progress: Creativity being the keystone of progress, no civilized society can afford to ignore the basic requirement of encouraging the same. The economic and social development of a society is largely dependent on creativity . The protection pro- vided by the IPR to the creators/innovators is in fact an act of incentivization(providing legal protection and exclusive rights to creators) for encouraging them to create more and motivates others to create new.

Negative Impact of Rigid IPR: However, if IPR is practiced rigidly, it may have a negative impact on the progress of society. For example, compliance with the Trade- Related Aspects of Intellectual Property Rights (TRIPS) Agreement has affected the farming community as they are unable to store seeds for the next crop. Multinational companies regulate the price of seeds, which is generally beyond the reach of a majority of the farmers.

Balancing IPR with Exceptions: To address or mitigate the negative impact of IPR, certain laws, exceptions and limitations associated with IPR have been enacted to main-

tain a balance between the interests of the creators/inventors and the community.

For example, farmers rights under the Protection of Plant Varieties and Farmers Rights (PVP&FR) Act, 2001 entitles them to many privileges, such as Rights on seeds provides rights to the farmers to save seeds, use seeds and share, exchange or sell seeds to other farmers. Right to protection against accusations of infringement protects the farmers from infringement and other legal accusation levied upon them due to his legal ignorance in using other's plant varieties.

The use of copyrighted material for education and religious ceremonies is exempted from the operation of the rights granted in the Copyright Act. Similarly, a patent can be revoked in favor of compulsory licensing by the government during an emergency or a natural calamity.

Society's Interest and Government Intervention: If an invention/creation is not in the interest of society, it is not registered by the government for grant of any rights associated with IP.

For example, cloning of human embryos is banned for IP protection, and so is the creation of super microbial pathogens, which can play havoc with human lives.

Traditional Knowledge (TK) and Genetic Resources: India is enriched with massive biodiversity and genetic resources and their use is embodied in what is referred to as Traditional Knowledge (TK). However, the use of such knowledge and resources are not limited to local contexts as many innovations relate to and draw on them. Therefore, the main issue of concern is to protect TK and genetic resources, which are rapidly coming under the governance of sometimes conflicting IPR policies. To derive maximum benefit from them, the establishment of adequate legal infrastructure and enforcement is required.

Initiatives and Benefits: With initiatives like 'Make in India', 'Atmanirbhar Bharat' and supporting local homegrown brands, and easy as well as accessible approach to patents and trademarks registration, it is possible to reap the benefits of our resources.

3.3 IP Governance(Role of National Agencies and In- ternational Organizations)

National IP Governance in India : Since IP is an integral component of human society, each and every nation has dedicated agencies for laying out the guidelines, implementation and enforcement of IP related matters. In India, many organizations/agencies

deal with various aspects of IP. The governance of all categories of IP, except the Plant Variety and Farmers' Rights Act, is carried out by the Department for Promotion of Industry & Internal Trade (DPIIT) under the guidance, sponsorship, or authority of the Ministry of Commerce and Industry, Government of India (GoI).

Indian Organizations for IP : There are a few other dedicated organizations/departments established by the government to promote patent-ecosystem (patent awareness, patent fil- ing and patent commercialization) in India e.g.

TIFAC (Technology Information Forecasting and Assessment Council)

NRDC (National Research Development Corporation)

CIPAM (Cell for IPR Promotion and Management)

International IP Governance - WIPO : In order to create a hassle-free exchange of IP related activities amongst all the nations, it is imperative to have minimum standards of rules and regulations pertaining to all aspects of IP including rights, empowerment, exceptions, etc. To achieve this goal, the United Nations (UN) has established an orga- nization called the World Intellectual Property Organization (WIPO). This agency is at the forefront of imparting knowledge about IP and governs international filing and reg- istration of IP through various Conventions and Treaties like Paris Conventions, Patent Cooperation Treaty (PCT), Rome Convention, Berne Convention, etc.

3.4 IP as a Global Indicator of Innovation

IP as an Indicator of Innovation : Intellectual Property (IP), especially patents, plays a crucial role as an indicator of innovation. Global ranking organizations use IP as a parameter to evaluate Science, Technology, and Innovation (STI) ecosystems.
Example: Scimago 2020 Report: The Scimago 2020 Report, a publicly available online portal ranking journals and countries based on Scopus data, highlights India's position. In the report, India is ranked 4th position in the parameter of 'Research Publications' but 50th position in the parameter of 'Intellectual Property Rights.'

Importance of IP in Global Rankings : IP is reflective of a nation's innovation and research output. There is a need to sensitize teaching and scientific communities about the importance of IP. Creating infrastructure in higher learning institutes for IP awareness and utilization is crucial.

3.5   Origin of IP

Ancient IP Practices: Though there is no official record of the origin of IP, rudimentary forms of IP were believed to exist around 500 Before the Common Era(BCE) in Sybaris, a state of Greece.

Sybaris Example : Natives of Sybaris were granted a year's protection for their intellect to create "any new improvement in luxury".

Medieval Europe : Practical IP governance began taking shape in medieval Europe.

1623 Legislation in Britain : Britain passed an IP legislation in 1623, allowing guilds(association of artisans or merchants) to create innovations and bring them to mar- ket for trade purposes. However, it faced public resentment and was replaced by the 'Statute of Monopolies.

Statute of Monopolies (1624): 'Statute of Monopolies' granted rights to the original creator/inventor for 14 years, addressing public concerns.

Statute of Anne (1710): Another legislation, 'Statute of Anne', was passed by the British parliament in 1710. This legislation aimed at strengthening copyrights by providing rights to the authors for recreation and distribution of their work. The work could also be renewed for another 14 years.

Global Adoption of IP Legislation : By the end of the 18th century and the beginning of the 19th century, almost every country started laying down IP legislation to protect their novel inventions and creations.

3.6   History of IP in India

In this section, the history of IP in India is explored, covering the pre-independence era, amendments and developments, the post-independence era, and key milestones in shaping Indian patent laws.

3.6.1 History of patents :

Patents in Pre-Independence Era:

The history of the Indian patent system dates back to the pre-independence era of British rule. The first patent-related legislation in India was Act VI of 1856, adapted from the British Patent Law of 1852. The objective of this legislation was to encourage the inventions of new and useful manufactures. The rights conferred to the inventor were termed as 'Exclusive Privileges'. In 1859, certain amendments were made to the Act:

Amendments in 1859 and Developments:

Grant of exclusive privileges to useful inventions.

Increase of priority time from 6 months to 12 months.

Exclusion of importers from the definition of the inventor.

The world's first patent was granted in 1790 to Samuel Hopkins in the USA for the "making of potash and pearl ash by a new apparatus and process". In India, the first patent (known as 'Exclusive Privileges' at that time) was awarded in 1856 to a civil engineer, George Alfred DePenning from Calcutta, for his invention, 'An Efficient Punkah Pulling Machine'.

Inclusion of 'Designs' in Patent Act: A few years later, it was felt that 'Designs' could also pass the criteria of the invention and thus should be included in the Patent Act. The new Act was rechristened as "The Patterns and Designs Protection Act" under Act XIII of 1872. This Act was further amended in 1883 (XVI of 1883) to include the provision of protection for 'Novelty' in the invention.

The Indian Patents and Designs Act, 1911: At the beginning of the 20th century, all the earlier Acts related to inventions and designs were done away with the introduc- tion of 'The Indian Patents and Designs Act, 1911' (Act II of 1911). As per this Act, the governance of patents was placed under the management of the Controller of Patents. In the next three decades, many amendments were introduced for reciprocal arrangements with other countries for securing priority dates. These amendments dealt with:

Use of invention by the government.

Patent of Addition.

Enhancing the term of the patent from 14 years to 16 years.

Filing of 'Provisional Application' and submission of 'Complete Application' within 9 months from the date of filing the application.

Patents in Post-Independence Era :

After India got independence in 1947, many patent experts felt the need to review the Indian Patents and Designs Act, 1911, keeping the national interest (economic and polit- ical) in mind. A dedicated committee, chaired by a renowned Justice Bakshi Tek Chand (retired Judge of Lahore High Court), was constituted in 1949 to review the advantages of the patent system. The committee submitted a plethora of recommendations, including :

Misuse of patents rights needs to be prevented.

There must be a clear indication in the Act that food, medicine and surgical and curative devices should be made available to the masses at the cheapest rate by giving reasonable compensation to the owner of the patent.

Amendments in Sections 22, 23 and 23A of the Patent and Design Act, 1911, on the lines of the UK Patent Act.

Amendments in 1950 and 1952: These recommendations were introduced in the Act XXXII of 1950. Two years later, another amendment (Act LXX of 1952) was made to provide compulsory licensing of patents related to food, drugs and chemicals killing in- sects and microbes. Based on these amendments, a bill was presented in the parliament in 1953 but was rejected.

Committee in 1957 and New Legislation in 1965: In 1957, the central govern- ment constituted yet another powerful committee under the chairmanship of Justice N. Rajagopala Ayyangar to seek inputs for further strengthening the Indian Patent Law. The committee submitted its report to the government in 1959. It comprised two segments addressing:

1. General aspects of the patent laws.

2. Bill rejected back in 1953.

Patents Act, 1970 : The revised patent legislation was submitted to the Lok Sabha in 1965. After many hiccups, clarifications, and modifications, the Patents Act, 1970 (http: //www.ipindia.nic.in/writereaddata/Portal/IPOAct/1_31_1_patent-act-1970-11march2015. pdf) was introduced, superseding all the previous laws related to the patents. However, the Indian Patents and Designs Act of 1911 remained applicable for designs only until 1994.

India Signs TRIPS Agreement in 1995: In 1995, India signed the TRIPS Agreement and got a transition period of 10 years (1995-2005) to make domestic laws compatible with the international treaty.

Patents (Amendment) Act, 1999 : In 1999, The Patents (Amendment) Act, 1999 was introduced providing for the filing of applications for 'Product Patents' in the areas of drugs, pharmaceuticals and agrochemicals (earlier, only 'processes' were protected under the Patent Act). The new Patent Act also included provisions for the grant of Exclusive Market Rights (EMRs) for the distribution and sale of pharma products on fulfillment of certain conditions.

Patents (Amendment) Act, 2002: The second amendment to the 1970 Act was made through the Patents (Amendment) Act, 2002 (Act 38 of 2002). This Act introduced new Patent Rules, 2003, thus replacing the earlier Patents Rules, 1972. The major amendments were:

The protection term of 20 years for all inventions from the date of filing.

Scope of non-patentable inventions including Traditional Knowledge expanded.

Disclosure of source and geographical origin of biological material made compulsory.

Provisions concerning convention countries simplified.

Establishment of Appellate Board.

Compulsory license provisions strengthened.

Simplification of procedures.

Harmonization with Patent Cooperation Treaty (PCT) provisions.

Patents (Amendment) Act, 2005 : With the rapidly changing scenario of IPR at a global level, a need was felt to further amend the Patent Act, 1970. The highlight of the Patents (Amendments) Act 2005 were:

Product patent for inventions in all fields of technology.

New forms of known substances excluded to prevent evergreening of the patent.

Rationalization of the opposition procedure.

Introduction of pre-grant opposition by representation.

Introduction of post-grant opposition.

Compulsory license for export purposes.

Compulsory license for manufacture.

Extension of grace period from 6 months to 12 months for filing a patent, if published in government exhibition.

International Agreements : India is a member of all prominent Conventions and Treaties related to the facilitation of the inventors for international filing and protecting the rights over the inventions globally. The important international agreements to which India is a signatory party are TRIPS Agreement (1995), Paris Convention (1883), PCT (1970) and Budapest Treaty (1977) and many more.

3.6.2   History of Copyrights and Related Rights :

The concept of copyrights started way back in the 15th century. However, the actual need for copyright law was felt only after the invention of printers and copiers. Before the invention of printers, writing could be created only once. It was highly laborious, and the risk of errors was involved in the manual process of copying by a scribe.

During the 15th and 16th centuries, printing was invented and widely established in Eu- rope. Copies of 'Bibles' were the first to be printed. The government had allowed the printing of the documents without any restrictions, but this led to the spreading of a lot of governmental information. Subsequently, the government started issuing licenses for printing.

Phases of Copyrights Law in India: The evolution of copyright law in India oc- curred in three phases. The first two phases were enacted during the British Raj.

1. **First Phase (1847) :** In the first phase, the concept of copyrights was introduced in 1847 through an enactment during the East India Company's regime. The term of copyrights was for the lifetime of the author plus seven years after death. Unlike today, copyrights in work were not automatic. The registration of copyright was mandatory for the enforcement of rights under the Act. The government could grant a compulsory license to publish a book if the owner of the copyright, upon the death of the author, refused to allow its publication.

2. **Second Phase (1914):** In the second phase, the Indian legislature, under the British Raj, enacted the Copyright Act of 1914 based on the Imperial Copyright Act (1911) of the UK. An Act for criminal sanction for an infringement was introduced.

3. **Third Phase (1957) :** The third phase of the copyrights regime was witnessed post-independence. The Copyright Act 1957 was enacted, superseding the Indian Copyright Act, 1914, to suit the provisions of the Berne Convention (1886). The 1957 Act has been amended six times (1983, 1984, 1992, 1994, 1999, 2012) to comply with the WIPO Copyright Treaty (WCT), 1996, and WIPO Performances and Phonograms Treaty (WPPT), 1996.

Evolution of Copyright Laws in the Digital Age: Most of the amendments in copyright laws were in the digital environment, such as penalties for circumvention of technological protection measures; rights of management information; liability of internet service providers; introduction of statutory licenses for the cover versions (the cover version is a re-recording or re-composition of the original song by other artists or composers and is also termed as a remake, cover song, revival, etc.) and broadcasting organizations; ensuring the right to receive royalties for authors and music composers; exclusive economic and moral rights to performers; equal membership rights in copyrights societies for authors and other right owners and exception of copyrights for physically disabled to access any works.

India is an active member of nearly all significant international Conventions/Treaties related to Copyright Law, e.g., the Berne Convention as modified in Paris in 1971, the Universal Copyright Convention (1951), the Rome Convention (1961), WCT, WPPT, and (TRIPS, 1995).

3.6.3   History of Trademarks (TM):

The first statutory law related to Trademarks (TM) in India was the Trade Marks Act, 1940, which was carved out from the Trade Marks Act, 1938 of the UK. It was followed by

the incorporation of provisions of TM stated in the Indian Penal Code, Criminal Procedure Code, and the Sea Customs Act. Later on, Trade Marks Act, 1940 was rechristened as Trade and Merchandise Marks Act, 1958. Nearly four decades later, this Act was repealed by the Trade Marks Act, 1999. The need for this occurred to comply with the provisions of the TRIPS. It is the current governing law related to registered TM.

3.6.4   History of Geographical Indications:

India, as a member of WTO, enacted the Geographical Indications of Goods (Registration and Protection) Act, 1999. It came into force with effect from 15th September 2003. Geographical Indicators have been defined under Article 22 (1) of the WTO Agreement on TRIPS.

3.6.5   History of Trade Secrets

In India, Trade Secrets are protected despite the absence of specific laws dedicated to them. Courts have recognized and upheld Trade Secrets protection through different statutes(laws) like contract law, Copyright law, principles of equity, and the common law action of breach of confidence, effectively treating it as a breach of contractual obligation.

3.6.6   History of Semiconductor Integrated Circuits and Layout Designs

In the 21st century, Information Technology (IT) has revolutionized the economic and societal growth of the world economy. The rapid and tremendous scientific advancements in the field of IT resulted in the creation of a new class of IP called the Layout-Design of the Semiconductor Integrated Circuits.

International Regulations : Various organizations, including WTO and TRIPS Agree- ment, laid down rules and regulations regarding the protection of Semiconductor Integrated Circuits and Layout Designs (SICLD).

SICLD Act, 2000: India, being a member of the WTO, also passed an Act called the SICLD Act, 2000. This Act is TRIPS compliant and fulfills the conditions of the

TRIPS agreement (Articles 35 to 38) concerning the protection of SICLD.

3.6.7 History of Plant Varieties

Plant Varieties: Historical Overview : Till the 1970s, not much emphasis was laid on patentable matter originating from animals and plants. However, microbes and microbial products/processes were patentable.

Introduction of Sui Generis Law : To include all kinds of biological materials under the ambit of patent laws, a decision to enact a new sui generis law under the International Convention for the Protection of New Varieties of Plants (UPOV, 1978) and UPOV, 1991 was taken. These decisions were made to address environmental and public interest con- cerns.

PPV&FR Act, 2001: Compliance with TRIPS
The Indian Patents Act, 1970 excludes "plants and animals in whole or any part thereof other than microorganisms" from patentability. To comply with the mandate of Arti- cle 27.3 (b) of TRIPS, India adopted the PPV&FR Act, 2001 as a sui generis regime protecting not only new plant varieties but also farmers' rights.

3.6.8 History of Traditional Knowledge :

Definition: Traditional Knowledge (TK) is the ancient and indigenous knowledge held by any community or a group of people. In olden times, it was not recorded anywhere and was available only in oral form. So, Traditional Knowledge (TK) was verbally passed on to future generations.

Scope: TK is not limited to a particular field. It covers a wide area, such as the use of plants or their extracts for medical treatments, a traditional form of dance, particular techniques used for hunting, craft knowledge/skills, and so on.

Transmission: Though there is no official record, some forms of TK find appearance in the culture, stories, legends, folklore, rituals, songs, etc. Previously, there was no mech- anism available to protect TK, but now, it has been recognized as Intellectual Property Rights (IPR) under the TRIPS Agreement.

Government Initiative: The Government of India has created a digital library termed as Traditional Knowledge Digital Library (TKDL) as a repository of 2,50,000 formulations

of various systems of Indian medicine.

3.6.9 History of Industrial Design Protection

A design is a creation of the human mind, which is appealing to the eyes and attracts the attention of the viewers. The need to protect Industrial Designs (ID) was recognized in the 18th century, leading to the enactment of the 'Patterns and Designs Act' in 1872 for the first time.

Transition Period: 1872 to 1911
The 'Patterns and Designs Act' of 1872 aimed to protect the rights over the creation of designs and novel patterns by inventors. However, in 1907, this Act was replaced by the British Patents and Designs Act, laying the foundation for the Indian Patents and Designs Act, 1911.

Separation of Acts: 1970
In 1970, a significant development occurred with the enactment of a separate Act for patents, namely the Patent Act, 1970. The Indian Patents and Designs Act, 1911, continued to govern designs exclusively.

Dedicated Act for Industrial Designs: 2000
Finally, in the year 2000, recognizing the distinct nature of Industrial Designs, a dedicated Act for ID was passed. This Act came into force in 2001, marking a crucial milestone in the protection of industrial designs in India.

3.6.10 History of Biodiversity Conservation

Biodiversity is an inseparable part of human livelihood, with mentions of protecting biodiversity dating back to the times of Chandragupta and Ashoka. In those eras, trees and forests were classified, establishing reserved categories.

Evolution of Legal Protection
In 1927, the 'Indian Forest Act' was a significant step towards legal protection for biodiversity. Later, the 'Wildlife Protection Act, 1972' was enacted, further strengthening legal safeguards.

National Forest Policy of 1988

The year 1988 saw the enactment of the 'National Forest Policy' bringing revolutionary changes in the conservation and management of biodiversity in India.

Acts and Policies for Environmental Protection

Several Acts and policies are in force to protect the environment and biodiversity in India. These include the 'Mining and Mineral Development Regulation Act, 1957, 'Water (prevention and control of pollution) Act, 1974, 'Forest Conservation Act, 1980', 'Biological Diversity Act, 2002', 'Scheduled Tribes and other Traditional Forest Dwellers (recognition of rights) Act, 2006, 'National Biodiversity Action Plan, 2009, 'National Environment Policy, 2006', and more.

3.7 Major Amendments in IP Laws and Acts in In- dia:

In order to fill the gaps existing in the IP Laws and Acts and also to introduce new guidelines/directions based on the current scenario (socially and politically), each nation keeps on updating the concerned IP Laws and Acts. Some of the salient amendments made in Indian Laws and Acts on IPR are mentioned below :

Patents

1. **1856:** The Act VI of 1856 on the protection of inventions based on the British Patent Law of 1852.

2. **1859:**

   Rights renamed as 'Exclusive Privileges.'

   Time for priority increased from 6 months to 12 months.

3. **1883:**

   The Patterns and Designs Protection Act.

   Introduction of novelty in the invention.

   A grace period of 6 months for the disclosure of the invention.

4. **1911:** Renamed as 'The Indian Patent and Design Act' and brought under the management of 'Controller of Patents.'

5. **1930:**

   Introduction of Patent of Addition.

   Government can use the invention if required.

   The term of patent protection increased from 14 to 16 years.

6. **1945:**

   Filing of the provisional specification to secure the priority date.

   Provision of submitting complete specifications within 9 months.

7. **1949:** Dedicated Committee formed under the leadership of Justice Bakshi Tek Chand for reviewing the patent system as per the national environment.

8. **1950:**

   A working statement needs to be submitted at the Patent Office.

   Endorsement of the Patents with the words 'License of Right' on the application made by the government so that the Controller could grant the license.

9. **1952:**

   Provision of 'Compulsory License' in the areas of food, medicine, and insecticide germicide.

   Process for producing substance or any invention relating to surgical or curative devices.

10. **1965:** After incorporation of the recommendation submitted by the committee formed in 1949, a new bill was introduced in Lok Sabha but was not cleared.

11. **1967:**

    Again submitted to Parliamentary Committee.

    1911 Act remained applicable for Designs.

12. **1970:** The Patent Act, 1970 passed by the Parliament Committee.

13. **1972:** The Patent Act, 1970 came into force with the introduction of patent rules.

14. **1995:** TRIPS Agreement was signed by India and got a transition period 1995-2005 to make domestic laws compatible with TRIPS.

15. **1999:**

Introducing the provisions for receiving the applications for the product patent in the field of pharmaceuticals and agro-chemicals (mailbox).

Provisions for the grant of EMRs for distribution and sale of pharma products on fulfillment of certain conditions.

Grant of EMR subject to certain conditions. (After the amendments (1999), the product patents related to the pharmaceuticals and agrochemicals were kept on hold for examination till 2005. It is called a mailbox or black box.)

16. **2002:**

The uniform 20-year term of the patent for all inventions.

Disclosure of source and geographical origin of biological material made compulsory.

Establishment of Appellate Board.

Compulsory License provisions strengthened.

17. **2003:** The Patents Rules, 2003 were introduced.

18. **2005:**

Product patent for inventions in all fields of technology, including food, drug, chemicals, and microorganisms.

New forms of known substances excluded to prevent the ever-greening of the patent.

Introduction of pre-grant opposition.

Introduction of post-grant opposition.

Extension of grace period to 12 months.

Copyrights and Related Rights

19. **1847:**

The concept of Copyrights in India was introduced.

Validity - Lifetime+7 years but not more than 42 years in total.

20. **1914:** Copyright Act, 1914 was introduced based on the Imperial Copyright Act, 1911 of the UK.

21. **1957:** Copyright Act, 1914 was replaced with Copyright Act, 1957 with minor modifications.

22. **1984:** Penalty on second and subsequent conviction.

23. **1994:** Registration of Copyright Society made mandatory.

24. **2012:**

To comply with international Treaties for copyrights protection in the digital environment.

Right to receive royalties for authors and music composers.

Exception of copyrights for physically disabled persons to access any work.

25. **2013:** Copyrights Rules, 2013 introduced.

Trademarks

26. **1940:** Trademarks Registry established in India.

27. **1958:** The Trade and Merchandise Marks Act, 1958 enacted as per TRIPS Agree- ment.

28. **1999:** Amended to avoid duplicity and ensure securing proprietors' trade and good-will.

29. **2002:** Trademarks Rules introduced.

30. **2010:**

Amended to comply with Madrid Protocol for international filing.

Provision for filing opposition of the registration within 4 months.

31. **2013:** Trademarks Rules introduced.

Geographical Indications

32. **1999:** Being a member of the World Trade Organization (TRIPS), GI of goods (Registration and Protection) Act was introduced.

33. **2002:** The Geographical Indications of Goods (Registration and Protection) Rules, 2002 was introduced.

34. **2003:** The Geographical Indications of Goods (Registration & Protection) Act came into force.

Designs

35. **1872:** Patterns and Designs Protection Act introduced for the protection of new patterns and designs.

36. **1888:** Amended as Invention and Design Act, 1988 for the protection of new inventions and designs.

37. **1911:** Renamed as The Indian Patent and Design Act.

38. **2000:** Design Act, 2000 was introduced; separated from the Indian Patent and Design Act.

39. **2001:** Design Rules, 2001 introduced.

Semiconductor Integrated Circuits Layout Design (SICLD)

40. **2000:** Semiconductor Integrated Circuits Layout Design (SICLD) Act 2000 intro- duced as a signatory of WTO.

41. **2001:** SICLD Rules introduced.

Protection of Plant Varieties and Farmers' Rights (PPV&FR)

42. **1970:** The Patent Act, 1970 excluded plants and animals in whole or in any part from patentability (in 1999 amendments).

43. **1991:** Enactment of protection of new varieties of plants on a sui generis basis on the lines of UPOV.

44. **2001:** In line with TRIPS Agreement enactment of PPV&FR Act was introduced.

Biological Diversity

45. **2002:** The Biological Diversity Act, 2002 introduced on the lines of the Convention on Biological Diversity (CBD, 1992).

46. **2003:**

   Establishment of National Biodiversity Authority.

   Designation of repositories under the Biological Diversity Act.

47. **2004:** Biological Diversity Rules introduced.

CATEGORIES OF INTELLECTUAL PROPERTY

Intellectual Property (IP) is a vast field comprising technology-led inventions, work of artisans, novel Industrial Designs, unique brands of commercial items, and Traditional Knowledge being practiced continuously over centuries for the production of goods (carpets, textiles, food products, etc.). In order to understand the extensive field of IP, it has been divided into various categories. In India, these categories include:

   Patents

   Copyright and Related Rights

   Trademark

   Trade Secrets

   Industrial Designs

   Geographical Indications

   Semiconductor Integrated Circuits Layout Designs

3.8 Patents

A patent is an exclusive right granted for an innovation that generally provides a new way of doing something or offers a new technical solution to a problem. The exclusive right legally protects the invention from being copied or reproduced by others. In return, the invention must be disclosed in an application in a manner sufficiently clear and complete to enable it to be replicated by a person with an ordinary level of skill in the relevant field.

3.9 Conditions for Obtaining Patent Protection

There is a set criterion, as provided in Section 2(1)(j) of the Patents Act, 1970, which must be fulfilled for a product or a process to qualify for the grant of a patent. The criterion encompasses:

Novelty - Not part of 'State of the Art'. The innovation claimed in the patent application is new and not known to anybody in the world. In other words, the innovation is a) not in the knowledge of the public, b) not published anywhere through any means of publication, and c) not claimed in any other specification by any other applicant.

Inventive Step - Not obvious to the person(s) skilled in the art. The innovation is a) a technical advancement over the existing knowledge, b) possesses economic significance, and c) not obvious to a person skilled in the concerned subject.

Capable of Industrial Application - For the benefit of society. The invention is capable of being made or used in any industry.

3.10 To Patent or Not to Patent an Invention

Once an invention has been developed, the inventor has to decide whether to exploit the invention for personal benefits as provided by the statutory laws of the country or put it in the public domain. By and large, the inventor prefers the former option. Only a minuscule of inventions are placed in the public domain without claiming any benefits. In the latter case, anybody can exploit the innovation for commercial or societal benefit

without paying any money to the inventor.

If the owner of an invention wishes to seek monetary gains, he can choose from either of the two options, i.e. patenting or Trade Secret. If the inventor is absolutely sure of maintaining the secrecy of the invention for a very long period (maybe 100 years or more) and the probability of reverse engineering of the technology is nil or very low, then the 'Trade Secret' category is preferred. If the invention has a short life span or can be kept secret only for a small period of time (a couple of years or so) or the probability of reverse engineering is high once the invention is in the public domain, then the 'patent' category is preferred.

3.11   Rights Associated with Patents

As per the Court of Law, a patent owner has the right to decide who may or may not use the patented invention. In other words, the patent protection provided by the law states that the invention cannot be commercially made, used, distributed, imported, or sold by others without the patent owner's consent. The patent owner may permit other parties to use the invention on mutually agreed terms. As a matter of fact, the patent rights are negative rights as the owner is restricting others from using the patent in any manner without his prior permission. The patent holder may choose to sue the infringing party to stop illegal use of the patent and also ask for compensation for the unauthorized use.

3.12   Enforcement of Patent Rights

Enforcement is the process of ensuring compliance with laws, regulations, rules, standards, and social norms. Patent rights are usually enforced by the judicial courts. The Court of Law has the authority to stop patent infringement. However, the main responsibility for monitoring, identifying, and taking action against infringers of a patent lies with the patent owner.

3.13   Inventions Eligible for Patenting

Range of Patentable Inventions: Patents may cover inventions in diverse fields, from everyday items like paper clips to advanced technologies such as nanotechnology chips or genetically modified organisms.

Misconceptions about Patent Awards: Contrary to common belief, patents are not exclusive to major scientific breakthroughs. Many patents are granted for incremental improvements over existing inventions.

Examples of Patentable Molecules: Single molecules, like penicillins, and their derivatives can receive multiple patents. These derivatives, achieved through structural modifications, exhibit new and improved properties.

Everyday Products with Patents: Various everyday products, including toothbrushes, shoes, pens, eyeglasses, textiles, and electronic devices, often incorporate patented technologies. Complex products like laptops, cars, and mobile phones may involve numerous patented components.

3.14   Non-Patentable Matters

The Patent Act, 1970 outlines certain exclusions regarding products and processes that are not eligible for patents. These exclusions include:

Inventions Contrary to Public Morality: Examples: Methods for human cloning, methods for gambling. **Mere Discovery**
Examples: Discovery of a new micro-organism occurring freely in nature, laws of gravity.

Discovery of a New Form of a Known Substance
Examples: Use of aspirin for heart treatment, which was originally patented for reducing fever and mild pains.

Frivolous Invention
Examples: Dough supplemented with herbs merely changing the taste, a 100 years calen- dar, bus timetable.

Arrangement or Rearrangement Examples: An umbrella fitted with a fan, a torch attached to a bucket.

Inventions falling within Section 20(1) of the Atomic Energy Act, 1962
Examples: Inventions related to compounds of Uranium, Beryllium, Thorium, Plutonium, Radium, Graphite, Lithium, and more as notified by the Central Government.

Literary, Dramatic, Musical, Artistic Work
Examples: Books, sculptures, drawings, paintings, computer programmes, mathematical calculations, online chatting method, method of teaching, method of learning a language, as they fall under the Copyright Act, 1957.

Topography of Integrated Circuits
Protection of layout designs of integrated circuits is provided separately under the Semi-conductor Integrated Circuit Layout Designs Act, 2000.

Plants and Animals
Plants and animals in whole or in part, including seeds, varieties, and species, along with essentially biological processes for the production or propagation of plants and animals, are excluded from patent protection.

Traditional Knowledge An invention that effectively represents traditional knowledge or is an aggregation or duplication of known properties of traditionally known components is also excluded.

3.15 Patent Infringements :

Once a patent is granted to the applicant, they gain the exclusive right to use or exploit the invention in any capacity. Unauthorized use of the invention without prior permission from the owner constitutes patent infringement. Infringements can be categorized into two types:

Direct Infringement: Occurs when a product is substantially close to any patented product or when the marketing or commercial use of the invention is carried out without the owner's permission.

Indirect Infringement

Occurs when some amount of deceit or accidental infringement happens without any intentional infringement.

In case of patent infringement, the patentee has the right to sue the infringer through judicial intervention. Countries have specific laws to address such unlawful acts, and the patentee may seek the following reliefs:

Interlocutory/Interim Injunction

Damages or Accounts of Profits

Permanent Injunction

It is essential to note that the Central government retains the right (Section 100 of the Patent Act, 1970, Rule 32 of the Patent Rules, 2003) to use the invention in cases of national emergency or other circumstances of extreme urgency after notifying the owner.

3.16   Avoid Public Disclosure of an Invention before Patenting

Generally, an invention that has been either published or publicly displayed cannot be patented, as the claimed invention will lose the 'Novelty' criterion. However, under certain circumstances, the Patents Act provides a grace period of 12 months for filing a patent application from the date of its publication in a journal or presentation in a reputed scientific society or exhibition.

Sometimes, disclosure of an invention before filing a patent application is unavoidable, for example, selling your invention to a potential investor or a business partner who would like to know complete details of the invention to judge its commercial value. In such cases, it is advisable to sign a Non-Disclosure Agreement (NDA) or any other confidential agreement to safeguard your interest.

3.17 Process of Patenting :

In India, the process of granting a patent is a lengthy procedure that may take anywhere from 3-4 years or more. The major steps involved in this process are:

1. Prior art search,

2. Choice of Application to be Filed,

3. Patent Application Forms,

4. Jurisdiction of Filing Patent Application,

5. Publication,

6. Pre-grant Opposition,

7. Examination,

8. Grant of a Patent,

9. Validity of Patent Protection,

10. Post-grant Opposition.

Some major steps involved in this process are listed in the following figure.

Filing of Application with IPO
https://ipindiaonline.gov.in/ePatentfiling/goForLogin/doLogin

Publishing

Examination
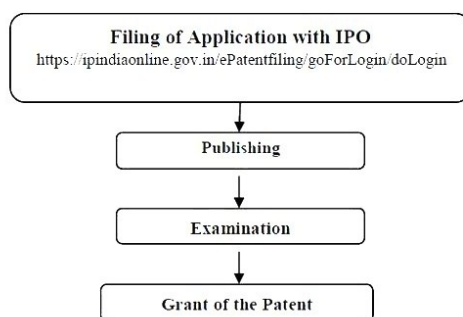
Grant of the Patent

1. Prior Art Search:

Before an inventor embarks upon the patent filing process, he has to ensure that his invention is 'novel' as per the criterion for the grant of a patent. For this, he has to check whether or not his invention already exists in the public domain. For this, he needs to read patent documents and Non-Patent Literature (NPL), scientific journals/reports/magazines, etc. The information lying in the public domain in any form,

either before the filing of the patent application or the priority date of the patent application claiming the invention, is termed as Prior Art.

Conducting a prior art search before filing the patent has advantages as it averts infringement, tracks research and development, and provides access to detailed information on the invention. The prior art search is carried out on the parameters such as novelty, patentability, state of the art, infringement, validity, and freedom to operate. The com- monly used databases for prior art search fall into two categories: Patents Databases and NPL.

Patents' Databases :

Indian Patent Advanced Search System (InPASS- http://ipindiaservices.gov.in/publicsearch/).

Patentscope (WIPO- https://www.wipo.int/patentscope/en/).

Espacenet (EU- https://worldwide.espacenet.com/patent/).

USPTO (USA- https://www.uspto.gov/).

Google Patents Advanced Search (https://patents.google.com/advanced).

Orbit Intelligence (https://www.questel.com/business-intelligence-software/orbit-intelligence/).

Derwent Innovation (https://clarivate.com/derwent/solutions/derwent-innovation/).

PROQUEST (https://about.proquest.com/search/?searchKeyword=patent+).

Non-Patent Literature (NPL):

Scholarly publications: Handbooks, Textbooks, Withdrawn Patents, Encyclopedias, Journals (IEEE, Research Gate, Springer, Wiley Online Library, etc.), Dissertations, NCBI's PubMed, Conference Proceedings, Technical Reports, Public Conferences, etc.

Industry/trade publications: Industry reviews and public disclosures (Social media, YouTube, Books, Magazines, Datasheets, Blueprints, etc.).

Others: Newspapers, Websites, Technology blogs, Researchers' websites, etc.

Although the majority of NPL data is available freely on the public forum, some of the journals are paid and can be accessed after paying the subscription. Major Patent Offices such as the United States Patent and Trademark Office's (USPTO), European Patent Office (EPO), Japan Patent Office (JPO), etc. are maintaining in-house NPL databases to make patents examination more effective.

2.Choice of Application to be Filed - Once a decision has been made to patent the invention, the next step is, what kind of application needs to be filed i.e. provisional patent application or complete (Final) patent application - generally, the provisional patent application is preferred for the following reasons:

It is cheaper, takes less time, and involves fewer formalities.

Any improvements made in the invention after the filing of the provisional application can be included in the final application. In other words, the provisional application does not require complete specifications of the inventions. The application can be filed even though some data is yet to be collected from pending experiments.

A provisional application allows you to secure a priority date for the patent applied.

However, it is mandatory to file the complete patent application within one year of the filing of the provisional application; otherwise, the application stands rejected.

3. Patent Application Forms:

As per the Patent Act, 1970 (Section 39) and the Patents Rules, 2003 (Rule 7, 54, 135 and subrule (1) of rule 20, the application for the grant of patent is filed using Form-1 and Form-2.

The information sought in Form-1 is general in nature i.e. Title of Application, Names of Applicant(s) and Inventor(s), Type of Application (Ordinary, Convention, PCT-NP (PCT- National Phase), Divisional, Patent of Addition, etc.).

Whereas Form-2 seeks technical information and whether to file the provisional application or complete the application.

For 'Provisional Application', only 'Description of the Invention' and the 'Abstract' is to be furnished. Whereas, 'Complete Application' requires 'Description of the Invention', 'Abstract', 'Claims' and the manner in which invention has to be per- formed.

The '**Claims**' of the patent are a very crucial part of the specifications because they define the actual boundary of the invention.

'Claims' specify what is actually claimed by the invention and what is being sought to be protected. It clearly describes what the patent does and does not cover.

The Claims are usually expressed as a declaration of technical particulars articulated in legal terms.

Claims can be classified into two types
a) Independent Claims (stand alone claim) and
b) Dependent Claims (dependent on independent claim).

The Claims must be drafted precisely and carefully in order to seek patent protection and also to protect the invention against potential infringers.

4. Jurisdiction of Filing Patent Application

India has four offices for filing patent applications(Refer the following table).

The applications can be filed only in one of the offices based on the applicant's residence or domicile or place of business or origin of the invention. These are termed as jurisdictions to file patents.

Region/Office	Territorial Jurisdiction
West Region : Patent Office Branch, Mumbai	The States of Maharashtra, Gujarat, Madhya Pradesh, Goa and Chhattisgarh and the Union and the Territories of Daman and Diu & Dadra and Nagar Haveli
South Region :Patent Office Branch, Chennai	The States of Andhra Pradesh, Karnataka, Kerala, Tamil Nadu, Telangana and the Union and the Territories of Pondicherry and Lakshadweep
North Region :Patent Office Branch, New Delhi	The States of Haryana, Himachal Pradesh, Punjab, Rajasthan, Uttar Pradesh, Utarakhand, Delhi and the Union Territory of Chandigarh, Jammu and Kashmir and Ladakh.
Patent Office,Kolkata	The rest of India.

For a foreign applicant, the address for service in India or place of business of his patent agent determines the appropriate Patent Office for filing a patent application.

In the case of joint applications, all the applicants are bestowed with equal rights and consideration.

5. Publication:

Once the patent application has been filed at the Regional Patent Office, the patent application is kept secret for 18 months in the Patent Office.

After the expiry of 18 months (from the date of filing of the application or the priority claimed date, whichever is earlier), the application is published in the Official Journal of Patent Office (http://www.ipindia.nic.in/journalpatents.htm).

The purpose of publishing the application is to inform the public about the invention. The publication of an application is a mandatory step.

6. Pre-grant Opposition:

If anybody has an objection to the invention claimed in the patent application, he can challenge the application by approaching the Controller of Patents within 6 months from the date of publication. It is termed as Pre-grant Opposition.

Depending on the outcome of the case, the patent application may be rejected or recommended for the next step, i.e. patent examination.

Although the patent application is kept secret for 18 months, under special circumstances, this period can be reduced when the patentee(A person/Organization who owns the patent (granted))/applicant plans to sell or license the patent or seek an investor.

For this, the applicant has to fill a Form-9 and submit it to the Controller General.

7. Examination:

Patent examination is a critical step in the process of grant of a patent. All the important criteria (novel, inventive step, etc.) are scrutinized by the professionals depending on the content of the invention.

Usually, the examiner raises certain queries/doubts which need to be addressed by the inventors. Once the examiner is satisfied with the answers received from the inventors, the application is recommended for the grant of a patent.

It is pertinent to mention that a patent application is not examined automatically after clearing the publication stage.

The applicant or his representative has to make a request for examination of the patent by filing Form-18A and submitting the same within 48 months from the date of filing of the application.

8. Grant of a Patent:

After fulfilling all the requirements for the grant of a patent, including all objections/queries raised by the 'Patent Examiner' and the public at large, the patent is granted to the applicant.

The granted patent is published in the Official Journal of the Patent Office.

This journal is published every Friday and contains information related to patent applications published under section (u/s) 11A, post-grant publication, restoration of patent, notifications, list of non-working patents and public notices issued by the Patent Office.

9. Validity of Patent Protection:

The patent protection is granted to an applicant for a limited period, generally 20 years, starting from the date of filing of the application.

Once a patent is granted for an invention in India, the next vital step is to ensure that it is renewed annually by paying Patent Renewal Fee as per Section 53, Rule 80 of the Indian Patents Act, till the expiry of the patent grant period. Non-payment of Patent Renewal Fee might result in the cancellation of the patent.

In some countries, patent protection may be extended beyond 20 years. The extension aims to compensate for the time expended on the administrative approval procedure before products can be put on the market.

The time taken for this procedure means that the patent owner may sometimes not be able to benefit from his right for a considerable period after the grant of the patent.

10. Post-grant Opposition : Once the patent has been granted by the Patent Office, it still can be challenged by anyone within one year from the date of publication of the grant of the patent. The granted patent can be challenged either via a Patent Office or

in a Court of Law. These bodies may invalidate or revoke a patent upon a successful challenge by the interested party on the grounds mentioned below :

The applicant for the patent wrongfully obtained the invention or any part of the invention.

The invention claimed has been published before the priority date.

The invention claimed was publicly known/used before the priority date.

The invention claimed is obvious and does not involve an inventive step.

The subject of the claim is not patentable as per Chapter II of the Patent Act, 1970.

The details/specifications of the invention do not sufficiently and clearly describe the invention.

3.18 Commercialization of a Patent :

The patent owner may grant permission to an individual/organization/industry to make, use, and sell his patented invention. This takes place according to agreed terms and conditions between the involving parties.

A patent owner may grant a license to a third party for the reasons mentioned below:

- The patent owner has a decent job (e.g., university professor) and has no desire or aptitude to exploit the patent on his own.
- The patent owner may not have the necessary manufacturing facilities.
- The manufacturing facility is not able to meet the market demand.
- The patent owner wishes to concentrate on one geographic market; for other geographical markets, he may choose to license the patent rights.

Once the patent is granted, the patentee (person holding the rights to the patent) enjoys the exclusive rights to use the patented invention.

Only the patentee has the right to license or deal with the patent for any deliberations. Although the validity of the granted patent is for 20 years (from the date of filing a patent application), the patentee is required to furnish information (Form-27) annually relating to the commercialization/selling of the patent. It is called as 'Working/Licensing of the Patent'.

The licensing of a patent can be exclusive or non-exclusive.

In an **Exclusive Licence**, the patent is sold to only one individual/organization for a fixed time period. During this time period, no other person or entity can exploit the relevant IP except the named licensee.

In a **Non-Exclusive Licence**, a patentee can sell his patent rights to as many individuals/parties as he likes.

If the patentee is not able to commercialize his patent within three years from the date of the grant of a patent, any person may submit an application to the Controller of Patents for the grant of **Compulsory Licensing** (of the patent), subject to the fulfillment of the following conditions:

- Reasonable requirements of the public concerning the patented invention have not been satisfied.

- The patented invention is not available to the public at a reasonable price.

- The patented invention is not worked in the territory of India.

3.19 Need for a Patent Attorney/Agent

In general, applicants can prepare their patent applications and file them without assistance from a patent attorney.

However, given the complexity of patent documents, it is advisable to seek legal assistance from a patent attorney/agent when drafting a patent application.

Furthermore, the legislation of many countries requires that an applicant, whose ordinary residence or principal place of business is outside the country, be represented by an attorney or agent qualified in the country (which usually means an agent or attorney who resides and practices in that country).

3.20 Can a Worldwide Patent be Obtained

There is no such term as 'Universal Patent' or 'World Patent' or 'International Patent' as the patent rights are territorial.

An application for a patent must be filed with a Patent Office of the country in which one wishes to seek patent protection. Unfortunately, this option becomes laborious, cumbersome, timeconsuming and expensive if one wishes to file a patent application in many countries.

To ease out this issue, many Regional Offices have been established which receive patent applications on behalf of a group of nations e.g. European Patent Office and African Regional Intellectual Property Organization.

A single application is sufficient to cover many nations that are members of a particular regional office/organization.

However, if one wishes to seek patent protection in several countries worldwide, it is preferred to file an international patent under the Patent Cooperation Treaty (PCT).

The only condition is that the applicant's country should be a member of PCT. India, along with over 190 nations, is a member of PCT.

3.21   Do I Need First to File a Patent in India

Yes, in general, Indian residents are required to file the patent application first in India. Subsequently, they may file for patent protection in other countries. However, prior approval is needed from the Patent Office. This approval can be waived off under the following circumstances:

The applicant is not an Indian resident.

If 6 weeks have expired since the patent application was filed in India by an Indian resident.

If two or more inventors are working on an invention in a foreign country and one of the inventors is an Indian resident. The invention does not have a potential market in India, and hence the Indian resident seeks Foreign Filing Permission (FFP) from an Indian Patent Office.

In case of international collaboration, if one part of the invention originated in India and the inventor is an Indian resident, he has to seek permission to file the patent outside India.

If the invention is related to defense or atomic energy or utility model, the inventor(s) need to seek permission from the Indian Patent Office because inventions related to these domains are not the subject matter of patentability in India.

3.22   Patent Related Forms :

There are over 30 patent-related forms. Some of Important Patent Application Forms are mentioned below.

Form No.	Title of Form
1	Application for a grant of a patent
2	Provisional/Complete specifications
7	Notice of opposition on grant of a patent
7A	For filing a representation opposing grant of a patent
17	Application for compulsory license
18	Request for examination of the application for patent
21	Request for termination of compulsory license
22	Application for registration of patent agent
27	Statement regarding the working of the patented invention on a commercial scale in India
30	Miscellaneous form to be used when no other form is prescribed

3.23   Fee Structure

As per the Patent Act, 1970, and The Patents Rules (1972), the requisite fee has been specified based on the type of form/s to be submitted to the Office (See the Table). Electronically filed applications are 10% cheaper than physical filing.

Item	Natural Person/Startup (Rupees)	Small Entity Alone or with Natural Person/Startup (Rupees)	Others Alone or with Natural Person/Startup/Small Entity (Rupees)
Provisional/Complete Specifications	1,600	4,000	8,000
Request for Early Publication	2,500	6,250	12,500
Request for Examination	4,000	10,000	20,000
Express Request for Examination	5,600	14,000	28,000
Renewal Fees (Annually) 3rd to 6th Year 6th to 10th Year 11th to 15th Year 16th to 20th Year	800 2,400 4,800 8,000	2,000 6,000 12,000 20,000	4,000 12,000 24,000 40,000

3.24   Types of Patent Applications:

Provisional Application - A patent application filed when the invention is not fully finalized and some part of the invention is still under experimentation. Such type of application helps to obtain the priority date for the invention.

Ordinary Application - A patent application filed with complete specifications and claims but without claiming any priority date.

PCT Application - An international application filed in accordance with PCT. A single application can be filed to seek patent protection and claim priority in all the member countries of PCT.

Divisional Application - When an application claims more than one invention, the applicant on his own or to meet the official objection on the ground of plurality may divide the application and file two or more applications. This application divided out of the parent one is known as a Divisional Application. The priority date for all the divisional applications will be the same as that of the main (the Parent) Application (Ante-dating).

Patent of Addition Application - When an invention is a slight modification of the earlier invention for which the patentee has already applied for or has obtained a patent, the applicant can go for 'Patent of Addition', if the modification in the invention is new. Benefit - There is no need to pay a separate renewal fee for the 'Patent of Addition', during the term of the main patent. It expires along with the main patent.

Convention Application - If a patent application has been filed in the Indian Patent Office, and the applicant wishes to file the same invention in the one or more Convention countries (e.g., Paris Convention) by claiming the same priority date on which the application was filed in India, such an application is known as Convention Application. The applicant has to file Convention Application within 12 months from the date of filing in India to claim the same priority date.

3.25   Commonly Used Terms in Patenting

There are certain terms that are commonly used in the field of patenting, as listed in following table.

Sl. No.	Term	Definition
1	Inventor	Creator of an invention
2	Applicant	Organization/individual/industry that files a patent application or applies for a patent
3	Patentee	A person/organization who owns the patent (granted)
4	Licensee	Organization/individual/industry which obtains a license of the patent from the Patentee for commercialization purpose
5	Assignee	A person in whose name patent has been assigned legally
6	In force	The applicant is paying the annuity (renewal fee) for the patent to keep it alive (Active Patent)
7	Working of a Patent	The selling of a patent to an individual/party for commercial exploitation is called the working of a patent
8	Patent Specification	Written description of the invention and the way of representation and process of making and using the same

9	Priority Right	A time-limited right, activated by the first filing of an application for a patent
10	Priority Date	The claimed date on which the first application for the invention is filed
11	Patent Claims	The scope of the protection conferred by a patent, or the protection sought in a patent application. The purpose of the claims is to define which subject matter is protected by the patent
12	National Phase Application	An application filed to obtain patents in different countries simultaneously based on a single International/PCT application
13	Patent Revocation	Cancellation of the patent due to certain reasons, such as lack of patentability or wrongfully obtaining a patent
14	Restoration of Patent	Once a patent has ceased (e.g., due to non-payment of the fee), it can be restored within a permitted period by paying the requisite fee

3.26   National Bodies Dealing with Patent Affairs:

There are many departments/organizations/bodies dealing with various aspects of patents, namely:

1. **The Indian Patent Office (IPO):** The Office of the Controller General of Patents, Designs and Trade Marks generally known as the Indian Patent Office, is an agency under the Department for Promotion of Industry and Internal Trade which administers the Indian law of Patents, Designs and Trade Marks.

2. **Department for Promotion for Industry and Internal Trade (DPIIT):** DPIIT, earlier known as the Department of Industrial Policy and Promotion (DIPP), under the Ministry of Commerce and Industry, Govt. of India, is the apex IP body. It came into existence in 1995 and is the main body for regulating and administering the industrial sector.

3. **Technology Information, Forecasting and Assessment Council (TIFAC)**
   : The importance of undertaking technology forecasting and assessment studies on a systematic and continuing basis was highlighted in the Government of India's Technology Policy Statement (TPS) of 1983. Therefore in 1985, TIFAC was established as an autonomous body, registered as a Society in 1988, under the Department of Science and Technology. It is an important cog in filling a critical gap in the overall Science and Technology system of India. Its mission is to assess the state-of-art of technologies and set directions for future technological developments in India in important socio-economic sectors.

4. **National Research Development Corporation (NRDC)**: NRDC, an enterprise of Department of Scientific & Industrial Research (DSIR), Govt. of India, was set up in 1953 with a mandate to develop, promote and transfer/commercialize IP and technologies emanating from Higher Education Institutes (HEIs), R&D research laboratories/institutions and Public Sector Undertakings (PSUs). NRDC has a repository of 2500 Indian technologies, filed over 1700 Patents and transferred about 5000 technologies in different sectors in India. It has also created a technology data bank (http://fccollc.com/nrdclive/) containing information regarding technologies available in various fields, such as electrical & electronics, mechanical, coil, mining, biotechnology, healthcare, leather, etc.

3.27 Utility Models:

In many cases, a new invention involves an incremental improvement over the existing products, but this technical improvement is not sufficient enough to pass the stringent criterion of 'Novelty' and 'Non-obviousness' set aside for the grant of a patent. Such small innovations can still be legally protected in some countries and termed as '**Utility Models**' or '**Petty Patents**' or '**Innovation Patents**'. In this case, the criterion of 'Novelty' and 'Non-obviousness' are diluted or relinquished. But the requirement of industrial application or utility is the same as that for patents.

Definition of Utility Models : Utility Models, also known as 'Petty Patents' or 'Innovation Patents,' represent a form of intellectual property protection for incremental improvements over existing products.

Differences from Patents: While patents demand a higher threshold for 'Novelty'

and 'Non-obviousness,' Utility Models provide a more accessible option for smaller innovations. The industrial application or utility requirement remains consistent with patents.

Benefits for MSMEs : Utility Models serve as a valuable tool for Micro, Small, and Medium Enterprises (MSMEs), offering a less rigorous and cost-effective alternative to patents. This is particularly beneficial for MSMEs with limited resources for intensive research and development.

Duration and Global Recognition : The lifespan of a Utility Model is typically shorter than patents, varying from 7-15 years in different countries. Approximately 80 countries, including France, Germany, Japan, South Korea, China, Finland, Russian Federation, and Spain, recognize and provide protection for Utility Models under their Intellectual Property Rights (IPR) laws.

Current Status in India: As of now, India does not officially recognize utility patents. The inclusion of utility patents in India's IP protection framework could significantly impact the annual number of filed and granted patents.

Additional Information

The patent system in India is governed by the *Patents Act, 1970* (No.39 of 1970) as amended by the *Patents (Amendment) Act 2005* and the *Patents Rules, 2003*. The Patent Rules are regularly amended in accordance with the changing environment, with the most recent update in 2020.

Historical Note : The first patent filed in India dates back to *3rd March 1856*. George Alfred DePenning, a civil engineer and inventor from Calcutta, India, submitted the first petition for the grant of Exclusive Privileges (a term used for patents at that time) for his invention called *'An Efficient Punkah-Pulling Machine'*. This patent marked the inception of the patenting tradition in India.

Budapest Treaty (1977): According to the Budapest Treaty (1977), microorganisms involved in the patent disclosure procedure must be deposited with units of the International Depositary Authority (IDA).

Impactful Patents: Edison's Electric Bulb (1880) Patent Number: *US 223 898*

The Telephone (1876): Patent Number: *US 174 465*

The first telephone was invented and patented by Alexander Graham Bell in 1876. Bell went on to co-found the American Telephone & Telegraph Company (AT&T), which later expanded to control all telecommunications and became the world's most significant in- dustry.

Most Patents Granted : Japanese inventor Shunpei Yamazaki holds the record for the maximum number of patents (9700) granted in a span of 49 years (1972-December 2020) at an impressive rate of 196 patents per year.

Most Patents Granted to a Person of Indian Origin : Gurtej Sandhu holds the record for the maximum number of patents (1299) granted to a person of Indian origin in a span of 30 years (1991-December 2020) at the rate of 43 patents per year.

Question Bank

1. How does Intellectual Property (IP) play a crucial role in the economic and cultural development of society. (or) Describe the role of Intellectual Property in the economic and cultural development of a society

2. Examine and elucidate the roles played by national agencies and international organizations in the governance of intellectual property (IP).

3. What is the role of national agencies and international organizations in governing and regulating intellectual property (IP) matters?

4. Analyze the origin of IP and the major amendments in IP laws and acts in India.

5. Discuss the historical evolution of intellectual property (IP) in India.

6. Analyze the notable amendments made to intellectual property (IP) laws and acts in India, considering key changes, legislative developments, and their implications across different IP domains.

7. Discuss the categories of non-patentable matters (or) What types of inventions are not patentable in India?

8. What are the criteria of patentability?

9. Describe what types of inventions are eligible for patenting and which ones are not. Support your answer with examples.

10. Elaborate on the steps and requirements involved in the patenting process in India.

11. Explain the meaning of 'Prior Art Search' and emphasize its significance in the process of patenting. Also, provide an outline of how to conduct it.

12. Discuss the difference between Pre-grant Opposition and Post-grant Opposition in the context of patenting. How do they serve to maintain the validity of patent protection?

13. Can one obtain a worldwide patent or first need to file a patent in India? Discuss with all the procedures involved.

14. Explain the commonly used terms in the field of patenting.

15. Discuss the process of patenting an invention and the conditions for obtaining a patent.

16. What are the rights associated with patents and how can they be enforced? (or) Discuss the rights given to patent holders and outline the methods used for enforcing these rights.

17. What are the different types of Patent Applications? Illustrate with examples.

18. Describe the types of patent applications and the need for a patent attorney or agent in the process of patenting.

19. Explore the concept of Patent Infringements and the measures to avoid them.

20. Explain the effect of public disclosure of an invention before patenting and the significance of choosing the proper jurisdiction for filing a patent application.

21. Discuss the concept and importance of Utility models in contrast to patents. What economic and innovation-driven implications does each carry?

22. Why is the choice of application crucial in the patenting process and how does it influence the jurisdiction of filing a Patent Application?

23. Evaluate the evolution of copyright laws in India with a focus on the amendments made in the digital age. How have these changes addressed emerging challenges?

24. Compare and contrast the evolution of trademark laws in India before and after the Trade Marks Act of 1999. Highlight the major changes and their implications.

25. Trace the evolution of plant varieties protection in India from the exclusion under the Indian Patents Act, 1970, to the enactment of the Protection of Plant Varieties and Farmers' Rights Act, 2001.

26. Analyze the role of the National Biodiversity Action Plan, 2009, in biodiversity conservation in India. Highlight key provisions and their implications.

27. Explain the amendments made to the Indian Patents Act in 2005 and their significance in the context of global Intellectual Property standards.

28. Discuss the decision-making process an inventor goes through when determining whether to patent an invention or place it in the public domain, emphasizing the factors that influence this choice

29. Discuss the process of commercialization of a patent, highlighting how a patent owner can grant permission to individuals or organizations to make, use, and sell the patented invention

30. Explore the concept of exclusive and non-exclusive licenses in the context of patent commercialization, providing examples of each and discussing their implications.

31. Examine the role and importance of a patent attorney/agent in the process of draft- ing and filing patent applications?

32. Evaluate the concept of a 'Worldwide Patent' and discuss why patent rights are considered territorial.

33. Can a worldwide patent be obtained? Explain. (or) Can a worldwide patent be obtained? Explain the process, benefits and drawbacks of obtaining a worldwide patent.

34. What is the pre-grant and post-grant opposition in patent law, and how do they differ?

35. Discuss the general requirement for Indian residents to first file a patent application in India before seeking protection in other countries

36. What is the significance of utility models in patent law? Discuss some commonly used terms in patenting.

37. Discuss the concept of Patent Infringements and demonstrate how public disclosure of an invention before patenting can lead to it.

38. Describe what types of inventions are eligible for patenting and which ones are not. Support your answer with examples.

39. Explain the meaning of 'Prior Art Search' and emphasize its significance in the process of patenting. Also, provide an outline of how to conduct it.

40. What role does a Patent Attorney/Agent play in the patenting process?

41. Explain the role of intellectual property in both economic and cultural development within a society.

42. Discuss the historical origin and evolution of intellectual property in India.

43. Explain the essential conditions that an invention must fulfill to obtain patent protection.

44. Outline the step-by-step process of patenting an invention, from prior art search to publication and grant.

Module 4

Copyrights and Related Rights

Syllabus:

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. Valid- ity 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, Conven- tions 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.

4.1 Copyrights and Related Rights

Copyrights :

'Copyrights' refer to the legal rights provided by law to the original creator of the work in the fields of literature and computer software. The 'Related Rights' encompass the author's work in the fields of dramatics, sound recording, film/video recordings, paintings, architecture, etc.

Copyrights and Related Rights as Categories of IP:

Copyrights and Related Rights are one of the categories of IP and governed by the Copyright Act, 1957 of India. This Act provides rights of reproduction, communication to the masses, adaptation, and translation of the work.

4.2 Classes of Copyrights(Types or Categories)

In India, following classes of Copyrights exist:

1. **Literature**

    Books, Essays, Research articles, Oral speeches, Lectures, Compilations

    Computer programme, Software, Databases

2. **Dramatics**

    Screenplays

    Dramas

3. **Sound Recordings**

Recording of sounds regardless of the medium on which such recording is made, e.g., a Phonogram and a CD-ROM.

4. **Artistic**

    Drawing, Painting, Logo, Map, Chart, Photographs

    Work of Architecture, Engravings, and Craftsmanship

5. **Musical**

Musical notations, excluding any words or any action intended to be sung, spoken, or

performed with the music. A musical work need not be written down to enjoy Copyright protection.

6. Cinematograph Films

'Cinematograph Film' is a visual recording performed by any medium, formed through a process and includes a sound recording. For example, Motion Pictures, TV Programmes, Visual Recording, Sound Recording, etc.

Key Terms Author and Work in Copyrights :

The words 'author' and 'work' need to be understood from the perspective of Copyrights. The term 'author' refers to an individual who develops the content (of work). The author can be a writer (literary work), computer programmer (software), composer (musical work), producer (cinema films, sound recording), photographer (photos).

The term 'work' is a task undertaken in the fields of literature, dramas, music, artistic, cinematograph film, and sound recording.

4.3   Criteria for Copyright

1. Qualification for Copyright Protection

To qualify for Copyright protection, a work must exist in some **physical (or tangible)** form. The duration of the existence of the physical form may vary from a very short period to many years. Virtually any form of expression which can be viewed or listened to is eligible to qualify as Copyright. Even hurriedly scribbled notes for an impromptu speech are considered copyrightable material.

2. Originality and Original Work of Authorship (OWA)

The Copyright work has to be expressed by the creator in his frame of thought. In other words, the work has to be **original**, i.e., the author created it from independent think- ing void of duplication. This type of work is termed as an Original Work of Authorship (OWA). It may appear similar to already existing works but should not be the same. The original work may lack quality or quantity or aesthetic merit or all these parameters; still, it will pass the test of copyrightable work.

3. Creative effort: In addition to originality for the work, Copyright protection also requires at least some **creative effort** on the part of the author. There is no minimum limit for the extent of creativeness; it is a subjective matter. The minimal level of creativity needed for Copyright protection depends on the judgment of the evaluator (adjudicated by the Office of Registrar of Copyright).

As an example, mere changing the dimensions of a book will not be granted Copyright protection. Similarly, an address book of alphabetically arranged telephone numbers does not qualify for Copyright protection as it involves a straightforward alphabetical listing of phone numbers rather than a creative selection of listings.

4.4   Ownership of Copyright

1. Ownership of Copyright
The Copyright laws clearly state the ownership of Copyright.

The person who created the work is considered as the first (original) holder (owner) of the Copyright.

In case the author is an employee and has been contracted to do the work by a proprietor (of the company/firm/society/organization, etc.), the owner of the Copyright shall be the proprietor.

The government will be the primary owner of the government work in the absence of any kind of arrangement.

The person delivering a speech is the first owner of the Copyright.

2. Obtaining Permission to use Copyrighted Material
To obtain permission to use copyrighted material, a request should be made to the legal owner (of the copyrighted material), which could be the original author, the legal heir (in case of the death of the author), publisher, etc. The request must mention the following:

Title, author and/or editor, and edition.

Precise material to be used.

The number of copies.

The purpose of the material (e.g., educational, research, etc.).

Form of distribution (e.g., hard copy to classroom, posted on the internet).

Whether the material is to be sold (e.g., as part of a course pack).

4.5   Copyrights of the Author

The Copyrights of the creator/author are legally protected under Section 14 of the Copyright Act, 1957. The content (i.e. work) created by the author cannot be used or published by anyone without the author's consent. Copyrights provide exclusive rights to the author in the areas of publication, distribution, and usage. A Copyright owner enjoys two types of rights i.e. Economic Rights (or Proprietary Rights) and Moral Rights (or Personal Rights).

1. Economic Rights

Economic Rights are associated with financial benefits accruing from the sale of copyrights. As per the Act, Copyright owners can authorize or prohibit:

Reproduction of the work in any form, including printed publications or sound recordings.

Distribution of copies of the work.

Public performance of the work.

Broadcasting/communicating the work to the public.

Translating the work into other languages.

Adaptation of the work, such as converting a novel into a screenplay.

2. Moral Rights :

Moral Rights include 'Right of Paternity' and 'Right of Integrity'.

The 'Right of Paternity' - even if the Copyright has been licensed to another party, the original author of the work retains the right to claim authorship i.e. the name of the author/s will remain even though Copyrights have been transferred to another party e.g. a book publisher.

The 'Right of Integrity' - the original author has the right to prevent misuse of the work e.g. alterations/additions/deletions in work resulting in misrepresentation of the said work or harming the honor and reputation of the author.

Multiple Rights Holders

It is pertinent to mention that for a work, there can be more than one rights holders, for instance, a musical sound recording has many rights holders, such as the lyricist, music composer, singer, musicians and sound recorders.

4.6   Copyright Infringements

1. Which acts are Copyright Infringements?
As per the Copyrights Act, 1957, the following acts are regarded as an infringement of Copyrights:

Making copies for sale or hire or selling or letting them for hire without permission.

Permitting any place for the performance of owned work (in public) where such performance constitutes an infringement of Copyright.

Distributing infringing copies for trade or to such an extent to affect the interest of the owner of the Copyright prejudicially.

Public exhibition of infringing copies for trade purposes.

Importation of infringing copies.

Translating a work without the permission of the owner.

2. Liability of Owner of an Auditorium/Hall
The owner of an auditorium/hall is liable for punishment if he knowingly allows his premises to be used for communication of illegal copyright material (songs, music, dramas, etc.) to the public. If a person permits for profit any place to be used for communicating the work to the public, where such communication establishes an infringement of the Copyright unless he was not aware of and had no reasonable ground for believing that such communication to the public would be an infringement of Copyright, he will be deemed to have committed an offence under the Copyright Act.

3. Copyright Infringement is a Criminal Offence
According to Section 63 of the Copyright Act, 1957, if any person knowingly infringes the Copyright, he qualifies for the criminal offence. The punishment awarded for the infringement (of Copyright) is imprisonment for six months with the minimum fine of Rs 50,000/-. In case of a second and subsequent conviction, the minimum punishment is imprisonment for one year and a fine of Rs 1,00,000. There is a dedicated IP division to deal with Copyright cases. Also, there is a Copyright Board constituted by the Central Government in 1958 to adjudicate certain claims about Copyright.

4. Copyright Infringement is a Cognizable Offence
A police officer (rank of a sub-inspector or higher) can confiscate the infringed Copyright material without issuing a warrant and produce the same in the court of law.

4.7   Fair Use Doctrine

1. Fair Use Doctrine :

Any person not possessing a valid license from the owner of the Copyright is not entitled to exploit the said work. However, Section 52 of the Copyright Act, 1957, provides for certain exceptions to the infringement of Copyright. As per the rule of law, Copyrighted materials cannot be used by anybody without the proper consent of the legal owners (of the Copyright).

2. The Fair Use Doctrine - Four-Part Test:

However, limited use of Copyrighted materials for teaching and research purposes is legally permitted, under 'The Fair Use Doctrine', which comprises of the four-part test:

1. **The character of the use** - use of the work is purely educational, non-profit and personal.

2. **Nature of the work** - The use of work is factual in nature and not imaginative.

3. **Amount of the portion to be used** - permission is not needed if only a small portion of Copyright protected material is to be used. However, this parameter is debatable now.

4. **Impact of use on the value of the Copyrighted material** - If a small portion of the work is copied and is not affecting the author's economic and moral rights, it will be excused from the infringement.

3. Fair Use Doctrine Examples :

Detailed information on the examples of the Fair Use Doctrine can be accessed from the official website (http://copyright.gov.in/exceptions.aspx). A few examples are listed below:

If the Copyrighted work is used for personal use i.e. studies or research.

Quotation mentioned in the Copyrighted work.

Reporting of current events in the media, such as newspapers, magazines or radios/television.

Reproduction of the work by teachers or scientific researchers.

Performance is free of charge by government officials in the performance of their duties e.g. reproduction of any work for a judicial proceeding or a report of a judicial proceeding.

Use of any work prepared by the Secretariat of a Legislature.

Use of the work in a certified copy made or supplied in accordance with any law for the time being in force.

Making three or less than three copies of a book (including a pamphlet, sheet of music, map, chart or plan).

Bonafide religious ceremony, including a marriage function.

4.8 Copyrights and Internet

1. Challenges in the Digital Era :
The twenty-first century is an era of digitization. The Copyrighted data is quickly transmitted via the internet. This method of data transmission has brought amendments to the existing Copyright laws. One should be careful of Copyright/fair use principles when downloading material from the internet. There is growing concern about the ability to pull Copyrighted material from the internet without permission. Note that material may have been placed on the internet without the author's permission.

2. Internet Use and Copyright:
In general, posting material on the internet by the Copyright owner gives an internet user the right to use that material for his personal use, but he cannot use the work for commercial purposes. Electronic distribution of a Copyrighted work should mention the statement that —This work is protected by Copyright laws and is provided for educational instruction only. Any infringing use may be subject to disciplinary action and/or civil or criminal liability as provided by law".

3. Inclusion of Computer Programmes in Literary Work :
As per Section 2(o) of the Copyright Act, 1957, 'Literary Work' includes computer programmes, tables and compilations, including computer databases. It is mandatory to supply 'Source Code' and 'Object Code' along with the application for registration of Copyright.

4.9   Non-Copyright Work

Works which are exclusions from Copyright Protection :
The works not under the jurisdiction of Copyrights are as follows:

Exclusion of Copyright for Ideas, Concepts, and Principles : The ideas, concepts, and principles themselves cannot be protected under Copyright, only the form in which they are expressed can be copyrighted.

Exclusion of Copyright for Facts and Discoveries Facts, such as scientific or historical discoveries, are not copyright protected. Any fact a person discovers in the course of research cannot be Copyright protected. For example, an author of a book on 'Buddhism' takes ten-fifteen years to gather all the necessary materials and information for his work. At a great expense, the author travels to various museums, libraries and excavations sites. However, after the book is published, anyone is free to use the underlying facts, provided they express the information on their own.

Non-Copyrightable Elements : Copyright does not protect titles, names, slogans, short phrases, short word combinations, methods, or factual information.

Certificates : Certificates are not considered as Copyrightable subject matter as there is not much scope for creativity.

Digital Works: Digitally created works and Copyrighted works transformed into a digital format and placed on the internet are Copyright protected.

Copyright Registration for Websites and Apps: Copyright registration for a website as a whole is not possible. However, different components/rudiments can be granted Copyright registration. e.g. computer programmes/software, compilations including computer databases (*'literary works'*); photographs, paintings, diagram, map, chart or plan (*'artistic works'*); and works consisting of music including graph- ical notation of such work (*'musical works'*). However, a separate application for each component of work has to be filed for seeking Copyright registration.

Copyright Registration for Computer or Mobile Apps : A computer or mobile App qualifies for Copyright registration. An Application is a complete, self-contained computer program that is designed to perform a specific task. An App usually has dynamic content and is designed for user interaction. It may be used

directly or indirectly in a computer or handheld electronic device.

Copyright Infringement: Unauthorized Use of Digital Content If someone swipes your picture/song/video from the internet and uses it for their purposes, it is a Copyright infringement. By the way - the same is true if you nick some else's material for your purposes.

4.10 Copyright Registration

1. Automatic Copyright Protection:

It is not necessary to register a work to claim Copyright. Once a work is created via any medium, the work receives automatic Copyright protection. In other words, there is no formal request to be submitted to the office of the Copyright for acquiring Copyright. The act of creation itself grants the creator inherent Copyright rights to their work.

2. Role of Copyright Registration :

Copyright registration itself does not grant any new rights to the creator; rather, it serves as prima facie proof(In legal terms, "prima facie" means that, on the face of it or at first glance) of an entry in respect of the work in the Copyright register maintained by the Registrar of Copyrights. The certificate of registration serves as prima facie evidence in a court in cases of disputes relating to ownership or creation of Copyright, financial matters, transfer of rights, etc.

3. Copyright Registration Advice:

It is advisable that the author of the work registers for Copyright for better legal protection. In India, Copyright matters, including Copyright registration, are administered under the Copyright Act, 1957, and Copyright Rules, 2013.

4. Prominent Forms for Copyright Registration

Prominent forms for copyright registration can be accessed on the official website: https: //copyright.gov.in/. FORM No. XIV is used for an application for copyright registra- tion under section 45 of the Copyright Act, 1957. It includes a request for the Registrar of Copyrights to make entries in the Register of Copyrights based on the enclosed statement of particulars, and it declares that, to the best of the applicant's knowledge, there are no other claims or disputes regarding the copyright of the work. The "Statement of Par- ticulars" in this form provides detailed information for copyright registration, including the registration number, applicant details, nature of interest, class and description of the work, title, language, author information, publication details, rights owners, authorized

persons, and additional details specific to artistic works, such as location, registration under the Designs Act 2000, and industrial reproduction information.

5. Judicial Powers of the Registrar of Copyrights:

The Registrar of Copyrights has the powers of a civil court when trying a suit under the Code of Civil Procedure in respect of the following matters:

Summoning and enforcing the attendance of any person and examining him on oath.

Requiring the discovery and production of any document.

Receiving evidence on affidavit.

Issuing commissions for the examination of witnesses or documents.

Requisitioning any public record or copy thereof from any court or office.

Any other matters which may be prescribed.

6. Application Submission

A completed application (Form XIV) for copyright registration can be submitted to the Copyright Office at the address: The Registrar of Copyright, Plot no. 32, Boudhik Sampada Bhawan, Sector 14, Dwarka, New Delhi - 110075. The submission can be made by post or through the online registration using the 'E-filing facility' available at www.copyright.gov.in. Eligible applicants, whether authors of the work or assignees of the work, can file the copyright application.

7. Application Evaluation

Usually, it takes around 2-3 months to get the work registered by the Copyright Office. After applying, there is a mandatory waiting period of 30 days. If any person has any objection to the claim/s made in the application, he can contact the office of the Registrar of Copyrights. After giving an opportunity of hearing to both the parties, the Registrar may decide the case in favor or against the author of the work. Once the objections (if any) are cleared, the application is evaluated by the examiners. If any doubts/queries are raised, the applicant is given ample time (around 45 days) to clear these objections.

The elements included in Copyright filing to grant are depicted below in the flow chart:
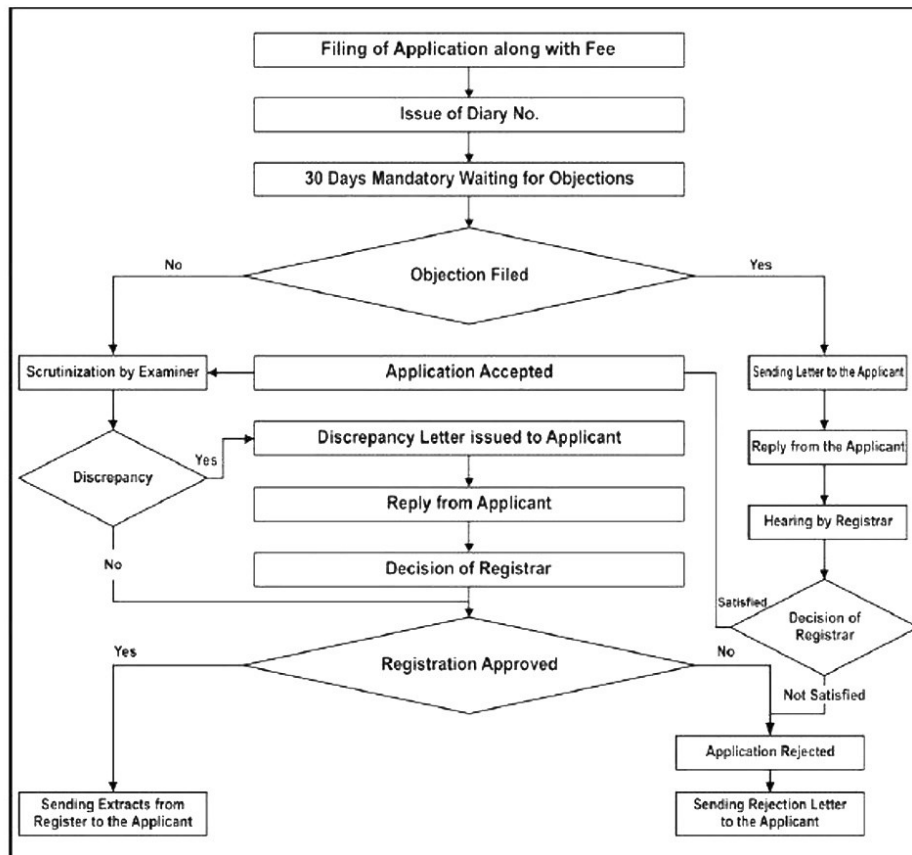
4.11   Important Copyright Forms :

Name of Form	Form No.
Application for registration of Copyright	Form-XIV
Application for registration of changes in particulars of Copyright	Form-XV
Registration of a Copyright Society	Form-VIII
Application for the relinquishment of Copyright	Form-I

Source:

http://Copyright.gov.in/frmformsDownload.aspx

4.12   Fee Structure

For each work, a separate application form needs to be submitted, along with the requisite fee. The fee is not reimbursable in case the application for registration is rejected.

Attributes and Fee :

Application for registration of Copyright (Literary, Dramatic, Musical, or Artistic work): Rs 500

per work

Application for registration of Copyright in a Cinematograph Film: Rs 5,000

Application for registration of Copyright in a Sound Recording: Rs 2,000

Making any change in Literary, Dramatic, Musical, or Artistic work: Rs 200

Making any change in a Literary or Artistic work used in relation to goods or services: Rs 1,000

Application for change in particulars of Copyright in a Cinematograph Film: Rs 2,000

Application for change in particulars of Copyright in a Sound Recording: Rs 1,000

Application for prevention of importation of infringing copies per place of entry: Rs 1,200

4.13   Copyright Symbol

It is not necessary to place the Copyright symbol   with your name and 'year created' near your published or printed materials - but if you do, it's easier to nail someone for infringement on your Copyright if you go to court. The important things which may be mentioned as a Copyright mark on Copyright creation are:

The Copyright symbol   (the letter C in a circle), or the word. 'Copyright', or the abbreviation 'Copr.'

In the case of compilations or derivative works incorporating previously published material, the year with the date of the first publication of the compilation or derivative work should be mentioned. The year date may be omitted for pictorial, graphic, sculptural work, greeting cards, postcards, stationery, jewellery, dolls and toys.

The name or the abbreviation by which the name can be recognized of the owner of the Copyright, or a generally known alternative designation of the owner can be mentioned.

The elements for sound recordings generally require the same three elements, except the symbol is   (the letter P in a circle) instead.

4.14   Validity of Copyright

In general, the validity of Copyright is for 60 years. This period starts either from the year after the death of the author (in case of literature, dramatic, musical and artistic works) or from the date of publication of the work (in case of cinematograph films, sound recordings, photographs, posthumous publications, works of government and works of international organisations).

4.15   Copyright Profile of India

A comparative five years (2015-20) study revealed a gradual increase in the number of Copyright appli- cations in the first four years of the study, with a maximum number of applications (21,905) recorded in the 2019-20 period. The number of applications examined was maximum (34,388) in 2017-18. However, it tapered down to 22,658 in 2018-19 and 19,460 in 2019-20. A similar trend was observed in the number of Copyright registrations, with a peak (19,997) observed in 2017-18.

4.16   Copyright and the word 'Publish'

Key Terms Author and Work in Copyrights :

The words 'author' and 'work' need to be understood from the perspective of Copyrights. The term 'author' refers to an individual who develops the content (of work). The author can be a writer (literary work), computer programmer (software), composer (musical work), producer (cinema films, sound recording), photographer (photos).

The term 'work' is a task undertaken in the fields of literature, dramas, music, artistic, cinemato- graph film, and sound recording.

Copyright and the word 'Publish' :

A work is considered published when it is in the public domain on an unrestricted basis.

For example, if a person writes an article called 'Life in Himalayas' and distributes it with restric- tions on disclosure, it is not considered published in the Copyright sense.

If the author removes the condition of non-disclosure or posts the article on the internet (i.e., public domain), it would be considered as published.

It is to be noted that both published and unpublished works can be registered under Copyright.

4.17   Transfer of Copyrights to a Publisher

The original authors of the Copyrighted work may not have the wherewithal(i.e.the resources or financial capability) to widely publicise their work. Usually, they transfer their rights to publishers for financial benefits, which could be a one-time lump sum amount or royalties or a combination of the two.

Repercussions of Unconditional Transfer :

However, transferring Copyrights unconditionally to the publishers (or anybody else) may have some repercussions for the owner of the Copyright. A publisher may prevent author/s from displaying their articles on the institute's websites. The new owner of Copyright may not even allow the author to revise his work. In other instances, a publisher might print an insufficient number of hard copies and also does not show interest in uploading the soft copy of the work on the internet. Hence, one must be careful   in

signing an agreement with the publishers.

Selective Rights Transfer :

The author may not transfer all the legal rights bestowed upon him as an author. An agreement may be signed permitting only the print and sale of hard copies by the publishers while retaining digital rights for the said work. An author may also put a time limit for the printing and sale of the books/articles, etc.

Changing Landscape with the Internet Era :

Before the digital era, authors used to rely completely on publishers for the dissemination of their work. However, in the internet era, the dependency on publishers has almost diminished. The author is in a position to bypass the publishers and bring his work into the public domain. But this freedom cannot be enjoyed by those who are already under the publishing contract.

Statutory Termination Right :

Even though the author has completely and exclusively licensed out his work, the Copyright Act has a provision under '**termination of transfer**' to reclaim his Copyright. Under this provision, certain Copyright agreements can be terminated after 35 years of the agreement. This statutory termination right applies even though it is not incorporated in the agreement.

Author's Caution :

It is strongly advised that authors must apply their mind while signing the Copyright agreement.

4.18   Copyrights and the Word 'Adaptation'

In the world of Copyright, the word 'Adaptation' signifies the creation of a similar work based upon contemporary work. The Copyright Act defines the following actions as adaptations:

Actions Considered as Adaptations :

1. Transformation of a dramatic work into a non-dramatic work.

2. Changing a literary or artistic work into a drama.

3. Re-arrangement of a literary or dramatic work.

4. Depiction through pictures of a literary or dramatic work.

5. The making of a cinematograph film of a literary or dramatic or musical work.

4.19   Copyrights and the Word 'Indian Work'

'Indian work' means a literary, dramatic, or musical work provided

1. The author of the work is an Indian citizen.

2. The work is first published in India.

3. In the case of an unpublished work, at the time of the making of the work, the author of the work was a citizen of India.

4.20   Joint Authorship

'Work of Joint Authorship' means a work produced by the collaboration of two or more authors in which the contribution of one author is not distinct from the contribution of the other author or authors.

4.21   Copyright Society

Many a time, authors and other owners of Copyrights are either unable or lose track of all the uses of their work, including the collection of royalties, infringement issues, etc. To overcome these hurdles, Copyright Societies have cropped up. As per Section 33 of the Copyright Act, 1957, a Copyright Society is a registered collective administration society formed by authors and other owners of the Copyright. Society can perform the following functions :

Keep track of all the rights and infringements related to their clients.

Issue licences in respect of the rights administered by the society.

Collect fees in pursuance of such licences.

Distribute such fees among owners of Copyright after making deductions for the administrative expenses.

Formation of Copyright Society :
A Copyright Society can be formed by a group of seven or more copyright holders. The term of registration of a Copyright Society is for five years. The registered Copyright Societies in India are:
Registered Copyright Societies in India :

Society for Copyright Regulation of Indian Producers for Film and Television (SCRIPT) 135 Continental Building, Dr. A.B. Road, Worli, Mumbai 400 018, (for cinematograph and television films).

The Indian Performing Right Society Limited (IPRSL), 208, Golden Chambers, 2nd Floor, New Andheri Link Road, Andheri (W), Mumbai- 400 058 (for musical works).

Phonographic Performance Limited (PPL) Flame Proof Equipment Building, B.39, Off New Link Road, Andheri (West), Mumbai 400 053 (for sound recordings).

4.22　Copyright Board

The Copyright Board is a regulatory body constituted by the government, to perform judicial functions as per the Copyright Act of India. The Board comprises of a Chairman and members (2-14) to arbitrate on Copyright cases. The Chairman of the Board is of the level of a judge of a High Court. As per the Act, the Board has the power to:

Appeals against Orders:

The Copyright Board has the authority to hear appeals against the orders of the Registrar of Copyrights.

Rectification of Entries :

The Board can hear applications for rectification of entries in the Register of Copyrights.

Disputes on Assignment:

It adjudicates upon disputes related to the assignment of Copyrights.

Compulsory Licences :

The Board has the power to grant compulsory licences to publish or republish works in certain circum- stances. It can also grant compulsory licences to produce and publish translations of literary or dramatic works in any language after seven years from the first publication.

International Disputes :

The Copyright Board is involved in hearing and deciding disputes concerning the publication status or the term of Copyright of a work in another country.

Royalty Rates :

It is responsible for fixing rates of royalties, particularly in respect of sound recordings under the cover- version provision.

Resale Share Right:

The Board determines the resale share right in original copies of paintings, sculptures, drawings, and original manuscripts of literary, dramatic, or musical works.

4.23 Copyright Enforcement Advisory Council (CEAC)

In 1991, the Government set up a CEAC to review the progress of enforcement of the Copyright Act periodically and advise the Government regarding measures for improving the enforcement of the Act. The term of the CEAC is three years. The CEAC is reconstituted periodically after the expiry of the term.

4.24 International Copyright Agreements, Conventions and Treaties

Any creative work is not protected and enforced automatically worldwide because Copyright laws are territorial by nature i.e. Laws are valid only in the country in which they have been created. To secure protection to Indian works in foreign countries, the author needs to apply separately to each country or through dedicated international 'Conventions on Copyright and Neighbouring (related) Rights', provided a country is a member of such Conventions. India is a member of the following Conventions:

Berne Convention for the Protection of Literary and Artistic Works, 1886.

(https:

//www.wipo.int/treaties/en/ip/berne/)

Universal Copyright Convention, 1952.
(http://www.unesco.org/new/en/culture/themes/ creativity/creative-
industries/copyright/universal-copyright-convention/)

**Rome Convention for the Protection of Performers, Producers of Phonograms
and**

Broadcasting Organizations, 1961. (https://www.wipo.int/treaties/en/ip/rome/)

Multilateral Convention for the Avoidance of Double Taxation of Copyright Roy-   alties,   1979. (https://treaties.un.org/doc/Treaties/1979/12/19791213%2009-00%20AM/ Ch$_$_XXVIII$_$_01$_$_ap.pdf)

Trade-Related Aspects of Intellectual Property Rights (TRIPS) Agreement, 1995. (https://www.wto.org/english/tratop_e/trips$_$_e/intel2$_$_e.htm)

In India, Copyrights of foreign authors, whose countries are members of the Berne Convention for the Protection of Literary and Artistic Works (1888), Universal Copyright Convention (1952) and the TRIPS Agreement (1995) are protected through the International Copyright Order.

4.25   Interesting Copyrights Cases :

Copyrights Cases 1. David vs. Macaques, Indonesia, 2011
In 2011, a UK-based photographer David Slater put his camera on a tripod in the wildlife sanctuary to click the photograph of Macaques monkeys. The Macaques were very curious about the equip- ment and they found the flashlight fascinating. One monkey clicked a selfie photograph which be- came very famous and legally controversial on the matter of Copyright. Theoretically, the monkey is the holder of Copyright as he clicked the photo. Practically, David Slater was the claimant of the Copyright. The dispute entered judicial quarters between People for the Ethical Treatment of Animals (PETA) and David Slater. Now, the settlement has been concluded. The photographer
i.e. David Slater withholds the Copyright of the picture for having a substantial contribution, but he would pay 25% of the royalty share to the wildlife sanctuary where the monkey lives (https: //www.wipo.int/wipo$_$_magazine/en/2018/01/article$_$_0007.html).

Copyrights Cases 2.'Happy Birthday to you' case law
According to the Guinness World Records, 1998, it is the most recognized song in the English language. The melody of 'Happy Birthday to You' originates from the song 'Good Morning to All', which has traditionally been attributed to American Sisters, namely Patty Smith Hill and Mildred J. Hill, in 1893. The sisters composed the melody of 'Good Morning to All' to make it more interesting for the chil- dren. In 1935, Summy Company registered the Copyright on the Piano Setting on the Song. In 1999 Warner/Chappell acquired the company and started taking royalty for the happy birthday song and earned a huge amount. After mediation by the Federal

court, Warner Music, through its publishing subsidiary Warner/Chappell, agreed to pay the settlement to a class of 'thousands of people and entities' who had paid licensing fees to use the song since 1949 because only the melody was registered and not the lyrics. Now the song is in the public domain.

Copyrights Cases 3.Amitabh Bachchan to lose Copyrights over his father's works in 2063 Father of renowned actor Mr. Amitabh Bachchan, (late) Shree Harivansh Rai Bachchan was a noted poet and Hindi writer. His most famous work was Madhushaala (1935). He was the recipient of the Sahitya Akademi award and the Padma Bhushan. He also did Hindi translations of Shakespeare's Macbeth and Othello. He passed away on 18th January 2003, at the age of 95. As per the Copyright Act, 1957, the

rights over his work will be completed in the year 2063 (rights remain with the author for his lifetime plus 60 years).

4.26   Trademark Definition

In simple language, a Trademark (or Trade Mark) is a unique symbol which is capable of identifying as well as differentiating products or services of one organization from those of others. The word 'Mark' stands for a sign, design, phrase, slogan, symbol, name, numeral, devise, or a combination of these. Essentially, the Trademark is anything that identifies a brand to a common consumer.

4.27   Eligibility Criteria for Trademarks

For goods/services to be legally classified as Trademark, they need to pass the following conditions:

Distinctiveness - The goods and services for which the protection is sought should possess enough uniqueness to identify it as a Trademark. It must be capable of identifying the source of goods or services in the target market.

Descriptiveness - The Trademark should not be describing the description of the concerned goods or services. Descriptive marks are unlikely to be protected under Trademark law. However, descriptive words may be registered if they acquire "secondary meaning", such as the brand name 'Apple' is used by a USA based multinational company that manufactures electronic gadgets.

Similarity to the prior marks - The mark should be unique and should not be having similarity to the existing marks.

4.28   Who Can Apply for a Trademark:

Any person who is a proprietor of the Trademark is eligible to apply for registration of Trademark. The mark can be filed collectively by two or more applicants and for that purpose, support documents need to be submitted.
Collective Marks:
An organization or association can file for a collective mark. This mark is then used by its members to collectively identify their products or services. An example of a collective mark is the 'Reliance' symbol, which indicates all products falling under the umbrella of the organization.

4.29   Acts and Laws

In India, Trademarks are governed under **The Trademarks Act, 1999**
(http://www.ipindia.nic.in/writereaddata/Portal/IPOAct/1‿43‿1‿trade-marks-act.pdf).
The Trademark rules are governed by Trademarks Rules, 2002
(http://www.ipindia.nic.in/writeread data/Portal/IPO Rule/1‿56‿1‿1‿59‿1‿tmr‿rules‿
2002‿1‿.pdf). The Acts and Rules have been amended from time to time. The latest
amendments were done in 2010 and 2017 for Trademarks Acts and Trademarks,
respectively. The administration of matters pertaining to Trademarks is carried out by the
Office of CGDPDTM, Government of India.

4.30   Designation of Trademark Symbols

Trademark symbols play a crucial role in indicating the status of protection associated
with a particular mark. Here are the commonly used trademark symbols:

Ⓞ :
This symbol represents that the Trademark is unregistered. It can be used for
promoting the goods of the company. The TM symbol indicates that the company
is using the mark as a trademark, but it has not yet been officially registered.

Ⓞ :
Similar to TM, SM represents that the Trademark is unregistered. However,
SM is specifically used for promoting brand services. It signifies that the company
is claiming the mark as a service mark for its services.

□ :
The R symbol represents a registered Trademark or Service Mark. The presence of
this symbol indicates that the Trademark has been officially registered, and the
applicant is its legal owner. It provides a higher level of protection and exclusivity.

4.31   Classification of Trademarks

Goods and Services under Trademarks are classified as per the '**Nice Agreement**'
(1957) adminis- tered by WIPO. A total of 149 countries (84 state parties who are
signatory to the Agreement and 65 additional states who are following this
classification for the Trademarks) and others (African In- tellectual Property
Organization, African Regional IP Organization and Trademark Office of European
Union) are using the same Trademark classification. Trademark classification
comprises of 45 classes, out of which 34 are for goods and 11 are for services
(http://euipo.europa.eu/ec2/   static/html/nice-   general-

remarksen.html;jsessionid=8FBC790A663FAC9092ACCDD9ED1AC65E.ec2t1).
Two examples of the classes are:

Class 1: Chemicals for use in industry, science and photography, agriculture, horticulture and forestry; Unprocessed artificial resins, unprocessed plastics; Fire extinguishing and fire prevention compositions; Tempering and soldering preparations; Substances for tanning animal skins and hides; Adhesives for use in industry; Putties and other paste fillers; Compost, manures fertilizers; Biological preparations for use in industry and science.

Class 45: Legal services; Security services for the physical protection of tangible property and individuals; Personal and social services rendered by others to meet the individuals' needs.

The **Vienna codification** established under the Vienna Agreement (1973) is an international classifi- cation of the figurative elements of marks. The relevant Vienna code class can be searched on the link: https://www.wipo.int/classifications/nivilo/vienna/index.htm?lang=EN/#.   The classification is used to divide all figurative elements into categories (from 1 to 29), divisions (from 1 to 19) and sections (from 1 to 30).

For example, the representation of "a little girl eating" belongs to Category 2 (Human beings), Division 5 (Children), Main Section 3 (Girls). If auxiliary sections are used, the figurative element can be identified additionally with the Auxiliary Section 18 (Children drinking or eating, Code A 2.5.18). The codification of this example will be then indicated as 2.5.3, 18 (main and auxiliary sections).

4.32   Registration of a Trademark is Not Compulsory

Although registration of a Trademark is not compulsory, registration provides certain advantages to the proprietor of the Trademark, such as:

Legal Protection: Prevents the exploitation of the Registering Trademark by other compa- nies/organizations/individuals without proper authorization by the legal owner/s of the Trade- mark. In legal suits, a registered Trademark can serve as potent evidence of the lawful proprietor- ship of the Trademark.

Exclusive Right: Grants the Trademark owner full rights to use it in any lawful manner to promote his business.

Brand Recognition: Products/services are identified by their logo, which helps create brand value over time. A strong brand is a huge pull for new customers and an anchor for existing customers. Registering a Trademark early and using it will create goodwill and generate more business for the brand owner.

Asset Creation: A registered Trademark is an intangible property of the organization. It can be used for enhancing the business of the company as well as

drawing new clients and retaining old ones by the account of brand identification.

To find out more about Registered Trademarks in India, one may look at http://www.ipindia.nic.in/writereaddata/Portal/Images/pdf/well-known-trademarks-updated-newone.pdf.

It is pertinent to mention that no legal course of action can be taken against the unlawful use of an unregistered Trademark. For unregistered marks (sometimes known as 'Common Law Trademarks', which are defined as the law rights that generally do not require formal registration for enforcement),

action can be brought against any person for the passing off goods or services as the goods or services provided by another person. In such cases, the unregistered Trademarks have to prove the establishment of goodwill or reputation connected with the goods or service.

4.33   Validity of Trademark

In India, a registered Trademark is valid for 10 years. The period can be extended every 10 years, perpetually. As per the Indian Trademarks Act, the renewal request is to be filed in the form 'TM-R' within one year before the expiry of the last registration of the mark.

4.34   Types of Trademark Registered in India

Trademark can be a word that must be able to speak, spell and remember. It is highly recommended that one should choose the Trademark like invented word, created words, and unique geographical name. One should refrain from Trademarks like common geographical name, common personal name and the praising words which describe the quality of goods, such as best, perfect, super, etc. To ensure all these characteristics in a Trademark, it is suggested to conduct a market survey to ensure if a similar mark is used in the market. Following are some examples of the registerable Trademarks:

Any name including personal or surname of the applicant or predecessor in business or the signature of the person e.g. the Trademark 'BAJAJ' is named after industrialist Mr. Jamnalal Bajaj.

A word having no relevance to the product/services e.g. Trademark 'INDIA GATE' is being used for food grains and allied products.

Letters or numerals or any combination thereof e.g. 'YAHOO' is the abbreviation of the phrase 'Yet Another Hierarchical Officious Oracle'. It has now become a worldwide famous Trademark.

Some of the Famous Examples of Trademarks :
Here are examples of different types of trademarks:

1. **Distinctive General Word & 'Apple' (IT Company):** Apple is a distinctive general word used as a trademark by the well-known IT company.

2. **Fanciful Designation & 'Kodak' (Photograph Film):** Kodak is a fanciful designation created for the specific purpose of serving as a trademark for

photographic films.

3. **Distinctive Personal Names & 'Ford' (Automotive):** Ford, a distinctive personal name, is used as a trademark in the automotive industry.

4. **Device & 'Udhaar' (Financial Technology):** Udhaar, with a unique design or device, serves as a trademark in the field of financial technology.

5. **Number & '4711' (Perfume):** The number 4711 is used as a trademark in the perfume industry.

6. **Picture & Allegator (Knitwear Manufacturing):** The picture of an alligator is used as a trademark in the knitwear manufacturing sector.

7. **Slogan & 'Drink it to believe it' (Soft Drinks):** The slogan "Drink it to believe it" serves as a trademark for a brand in the soft drinks industry.

Note: Trademark Registry Objections and Search :

The Trademark Registry may object to a yet-to-be-registered Trademark if it appears similar in looks or sound to existing registered marks. For example, a keyword like 'Ford' might face objections if similar- sounding terms like Foard, Phord, Fordd, Forrd already exist.

It is advisable to carry out a search for both identical and similar trademarks.

Use the free government portal for trademark searches: http://ipindiaservices.gov.in/tmrpublicsearch/ frmmain.aspx.

4.35 Trademark Registry

In India, Trademark operations are managed from five cities: Delhi, Mumbai, Ahmadabad, Kolkata, and Chennai. Each city is assigned a group of states, and businesses located in a particular state can use the services of the assigned Trademark Registration Office.

In the case of foreign applicants, jurisdiction is based on the location of the office of the applicant's agent or attorney.

Territorial Jurisdiction of Trademark Registration Offices :

Office Location	States Covered
Mumbai	Maharashtra, Madhya Pradesh, Chhattisgarh, Goa
Ahmedabad	Gujarat, Rajasthan, Daman, Diu, Dadra and Nagar Haveli
Kolkata	Arunachal Pradesh, Assam, Bihar, Orissa, West Bengal, Manipur, Mi- zoram, Meghalaya, Sikkim, Tripura, Jharkhand, Nagaland, Andaman & Nicobar Islands
New Delhi	Jammu & Kashmir, Punjab, Haryana, Uttar Pradesh, Himachal Pradesh, Uttarakhand, Delhi, Chandigarh
Chennai	Andhra Pradesh, Telangana, Kerala, Tamil Nadu, Karnataka, Pondicherry, Lakshadweep Island

Soursce : http://www.ipindia.nic.in/trade-marks.html

4.36 Process for Trademarks Registration

To seek Trademark registration, the proprietor of the Trademark has to fill an application. The propri- etor may choose to hire an agent to fill and submit the application on his behalf. Before applying, the applicant needs to conduct a prior art search to ensure the registration criteria.

Prior Art Search :

Prior to applying for Trademark registration, it is always prudent to check whether the intended Trade- mark is already registered or not. Also, it is ascertained whether the intended Trademark is not similar to the ones already registered. The requisite search can be carried out using various web portals, such as:

Public search for Trademarks by CGPDTM (https://ipindiaservices.gov.in/tmrpublicsearch/ frmmain.aspx).

WIPO's Global Brand Database (https://www3.wipo.int/branddb/en/).

Trademark Electronic Search System (TESS) (http://tmsearch.uspto.gov/bin/gate.exe?f= tess&state=4805:za847u.1.1).

MARKARIA Trademark Search Engine (https://trademarksearch.marcaria.com/en/asia/ india-trademark-search).

VAKIL Search (https://vakilsearch.com/trademarksearch/trademarks?search=bajaj).

Once the 'prior art search' is over and the applicant is convinced about the distinctiveness of the Trade- mark, he can proceed to fill the application form for registration (TM-A). The application is filed at the Trademarks Office subject to the jurisdiction of the applicant. The steps involved in the registration process are as follows :

Filing the Application: After the prior art search has been conducted, the applicant can apply for the registration on his own or with the help of a certified agent.

Application Assignment: The application is assigned an application number within a few days. The same can be tracked online at https://ipindiaonline.gov.in/tmrpublicsearch/frmmain. aspx.

Examination by Professional Examiner: The application is scrutinized by a professional examiner. If everything is in order, the particulars of the application are published in the official Trademark journal (http://www.ipindia.nic.in/journal-tm.htm). Otherwise, he will send the objections to the applicant for rectification. Based on the satisfactory response, the examiner would recommend the revised application to be published in the journal. If the application is rejected, the applicant may approach the Intellectual Property Division to challenge the rejection of an application by the examiner.

Publication and Objection Period: Once the Trademark is published in the official journal, the public has an opportunity to file an objection, if any, within 90 days. After hearing both the parties, the officer decides whether to proceed further for the grant of Trademark or disallow the grant of Trademark. In case of unfavourable outcome, the applicant has the right to contest the decision in front

of the IPAB. **Trademark Registration Certificate:** Once the application has successfully completed all formalities, a Trademark registration certificate is issued in the name of the applicant.

Language Requirements: One should keep in mind that while filing an application for the registration of a Trademark, an English translation of the non-English words has to be provided.

Priority Claim: If the applicant wishes to claim the priority from an earlier-filed application, he has to provide details like application number, filing date, country, and goods/services of that application.

4.37 Famous Case Law related to Trademarks :

Coca-Cola Company vs. Bisleri International Pvt. Ltd.

'**MAAZA**', a popular mango fruit drink in India, is a registered Trademark of an Indian company, Bisleri International Pvt. Ltd. The company transferred the rights (formulation, IPR, and goodwill, etc.) to a beverage company, Coca-Cola, for the Indian Territory. However, in 2008, the Bisleri Company ap- plied for registration of Trademark 'Maaza' in Turkey and started exporting the product with the mark '**MAAZA**'. This was unacceptable to the Coca-Cola Company and thus filed a petition for permanent injunction and damages for passing-off and infringement of the Trademark.

It was argued on behalf of Plaintiff (Coca-Cola Company) that as the mark 'Maaza' concerning the Indian market was assigned to Coca-Cola, and the manufacture of the product with such mark, whether for sale in India or for export, would be considered as an infringement. After hearing both the parties, the court finally granted an interim injunction against the defendant (Bisleri) from using the Trademark MAAZA in India as well as for the export market, which was held to be an infringement of Trademark.

Question Bank

1. Explain the concept of 'Copyrights' and 'Related Rights' and how they are categorized under intellectual property. Provide examples of works covered under these rights.

2. Examine the classes(types) of copyrights existing in India, highlighting the types of works covered under each class.

3. Elaborate on the criteria for copyright protection, focusing on the qualifications, originality, and creative effort required. Provide examples to illustrate these criteria.

4. Discuss the ownership of copyright, including the initial owner and scenarios involving employment or government work.

5. Explain the process and requirements for obtaining permission to use copyrighted material. High- light the factors to be mentioned in a permission request.

6. Distinguish between economic rights and moral rights of copyright owners. Provide examples of activities covered under each type of right.

7. Explore the concept of copyright infringements, listing acts considered as infringements under the Copyrights Act, 1957. Discuss the liabilities of the owner of an auditorium/hall in the context of copyright.

8. Discuss the Fair Use Doctrine and its four-part test. Provide examples of situations where the Fair Use Doctrine may be applicable.

9. Examine the challenges posed by the digital era in the context of copyrights. Discuss the implica- tions of internet use on copyright and the inclusion of computer programs in literary works.

10. Explain the concept of automatic copyright protection. What rights does the creator obtain upon the act of creation?

11. Discuss the role of copyright registration. How does the certificate of registration serve as prima facie evidence in legal disputes?

12. Describe the prominent forms used for copyright registration in India. Explain the information required in Form No. XIV.

13. Outline the judicial powers of the Registrar of Copyrights. In what situations can the Registrar exercise powers similar to a civil court?

14. Explain the process of copyright application submission in India. What are the options for sub- mitting the application, and who is eligible to file the application?

15. Discuss the time frame and steps involved in the evaluation of a copyright application. How are objections handled during the evaluation process?

16. Provide details on the fee structure for copyright registration in India. Include information on different types of works and their corresponding fees.

17. Examine the significance of copyright symbols. What elements can be included as a copyright mark on creative works?

18. Discuss the validity period of copyright in India. What factors determine the starting point of this validity period?

19. Analyze the copyright profile of India based on a five-year study. Highlight trends in the number of applications and registrations during this period.

20. Discuss the legal controversy surrounding the "David vs. Macaques" Copyright case in Indonesia, 2011. Analyze the settlement reached between David Slater and People for the Ethical Treatment of Animals (PETA).

21. Examine the legal history and settlement of the "Happy Birthday to you" case, highlighting the origins of the song and the Copyright issues involved. Discuss the implications of the song entering the public domain.

22. Explore the future Copyright implications for the works of Harivansh Rai Bachchan, the father of Amitabh Bachchan. Analyze the provisions of the Copyright Act, 1957, and discuss the rights duration as per the Act.

23. Explain the eligibility criteria for trademarks, emphasizing distinctiveness, descriptiveness, and similarity to prior marks. Provide examples to illustrate these criteria.

24. Discuss the concept of collective marks and provide an example, such as the use of

the 'Reliance' symbol. Explain how organizations or associations can file for and use collective marks.

25. Explore the acts and laws governing trademarks in India, focusing on The Trademarks Act, 1999, and Trademarks Rules, 2002. Highlight the key amendments made in 2010 and 2017.

26. Examine the classification of trademarks under the 'Nice Agreement' and provide examples of goods and services falling under different classes.

Module 5

Industrial Designs & Geographical Indications

Syllabus:

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

5.1   Industrial Designs

Definition of Design :
The word 'Design' is defined as the features of shape, configuration, pattern, ornament, or composition

of lines or colors applied to any article. The Design may be of any dimension, i.e., one or two or three dimensional or a combination of these. In addition, it may be created by any industrial process or means, whether manual, mechanical, or chemical, separate or combined, which in the finished article appeals to and is judged solely by the eye. However, the word 'Design' does not include any mode or principle of construction or anything that is in substance a merely mechanical device.

Example : Consider a smartphone case with a unique pattern embossed on its surface. The pattern and its arrangement contribute to the design of the case.

Object of Registration:

The main object of registration of industrial designs is to protect and incentivize the original creativity of the originator and encourage others to work towards the art of creativity.

Example : If an artist creates a novel and unique design for a chair, registering that design ensures that the artist is recognized as the originator and has exclusive rights to the design.

5.2 Eligibility Criteria

The Design for which protection is being sought must be **novel or original**, i.e., it should not be disclosed to the public by prior publication or by prior use or in any other way. The Design should be **significantly distinguishable** from the already registered Designs existing in the public domain.

Example : Consider a new and unique chair design that has not been publicly disclosed or used before. To be eligible for protection, this design must not closely resemble any existing registered designs in the public domain.

5.3 Acts and Laws to Govern Industrial Designs

In India, Industrial Designs are governed under *The Designs Act, 2000* (http://www.ipindia.nic. in/acts-designs.htm) and *Design Rules, 2001* (http://www.ipindia.nic.in/rules-designs.htm), which have been amended from time to time in 2008, 2013, 2014, and 2019. The Design should include the following characteristics:

It should be novel and original.

It should be applicable to a functional article.

It should be visible on a finished article.

There should be no prior publication or disclosure of the Design.

List of Industrial Designs :

A list of Industrial Designs can be accessed from https://www.creativebloq.com/product-design/

examples-industrial-design-12121488. Some of the famous Industrial Designs are mentioned below:

1. **Coca-Cola Bottle:** The contoured-shaped glass bottle of the Coca-Cola Company is marvelled as a master showpiece in the field of industrial design. It was designed in 1915 and is still a cynosure for all eyes.

2. **Piaggio Vespa:** Piaggio is an Italian company famous for manufacturing Vespa scooters. These scooters are sold worldwide since the 1940s. The structural design of the scooter is pleasing to the eyes, with a painted steel body concealing the engine, comfortable driver's feet rest, and a well-designed front portion.

3. **iPhone:** A highly popular mobile phone manufactured by the American company 'Apple Inc.' The sleek, handy, and rectangular body is pleasing to the eyes, with round and smooth corners. The features, such as on/off and speech volume, are easy to operate.

4. **Mini Cooper:** An automobile car manufactured by the British Motor Corporation. Its unique shape provides plenty of space (nearly 80

5. **Rocking Wheel Chair:** A sleek, circular-shaped chair that provides a smooth rocking motion. There is a provision for a headlight in the upper part of the chair.

6. **Juicy Salif:** A citrus juice squeezer considered an iconic structural design. The alumina-based body has been molded in the shape of a fish called a squid.

5.4   Design Rights

The Design registration also confers a monopolistic right to the Proprietor by which he can legally exclude others from reproducing, manufacturing, selling, or dealing in the said registered Design without his prior consent. The Design registration is particularly useful for entities where the shape of the product has aesthetic value, and the entity wishes to have exclusivity over the said novel and original Design applied to its product(s) or article(s).

Example : Consider a company that designs a unique and aesthetically pleasing chair. By registering the design, the company obtains exclusive rights to the design. This means that no other entity can reproduce, manufacture, sell, or deal in a chair with the same registered design without the prior consent of the proprietor.

5.5   Enforcement of Design Rights:

Once the applicant has been conferred with the rights over a specific Design, he has the right to sue the person (natural/entity) if the pirated products of his registered design are being used. He can file the infringement case in the court (not lower than District Court) to stop such exploitation and for claiming any damage to which the registered proprietor is legally entitled. The court will ensure first that the Design of the said product is registered under the Designs Act, 2000. If the Design is found not registered under the Act, there will not be legal action against the infringer. If the infringer is found guilty of piracy

or infringement, the court can ask him to pay the damage (Rs. 50,000/-) in respect of infringement of one registered Design.

Example : Consider a scenario where a company discovers that another entity is producing and selling products with an identical design that is registered under the Designs Act, 2000. The registered proprietor can enforce their design rights by filing an infringement case in the court (not lower than District Court). If the court finds the infringer guilty, they may be required to pay damages (Rs. 50,000/-) for the infringement of one registered Design.

5.6 Non-Protectable Industrial Designs in India

Any Industrial Design which is against public moral values.

Industrial Designs including flags, emblems, or signs of any country. Industrial Designs of inte- grated circuits.

Any Design describing the 'process of making of an article'.

Industrial Designs of – books, calendars, certificates, forms, and other documents, dressmaking patterns, greeting cards, leaflets, maps and plan cards, postcards, stamps, medals.

The artistic work defined under Section 2(c) of the Copyright Act, 1957 is not a subject matter for registration for Industrial Designs, such as:

- Paintings, sculptures, drawings including a diagram, map, chart, or plan.

- Photographs and work of architecture.

- Any other work related to artistic craftsmanship.

Industrial Designs do not include any Trademark (The Designs Act, 2000).

5.7 Protection Term

The outer 'Shape or Design' of a product makes it more appealing and acts as the value-adding factor to the product. Therefore, there is a need to protect one's creation from being used by third parties without consent from the original creator. The registered Designs are protected for 10 years in India and can be extended by 5 years after making a renewal application.

Example : Consider a company that registers the design of a unique and aesthetically appealing chair. The protection term for this registered design will initially be 10 years. However, to continue the pro- tection beyond the initial term, the company can apply for a renewal, extending the protection by an additional 5 years.

5.8   Procedure for Registration of Industrial Designs

1. Prior Art Search:

Before filing an application for the registration of Industrial Designs, it is prudent to ensure that the same or similar Design has not been registered earlier. This search can be carried out using various search engines, such as:

Design Search Utility (CGPDTM): (https://ipindiaservices.gov.in/designsearch/).

Global Design Database (WIPO): (https://www3.wipo.int/designdb/en/index.jsp).

Hague Express Database (WIPO): (https://www3.wipo.int/designdb/hague/en/#).

Design View (EUIPO): (https://www.tmdn.org/tmdsviewweb/welcome#/dsview).

2. Application for Registration :

Once the applicant is satisfied that his Design is novel and significantly distinguishable from other De- signs, he can proceed with filing an application for Design registration. The application for registration of Design can be filed by an individual, small entity, institution, organization, and industry. The appli- cation may be filed through a professional patent agent or legal practitioner. If the applicant is not a resident of India, an agent residing in India has to be employed for this purpose. The applicant submits the registration application at the Design Office Deputy Controller of Patents & Designs, Patent Office, Intellectual Property Office Building, CP-2 Sector V, Salt Lake City, Kolkata-700091.

After the application has been filed, an officer (examiner) analyses the application for qualifying the minimum standards laid down for eligibility criteria for registration. In case of any query, the same is sent to the applicant, and he is supposed to respond within 6 months from the objection raised. Once the objections are removed, the application is accepted for registration. The particulars of the applica- tion, along with the representation of the article, are published in the Official Journal of Patent Office (http://www.ipindia.nic.in/journal-patents.htm). If no objection is received from the public, the Design is registered.

After the registration of the Design, the applicant becomes the proprietor of the Design and is conferred with the exclusive right to apply that Design to the article belonging to the class in which it is registered. The applicant puts up a request for issuance of a certificate of registration (for an Industrial Design). A flow chart of the registration process is mentioned below:
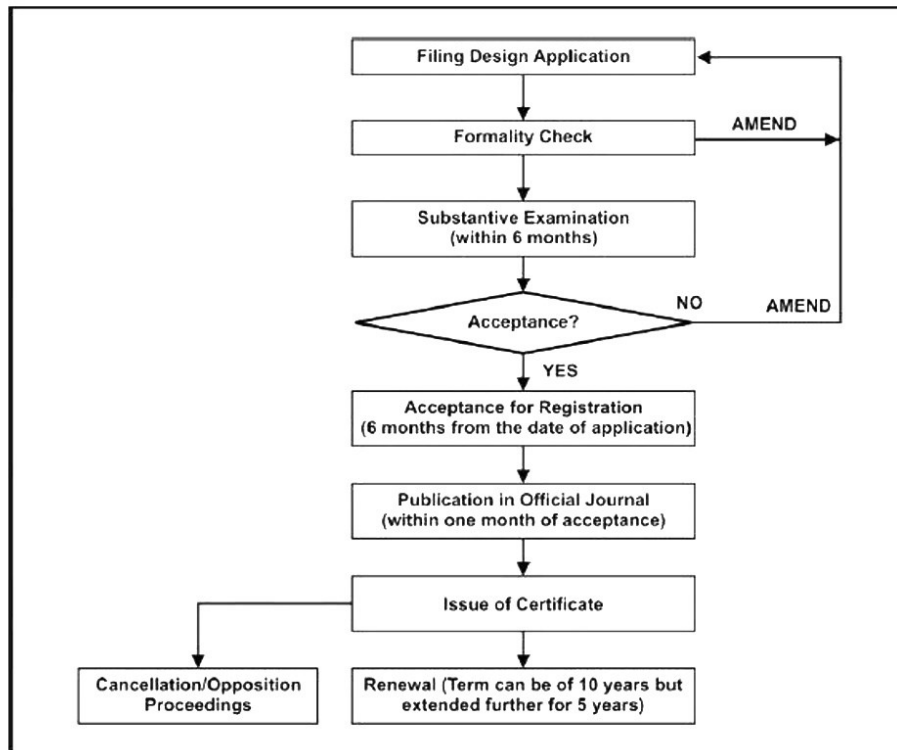
5.9 Duration of the Registration of a Design :

Initially, the Design registration is valid for ten years from the date of registration. In the case wherein the priority date has been claimed, the duration of the registration is counted from the priority date. The period of registration may be extended further for five years. An application has to be made in Form-3 accompanied by prescribed fees to the Controller General before the expiry of the said initial period of ten years.

Example : Consider a company that successfully registers the design of a new and innovative electronic device. The initial duration of protection for this registered design will be ten years from the date of registration. If the company wishes to continue the protection beyond the initial ten years, they can apply for an extension by submitting Form-3 along with the prescribed fees to the Controller General before the expiry of the initial ten-year period.

5.10 Importance of Design Registration

Registration of Design ensures the exclusive rights of the applicant on the Design. The owner can prevent the registered Design products from piracy and imitation. This helps the owner to boost the sale of the products and establish goodwill in the market.

Example : Consider a fashion designer who creates a unique and trendy clothing design. By registering the design, the fashion designer obtains exclusive rights, preventing others

from producing identical or similar clothing items without consent. This exclusivity not only safeguards the designer's creative efforts

but also enhances the market value of the designer's clothing line, as consumers are more likely to associate the unique design with the original creator, thereby establishing goodwill in the fashion industry.

5.11   Cancellation of the Registered Design

The registration of a Design may be cancelled at any time. The petition has to be filed in Form-8 with prescribed fees to the Controller of Designs. The application can be made on the following grounds:

Design has already been registered.

Design has been published in India or elsewhere before the date of registration.

Design is not novel and original.

It is not a Design under Clause (d) of Section 2.

Example : Consider a scenario where a company discovers that another entity has registered a design that is identical to their own and was already registered. The aggrieved company can file a petition in Form-8 with the prescribed fees to the Controller of Designs, citing the ground that the design has already been registered. If the Controller finds merit in the petition, the registration of the design may be canceled.

5.12   Application Forms

There are a total of 24 forms pertaining to Industrial Designs. A list of important forms is mentioned below.

S. No	Name of the Form	Form No.	Fee(Natural Person)	Fee(Small Entity)	Fee(Large Entity)
1.	Application for registration of Design.	Form-1	1,000	2,000	4,000
2.	Application for the Restoration of Design.	Form-4	1,000	2,000	4,000
3.	Application for renewal of Design.	Form-3	2,000	4,000	8,000
4.	Petition for cancellation for registration of a Design.	Form-8	1,500	3,000	6,000
5.	Notice of intended exhibition or publica-	Form-9	500	1,000	2,000

	tion of unregistered Design.				
6.	Application for entry of name of propri-etor or part proprietor in the Register.	Form-11	500	1,000	2,000
7.	Request for correction of clerical error.	Form-14	500	1,000	2,000
8.	Request for certified copy.	Form-15	500	1,000	2,000
9.	Application for rectification of Register.	Form-17	500	1,000	2,000
10.	Notice of opposition.	Form-19	100	200	400

5.13   Classification of Industrial Designs

Designs are registered in different classes as per the Locarno Agreement, 1968 (https://www.wipo. int/classifications/locarno/locpub/en/fr/). It is used to classify goods for the registration of Industrial Designs as well as for Design searches. The signatory parties have to indicate these classes in the official documents too. The classification comprises a list of classes and subclasses with a list of goods that constitute Industrial Designs. There are 32 classes and 237 subclasses that can be searched in two languages, i.e., English and French.

For example, Class 1 includes foodstuff for human beings, foodstuffs for animals, and dietetic foods excluding packages because they are classified under Class 9 (Bottles, Flasks, Pots, Carboys, Demijohns, and Pressurized Containers). Class 32 classifies the Design of graphic symbols and logos, surface patterns, ornamentation.

5.14   Designs Registration Trend in India

Figure 2.11 represents the statistics for Industrial Designs (filed, examined, and registered) for the period 2010-20. During this period, an increase of 88%, 117%, and 33% was observed in the parameters of Designs filed, examined, and registered, respectively. In all three parameters, the graph depicts a similar pattern (more or less) with the highest numbers observed in 2019-20 for Designs filed (12,268), examined (13,644), and registered (14,272).

5.15   Famous Case Law: Apple Inc.   vs.   Samsung Electronics Co.

In 2011, Apple Inc. filed a case against Samsung Electronics Co. in the United States District Court for the Northern District of California for infringing their Designs and Utility Patents of the user interface like screen app grid and tap to zoom. As evidence, Apple Inc. submitted the side-by-side image comparison of the iPhone 3GS and the i9000 Galaxy S to demonstrate the alleged similarities in both models. However, later it was found that the images were tempered by the Apple Company to match the dimensions and features of the controversial Designs. So the counsel for Samsung Electronics blamed Apple of submitting false and misleading evidence to the court, and the company countersued the Apple Company in Seoul, South Korea; Tokyo, Japan; and Mannheim, Germany, United States District Court for the District of Delaware, and with the United States International Trade Commission (ITC) in Washington D.C. The proceedings continued for 7 years in various courts. In June 2018, both companies reached a

settlement, and Samsung was ordered to pay $539 million to Apple Inc. for infringing on its patents.

5.16   Geographical Indications

Introduction:

In every country, there are certain regions famous for their traditional knowledge/heritage in various sectors, such as agriculture, food products, textiles, etc. People from far-off places used to travel to buy these products. For example, Christopher Columbus sailed from Spain to import world-famous spices from India. British people traveled to Arabian countries to import Arabian horses for siring fast running horses for commercial gains. Similarly, China silk and Dhaka Muslin have been in great demand from times immemorial. The reputation of these products was built upon and painstakingly maintained by the experts/masters of respective geographical locations. The know-how of these reputed products was passed onto future generations. With the passage of time, a specific link between the goods produced and geographical location evolved, resulting in the growth of Geographical Indications (GI).

Definition of Geographical Indications :

A GI is defined as a sign that can be used on products belonging to a particular geographical loca- tion/region and possesses qualities or a reputation associated with that region. In GI, there is a strong link between the product and its original place of production.

Examples of Geographical Indications :

   Darjeeling Tea: Known for its unique flavor and aroma, Darjeeling Tea is a Geographical Indi- cation associated with the Darjeeling region in India.

   Parmigiano-Reggiano: An Italian cheese known for its high quality, Parmigiano-Reggiano is a Geographical Indication linked to specific regions in Italy where it is produced.

   Champagne: The sparkling wine produced in the Champagne region of France is a classic example of a Geographical Indication.

5.17   Acts, Laws and Rules Pertaining to GI

In India, GI was introduced in 2003 and is governed under the *Geographical Indications of Goods (Reg- istration & Protection) Act, 1999* and the *Geographical Indications of Goods (Registration & Protection) Rules, 2002.*

5.18   Ownership of GI

The ownership/holders of GI (registered) can be of the producers, as a group/association/cooperative society, or association, or in certain cases, the government.

5.19   Rights Granted to the Holders

Right to grant the license to others: The holder has the right to gift, sell, transfer/grant a license, mortgage, or enter into any other arrangement for consideration regarding their product. A license or assignment must be given in writing and registered with the Registrar of GI for it to be valid and legitimate.

Right to sue: The holder of GI has the right to use and take legal action against a person who uses the product without his consent.

Right to exploit: The holder of GI can authorize users with the exclusive right to use goods for which the GI is registered.

Right to get reliefs: Registered proprietors and authorized users have the right to obtain relief concerning the violation of such GI products.

5.20   Registered GI in India:

GI products registered in India belong to various domains, including handicrafts, agriculture, foodstuffs, alcoholic beverages, etc.

Historical Context : The first GI tag was granted in 2004 to Darjeeling Tea, and the latest were Kashmir Saffron and Manipur Black Rice (Chakhao) in May 2020.

Total GI Registrations : As of May 2020, a total of 370 GI have been registered in India.

Distribution by Category:

Handicrafts: 58%

Agriculture: 30%

Other categories: foodstuffs, manufacturing, natural goods, etc.

Regional Distribution in Handicrafts : In the Handicraft category, Tamil Nadu holds the maximum number (21) of GIs, followed by Uttar Pradesh (20) and Karnataka (19).

Notable GIs :

A few popular GIs are mentioned in the following Table.

GI	Type	State
Darjeeling Tea	Agriculture	West Bengal
Mysore Silk	Handicraft	Karnataka
Kashmir Pashmina	Handicraft	Jammu & Kashmir
Banaras Brocades and Sarees	Handicraft	Uttar Pradesh

Naga Mircha	Agriculture	Nagaland
Tirupathi Laddu	Foodstuff	Andhra Pradesh
Phulkari	Handicraft	Punjab, Haryana, Rajasthan
Basmati	Agriculture	India

International countries, such as Thailand, France, Portugal, Italy, Mexico, Peru, and the United Kingdom, have also filed GI in India, e.g., Champagne (wine) of France and Scotch Whisky of the United Kingdom.

5.21 Identification of Registered GI

Registered GI products are granted a tag, which is printed on the registered products. The tag confirms the genuineness of the product in terms of its production (by set standards) and location of production. Non-registered GI products cannot use/exploit this tag. By and large, GI tags represent the place of origin (of the product) along with cultural and/or historical identity, e.g., Darjeeling Tea, Mysore Silk, Tirupathi Laddu, etc.

Issuance of GI Tags :
In India, GI tags are issued by the Geographical Indication Registry under the Department for Promo- tion of Industry and Internal Trade, Ministry of Commerce and Industry. The head of the GI registry is located at Geographical Indications Registry, Intellectual Property Office Building, Industrial Estate,
G.S.T Road, Guindy, Chennai - 600032.

Global Standards :
GI registered products can be grown/produced anywhere in the world using standards laid down by the GI Registry. However, these products cannot be labeled as GI unless they are produced/manufactured in a specific geographical location, as mentioned in the official records maintained by the GI Office. For example, plants of Darjeeling Tea can be grown in any part of India. Still, the tea leaves of these plants cannot be sold under the brand name of Darjeeling Tea, as the concerned plants were not grown in the soil and climate of the Darjeeling area.

5.22 Classes of GI

GI certified goods are classified under 34 different
classes. For example:

> **Class 1:** Chemicals used in industry, science, photography, agriculture, horticulture, and forestry; unprocessed artificial resins, unprocessed plastics; manures; fire extinguishing compositions; tem- pering and soldering preparations; chemical substances for preserving foodstuffs; tanning sub- stances; adhesives used in industry.
>
> **Class 33:** Alcoholic beverages (except beers).

Class 34: Tobacco, smokers' articles, matches.

More details can be extracted from the official website of CGPDTM Office (http://www.ipindia.nic. in/writereaddata/images/pdf/classificationof-goods.pdf).

5.23   Non-Registerable GI

For GI registration, the indications must fall within the scope of Section 2(1)(e) of the GI Act, 1999. Being so, it has to also satisfy the provisions of Section 9, which prohibits the registration of a GI mentioned below:

 The use of which would be likely to deceive or cause confusion.

The use of which would be contrary to any law.

Which comprises or contains scandalous or obscene matter.

Which comprises or contains any matter likely to hurt the sentiments of society.

Religious susceptibilities of any class or section of the citizens of India.

 Which are determined to be generic names or indications of goods and are, therefore, not or ceased to be protected in their country of origin or which have fallen into disuse in that country.

5.24   Protection of GI

The IP rights to GI are enforced by the court of law of the concerned country. The GI registration of a product has certain advantages. It enables to identify pirated/non-genuine stuff, provides more commercial value to the product, and also strengthens the case if it reaches the judicial courts.
The two common methods of protecting a GI are:

1. **Sui generis systems:** Special regimes of protection.

2. **Certification or Collective Mark Systems:** Under these systems, GI is protected through certification marks or collective marks. Many countries, including India, protect GI using the sui generis system. This decision was taken after the TRIPS agreement (1995), and an option was given to the countries to choose either TRIPS standards or the sui generis system. This was decided by considering the fact that every country has different legislation and geographical structures & resources. Therefore, this system is not uniform in all countries and varies according to the jurisdiction and legislation of the particular country.

5.25   Collective or Certification Marks

Certification marks aim to certify the products comply with specific quality standards

irrespective of their origin. These standards include permitted materials and manufacturing methods. Therefore, the purpose of certification marks is to distinguish certified goods from non-certified ones.

Collective marks are owned by associations ensuring compliance with the agreed standards. Collective marks signify that a good or service originates from a member of a particular association. The collective mark is used by cooperating enterprises that have agreed to comply with defined quality standards for goods or services that share common characteristics.

5.26   Enforcement of GI Rights

The rights to GI protection are typically enforced by the court of law. The sanctions provided could be civil (injunctions restraining or prohibiting unlawful acts, actions for damages, etc.), criminal, or administrative.

5.27   Procedure for GI Registration

Prior to filing an application for registering GI, it is prudent to search whether the concerned GI is already protected or not. This can be done by using search engines created by WIPO (https://www. wipo.int/ipdl/en/search/lisbon/search-struct.jsp) where 'Search of Appellations of Origin and Geographical Indications' both can be conducted.

Additionally, WIPO has created a directory of all IP offices of its member countries. The registered GI of any country can be searched by accessing the website of the respective country (https://www.wipo.int/ directory/en/urls.jsp). The list of registered GI in India can be accessed from the official website of CGPDTM http://www.ipindia.nic.in/writereaddata/Portal/News/367_1_Registered_GI.pdf.

Once the prior search for registered GI is done, the applicant has to file an application. The application for GI can be forwarded by an individual or an organization or authority of people established under Indian law. The application in a prescribed format is submitted to the Registrar, Geographical Indications along with the prescribed fee (http://www.ipindia.nic.in/writereaddata/Portal/IPORule/1_27_ 1_girules.pdf). In the application, the applicant needs to mention the interest of the producers of the concerned product. The application should be duly signed by the applicant or his agent with all the details about the GI that how its standard will be maintained. The submission of three certified copies of the map of the region where the GI belongs is mandatory.

Once the application is filed at GI Registry, the Examiner will scrutinize the application for any de- ficiencies or similarities. If the examiner finds any discrepancy, he will communicate the same to the applicant, which is to be replied within one month of the communication of the discrepancy. Once the examiner is satisfied with the response/s, he files an examination report and hands over the same to the Registrar. Once again, the application is scrutinized. If need be, the applicant is asked to clear any doubts/objections within two months of the communication otherwise, the application will be rejected. After getting a green signal from the Registrar, the application is published in the official Geographical Indication Journal (http://www.ipindia.nic.in/journal-gi.htm) for seeking any objections to the claims

mentioned in the application. The objections have to be filed within four months of the publica- tion. If no opposition is received, the GI gets registered by allotting the filing date as the registration date. Initially, GI is registered for ten years but is renewable on the payment of the fee.

5.28   Documents Required for GI Registration

The following documents are required for the registration of Geographical Indications:

Details about the applicant's name, address, and particulars.
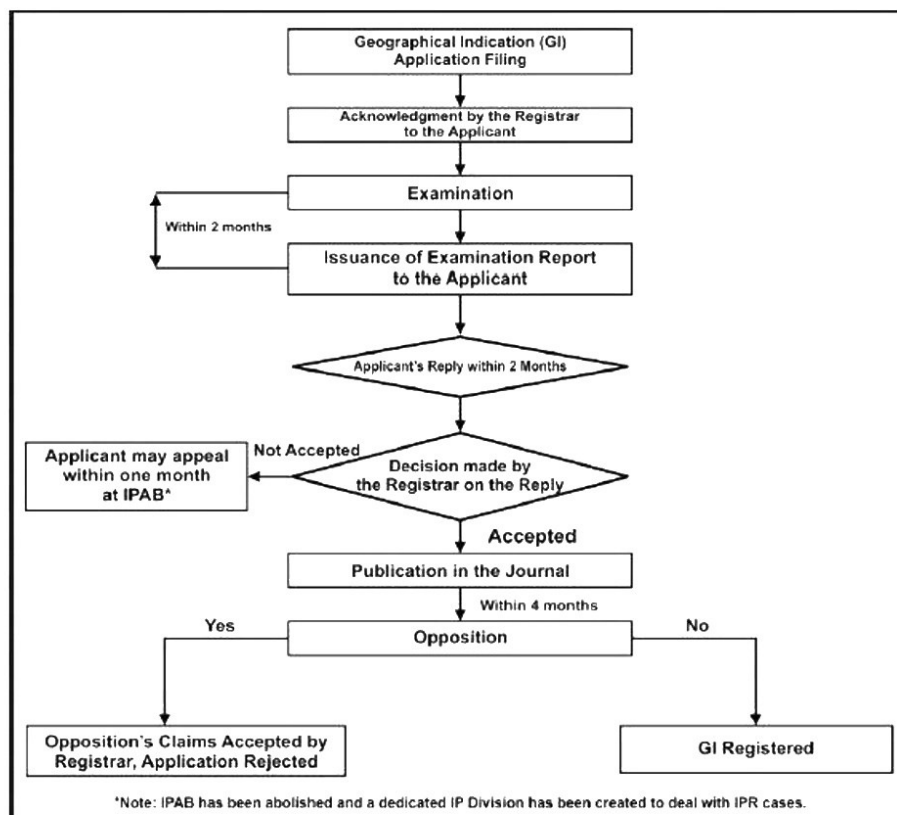
Application form GI-1A.

Statement about the designated goods being protected under GI.

Class of goods.

Affidavit to establish the claim of genuinely representing the interest of the producers.

Characteristics of GI.

The special human skill required (if any).

5.29   Application Forms for GI Registration in India

The important forms to file Geographical Indication (GI) in India under various classes are mentioned below:

1. **Form GI-1:** Application for the registration of a Geographical Indication for

goods included in one class.

Requisite Fee: Rs. 5000

2. **Form GI-1A:** Application for the registration of a Geographical Indication for goods included in one class from a Convention country.

    Requisite Fee: Rs. 5000

3. **Form GI-2:** A single application for the registration of a Geographical Indication for goods in different classes.

    Requisite Fee: Rs. 5000 for each class

4. **Form GI-2A:** A single application for the registration of a Geographical Indication for goods in different classes from a Convention country.

    Requisite Fee: Rs. 5000 for each class

5. **Form GI-3:** Notice of opposition to the registration of a Geographical Indication or an opposition or an authorized user.

    Requisite Fee: Rs. 1000 for each class

6. **Form GI-3A:** Form of counter-statement.

    Requisite Fee: Rs. 1000

7. **Form GI-3B:** Application for extension of time for filing notice of opposition.

    Requisite Fee: Rs. 300

8. **Form GI-4:** Application for the registration of an authorized user of a registered Geographical Indication.

    Requisite Fee: Rs. 500

9. **Form GI-5:** Request for issuance of a registration certificate as an authorized user.

    Requisite Fee: Rs. 100

10. **Form GI-6:** For renewal of an authorized user.

    Requisite Fee: Rs. 1000

11. **Form GI-7:** Renewal of the registration of a Geographical Indication at the expiration of the last registration.

    Requisite Fee: Rs. 3000

12. **Form GI-7A:** Application for restoration of a Geographical Indication or an authorized user removed from the Register.

    Requisite Fee: Rs. 1000 plus applicable renewal fee

13. **Form GI-7B:** Application for renewal within six months from the expiration of

the last registra- tion of Geographical Indication.

Requisite Fee: Rs. 3500

14. **Form GI-8:** Application for registration of a Geographical Indications agent.

Requisite Fee: Rs. 1000

15. **Form GI-10:** Application for cancellation of an entry in the Register or to strike out goods.

Requisite Fee: Rs. 300

5.30   GI Ecosystem in India

India is among the geographically and traditionally rich countries. The scope of generating Geographical Indication (GI) products in India is enormous. These products can contribute to the economic develop- ment of a particular region or society. However, till June 2021, a total of 370 GI have been registered in India, which is much below its potential (https://ipindia.gov.in/writereaddata/Portal/Images/ pdf/GI_Application_Register_10-09-2019.pdf). Figure 2.13 represents the statistics for GI (filed and registered) for the period 2010-20. The maximum number (148) of GI was filed in 2011-12, whereas the minimum number (17) was observed in 2015-16. Not much change in the number of GI registrations was observed during the period 2010-20. Each year, the number hovered around in the twenties, with the maximum registrations (34) seen in 2016-17.

5.31   Turmeric Patent Case

Turmeric Plant:
Turmeric, scientifically known as *Cucurma*, is a prominent Geographical Indication (GI) in India. Turmeric(Curcuma longa) is a flowering plant from the ginger family, originating from rhizomes plants. It is used as a spice
in Indian cooking and has medicinal and cosmetic uses, traditionally known for its wound-healing and anti-parasitic properties.

Turmeric Patent Battle:
The Turmeric Case is one of the most publicized cases involves the patenting of the wound healing properties of turmeric (Curcuma longa) by two scientists of Indian origin in the United States in 1994. Turmeric powder, specifically for wound healing, was patented in the US by the University of Mississippi Medical Center. Although existing knowledge is not patentable, and the essential criterion of novelty should disqualify it as an invention, the patent was granted due to a failure by the Patent Office to identify the existing knowledge. This case sparked considerable discussion and debate in India as the knowledge was available in ancient Ayurvedic texts. The Council of Scientific and Industrial Research (CSIR) , New Delhi challenged the patent's grant before the US Patent and Trademark Office (USPTO) and a re-

examination application was filed with US Patent Office claiming the use of turmeric powder was no novel invention and the medicinal use existed since ages. All the supporting evidence of ancient Sanskrit were presented. Later, the US Patent Office revoked this patent stating the patent were obvious and agreeing the use of turmeric having been known in India for centuries.

5.32 Neem Patent Case

Neem :

Another instance involves the medicinal plant Neem (Azadirachta indica), whose properties were well- known in India but not as recognized in the US and Europe. Neem extracts are used in agriculture for pest and fungal control, and neem oil has medicinal properties. It has been used traditionally to treat various diseases, and neem twigs are used as toothbrushes.

Neem Patent Battle:

In 1994, the European Patent Office (EPO) granted a patent to the US corporation W.R. Grace Company and the US Department of Agriculture for a "method for controlling fungi on plants by the aid of hydrophobic extracted neem oil." This patent was opposed by various non-governmental organizations and Indian farmers, providing evidence of neem's traditional use. The European Patent Office later revoked the patent in 2000, stating it lacked inventive steps.

5.33 Basmati Patent Case

Basmati Rice :

Basmati rice is an aromatic variety grown in India and Pakistan. It has a long history in the region, with farmers conserving distinct varieties for centuries.

Basmati Patent Battle:

An American company 'RiceTec' was granted US Patent on 'basmati rice lines and grains'. The patent includes basmati and basmati-like rice. The company also claimed that it's the novel innovation of them creating such rice. Which also caused crisis between India and United States. The Indians claimed that the innovation they are claiming are false, India threateningly took the matter to WTO as violation of TRIPS. Later, RiceTec withdrew the claims of the patent. This controversy highlighted issues related to traditional knowledge.

These case studies underscore the importance of protecting traditional knowledge from misappropria- tion through patents. These cases also emphasize the need for a balanced approach that respects both traditional practices and modern innovations.

5.34 IP Organizations In India- Schemes and Pro- grammes

In India, the key organizations engaged in IP affairs are mentioned below.

Department for Promotion of Industry and Internal Trade (DPIIT), New Delhi

DPIIT, formerly known as the Department of Industrial Policy and Promotion (DIPP), operates under the Ministry of Commerce and Industry, Government of India. It is the apex body for intellectual property (IP) in India and was established in 1995. DPIIT plays a crucial role in regulating and administering the

industrial sector. The major categories of intellectual properties governed and administered by DPIIT are listed in Table 5.1.

S. No.	Type of IP Governing Body
1.	Patents Copyrights Industrial Designs Trademarks Geographical Indications Semiconductor Integrated Circuits Layout- Design Department for Promotion of Industry and Internal Trade, New Delhi
2.	Traditional Knowledge Digital Library Governed by CSIR & Ministry of AYUSII*
3.	Plant Variety Protection Governed by Ministry of Agriculture and Farmers Welfare, New Delhi
4.	Biological Diversity Protection Governed by Ministry of Environment, Forest and Climate Change, New Delhi
5.	Trade Secrets No specific body governs Trade Secrets. Protected under various statutes like Indian Contract Act, 1872 Copyright Act, 1957 Information Technology Act, 2000, etc.

DPIIT and Office of the Controller General of Patents, Designs, and Trade Marks (CG- PDTM)

DPIIT has established a dedicated and robust Office of the Controller General of Patents, Designs, and Trade Marks (CGPDTM). This office is responsible for formulating and implementing policies, rules, and regulations related to Intellectual Property Rights (IPR). In addition to its core responsibilities, DPIIT undertakes various IPR-related activities, including:

Modernization and strengthening of the Intellectual Property Office.

Strengthening of physical infrastructure.

Enhancement of human resources.

Expansion of physical infrastructure in Delhi, Mumbai, Kolkata, and Chennai.

IT up-gradation.

Development of software required for International Searching Authority (ISA)/International Pre- liminary Examining Authority (IPEA) and Madrid Protocol.

Subscription to non-patent literature required for Patent Cooperation Treaty (PCT) minimum documentation.

Digitization of records.

Sensitization and awareness programs.

Establishment of the electronic library.

Furniture and office equipment for the modernized environment in IP offices.

DPIIT actively engages in collaborations with the World Intellectual Property Organization (WIPO) and other apex industry organizations to promote and strengthen the Intellectual Property (IP) ecosystem. These collaborative efforts aim to foster innovation, protect intellectual property rights, and contribute to the overall development of the IP landscape.

In addition to collaboration, DPIIT plays a significant role in providing valuable inputs on various issues related to the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS agreement). This involvement underscores India's commitment to contributing to global discussions on intellectual property matters and ensuring alignment with international standards.

Through these collaborative initiatives and informed contributions, DPIIT strives to enhance the effec- tiveness and coherence of intellectual property frameworks, both at the national and international levels. **Intellectual Property Appellate Board (IPAB) and Recent Changes**

In response to the increasing importance of Intellectual Property Rights (IPR) worldwide, the Indian government established the Intellectual Property Appellate Board (IPAB) in 2003. IPAB, operating under DPIIT, aimed to address the rising number of disputes related to IPR.

Originally, IPAB handled appeals against decisions made by the Registrars of Trademarks and Geograph- ical Indications, and the Controller of Patents. The Copyright Office also had a dedicated board under IPAB for determining rates, royalties, licensing, and assessment of compensation.

In 2017, the Copyright Board and Plant Varieties Protection Appellate Tribunal were merged with IPAB, operating according to their respective Acts and Rules.

However, recent amendments in the Tribunal Reforms Ordinance led to the abolishment of various Boards/Appellate Tribunals, including IPAB, as of April 4, 2021. Chief Justice D.N. Patel directed the creation of a dedicated Intellectual Property Division (IPD) within High Courts to handle all IPR-related matters, preventing conflicting decisions and reducing the burden on the judicial system.

All pending IPAB cases (around 3000) were transferred to IPD. Delhi High Court is in the process of formulating comprehensive rules for IPD, including the creation of specific rules for patent disputes, following the model of IPDs in other countries like the UK, Japan, Malaysia, Thailand, and China.

This decision is considered a landmark in the history of IPRs in India, streamlining procedures and avoiding multiplicity of proceedings.

Draft Model Guidelines on Implementation of IPR Policy for Academic Institutions

To enhance the Intellectual Property (IP) ecosystem, IP commercialization, and the entrepreneurship and start-up ecosystem in academic institutions, the Department for Promotion of Industry and Internal Trade (DPIIT) has developed draft model guidelines for the implementation of an IPR policy.

The draft guidelines are designed to provide a framework for academic institutions to effectively imple- ment policies related to Intellectual Property Rights (IPR). These guidelines aim to foster a culture of innovation, protect intellectual property, and encourage the commercialization of IP.

The draft guidelines were made available for public feedback and suggestions from September 9th, 2019, to October 25th, 2019. Interested parties could access the draft on the official DPIIT website (https:// dipp.gov.in/draft-model-guidelines-implementation-ipr-policy-academic-institutions). The department actively sought input from the public during this period.

As of now, DPIIT is in the process of finalizing the guidelines, and the official release is expected soon.

Scheme for Facilitating Start-ups Intellectual Property Protection (SIPP)

To safeguard and promote Intellectual Property (IP) in India, the Department for Promotion of Indus- try and Internal Trade (DPIIT) introduced the Scheme for Facilitating Start-ups Intellectual Property Protection (SIPP) in 2016.

The details of the scheme can be found on the official DPIIT website (http://www.ipindia.nic.in/ writereaddata/Portal/News/323_1_Scheme_for_facilitating_start-ups.pdf). SIPP is specifically designed to facilitate the protection of Patents, Trademarks, and Designs generated by start-up compa- nies.

The primary objective of the scheme is to foster the growth of innovative and emerging technologies within start-ups. SIPP aims to support these start-ups by providing mentorship and assistance in the protection and commercialization of their intellectual property. This support is extended by granting access to high-quality IP services and resources.

Through SIPP, DPIIT seeks to create an environment that encourages the development and safeguarding of intellectual property within the start-up ecosystem.

5.35   Intellectual Property Initiatives in India

Intellectual Property Office (IPO) India

The IPO India, under the Department for Promotion of Industry and Internal Trade (DPIIT), is the pri- mary government agency responsible for the administration and regulation of intellectual property rights in the country. It oversees the grant and registration of patents, trademarks, designs, and geographical indications.

National Intellectual Property Rights (IPR) Policy

The National IPR Policy, launched in 2016 by the Government of India, aims to foster innovation, pro- mote creativity, and enhance access to intellectual property protection. The policy focuses on creating awareness, strengthening enforcement mechanisms, and facilitating the commercialization of IP.

Patent Information Centers (PICs)

The IPO India has established Patent Information Centers across the country to provide information and support on patents and the patenting process.

Technology and Innovation Support Centers (TISCs)

TISCs, set up in collaboration with the World Intellectual Property Organization (WIPO), provide patent- related information and services, fostering innovation and technology transfer.

R&D and IP Facilitation

Various government departments and agencies offer schemes and programs to encourage research and de-

velopment (R&D) with a focus on intellectual property. These initiatives often include funding support and incentives for innovation.

Start-up India and Make in India

The Start-up India initiative and the Make in India campaign encourage entrepreneurship and innova- tion. They provide support for startups, including facilitation of IP protection and fast-tracking of patent applications.

IP Awareness and Training Programs

The IPO India conducts awareness and training programs to educate stakeholders about intellectual property rights, their importance, and the process of obtaining protection.

Innovations in Science Pursuit for Inspired Research (INSPIRE)

INSPIRE is a program under the Department of Science and Technology that aims to attract talent to the study of science at an early age. It also promotes research and innovation among students.

Question Bank

1. Discuss the eligibility criteria for industrial design protection. Explain the concept of novelty and originality in relation to industrial designs.

2. Discuss the eligibility criteria for industrial designs. Explore the enforcement of design rights and non-protectable industrial designs in India. Provide insights into a famous case law related to industrial designs.

3. Describe the procedure for registration of industrial designs in India. Explain the importance of conducting a prior art search before filing an application.

4. What are the rights granted to the holders of geographical indications? Discuss the procedure for registration of geographical indications and the documents required for the registration process.

5. Explain the concept of design rights. Discuss the enforcement mechanisms available for protecting design rights in India.

6. Discuss the classification of industrial designs based on the Locarno Classification. Explain the significance of classifying industrial designs in the registration process.

7. Describe the protection term and renewal process for registered industrial designs in India. Discuss the importance of design registration for businesses.

8. Explain the concept of non-protectable industrial designs in India. Discuss the criteria for deter- mining the non-protectability of industrial designs.

9. Explain the concept of non-protectable industrial designs in India. Discuss the famous case law between Apple Inc. and Samsung Electronics Co., highlighting the key legal issues, and the prolonged legal proceedings.

10. Discuss the acts, laws, and rules governing geographical indications in India.

Explain the ownership of geographical indications and the rights granted to the holders.

11. Define Geographical Indications with example. Explain the procedure for GI Registration.

12. Describe the ecosystem for geographical indications in India. Discuss the role of various organiza- tions and bodies involved in the promotion and protection of geographical indications.

13. Explain the ownership of geographical indications (GIs) and the rights granted to holders. Discuss the classes of GIs and the protection of GIs. Explore collective or certification marks in the context of GIs.

14. Choose one of the case studies on patents (Curcuma, Neem, or Basmati) and discuss the key issues and outcomes of the case. Analyze the impact of these case studies on the protection of traditional knowledge and intellectual property rights.

15. Explore the eligibility criteria and laws governing industrial designs. Discuss the importance of design registration, the procedure for registration, and the duration of the registration of a design. Provide examples of famous case law related to industrial designs.