GHOUSIA INSTITUTE OF TECHNOLOGY FOR WOMEN

Near Dairy Circle, Hosur Road, Bengaluru-560029, KARNATAKA
Affiliated to VTU., Belagavi, Recognized by Government of Karnataka & A.I.C.T.E., New Delhi

BRMK557

RESEARCH METHODOLOGY & IPR

5TH SEMESTER B.E DEGREE

Research methodology is a systematic approach used to collect, analyze, and interpret data to solve a problem or gain insights. It ensures the validity and reliability of results through structured planning and scientific techniques.

Intellectual Property Rights are legal protections granted to individuals or organizations for their original works, ideas, or inventions, ensuring exclusive rights to use, produce, and commercialize them for a certain period.Together, research methodology and IPR form the backbone of ethical and innovative academic and industrial research.

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Assistant Professor

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RESEARCH METHODOLOGY & IPR

BRMK557

As per 2022 Scheme Syllabus Prescribed by V.T.U.

For

FIFTH SEMESTER

(Bachelor of Engineering)

Dr.NAVEED M.Tech., PhD.

Assistant Professor

Department of Computer Science & Engineering

V Semester

RESEARCH METHODOLOGY & IPR			
Course Code:	**BRMK557**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03

Course Objectives:

CO1. To Understand the knowledge on basics of research and its types.
CO2. To Learn the concept of Literature Review, Technical Reading, Attributions and Citations.
CO3. To learn Ethics in Engineering Research.
CO4. To Discuss the concepts of Intellectual Property Rights in engineering.

Teaching-Learning Process (General Instructions)

These are sample Strategies; that teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer methods (L) need not be only the traditional lecture methods, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video to explain various concepts on IPR.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher Order Thinking) questions in the class, which promotes critical thinking.
5. Introduce Topics in manifold representations.
6. Show the different ways to analyze the research problem and encourage the students to come up with their own creative ways to solve them.
7. Discuss how every concept can be applied to the real world - and when that's possible, it helps Improve the students' understanding.

Module-1 (8 Hours)

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

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

Teaching- Learning Process	Chalk and talk method / PowerPoint Presentation.

Module-2 (8 Hours)

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

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

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Module-3 (8 Hours)

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

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

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

Teaching- Learning Process	Chalk and talk method / PowerPoint Presentation.

Module-4 (8 Hours)

Copyrights and Related Rights: Classes of Copyrights. Criteria for Copyright. Ownership of Copyright. Copyrights of the Author. Copyright Infringements. Copyright Infringement is a Criminal Offence. Copyright Infringement is a Cognizable Offence. Fair Use Doctrine. Copyrights and Internet. Non-Copyright Work. Copyright Registration. Judicial Powers of the Registrar of Copyrights. Fee Structure. Copyright Symbol.

Validity of Copyright. Copyright Profile of India. Copyright and the word 'Publish'. Transfer of Copyrights to a Publisher. Copyrights and the Word 'Adaptation'. Copyrights and the Word 'Indian Work'. Joint Authorship. Copyright Society. Copyright Board. Copyright Enforcement Advisory Council (CEAC). International Copyright Agreements, Conventions and Treaties. Interesting Copyrights Cases.

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

Module-5(8 Hours)

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

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

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

Teaching- Learning Process	Chalk and talk method / PowerPoint Presentation

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). The student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- There are 25 marks for the CIE's Assignment component and 25 for the Internal Assessment Test component.
- Each test shall be conducted for 25 marks. The first test will be administered after 40-50% of the coverage of the syllabus, and the second test will be administered after 85-90% of the coverage of the syllabus. The average of the two tests shall be scaled down to 25 marks
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The schedule for assignments shall be planned properly by the course teacher. The teacher should not conduct two assignments at the end of the semester if two assignments are planned. Each assignment shall be conducted for 25 marks. (If two assignments are conducted then the sum of the two assignments shall be scaled down to 25 marks)
- The final CIE marks of the course out of 50 will be the sum of the scale-down marks of tests and assignment/s marks.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

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

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.

Marks scored shall be proportionally reduced to 50 marks.

Course Outcomes (Course Skill Set)

At the end of the course, the student will be able to:

CO1. To know the meaning of engineering research.

CO2. To know the procedure of the literature Review and Technical Reading

CO3. To understand the fundamentals of the patent laws and drafting procedure

CO4. Understanding the copyright laws and subject matters of copyrights and designs

CO5. Under standing the basic principles of design rights

Suggested Learning Resources:

Textbook

1. Dr. Santosh M Nejakar, Dr. Harish Bendigeri "Research Methodology and Intellectual Property Rights", ISBN 978-93-5987-928-4, Edition: 2023-24.

Reference Book:

1. David V. Thiel "Research Methods for Engineers" Cambridge University Press, 978-1-107-03488-4
2. Intellectual Property Rights by N.K.Acharya Asia Law House 6th Edition. ISBN: 978-93-81849-30-9

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Quizzes
- Assignments
- Seminars

MODULE-01 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, Ethical Issues Related to Authorship.

1.1 Introduction.

Research Methodology refers to the systematic approach used to identify, analyze, and solve research problems. It involves defining a research question, reviewing existing knowledge, selecting appropriate methods for data collection and analysis, and interpreting the results to generate new insights or solutions. In engineering, research methodology helps in innovating, optimizing systems, and addressing real-world challenges with scientific rigor. It ensures that the research is reliable, replicable, and contributes meaningfully to the field.

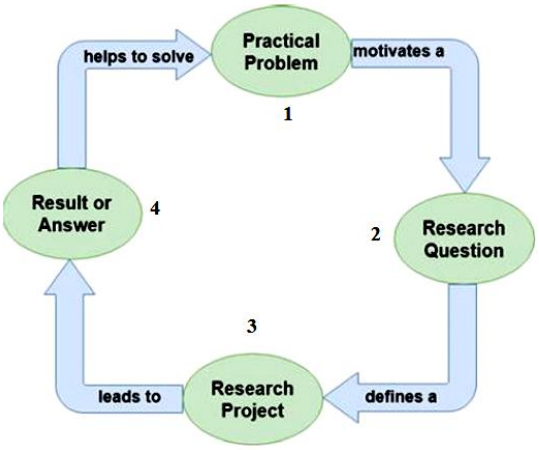
Example: Imagine a computer science student wants to design an AI-based traffic signal system *that reduces traffic jams in cities. First, they define the research problem: "How to optimize traffic flow using AI?" Next, they study existing methods like fixed-timer signals and sensor-based systems. Then, they decide on a methodology — collecting live traffic data, applying machine learning algorithms, and simulating results. Finally, they analyze the performance and suggest improvements. This systematic approach ensures the solution is scientific, reliable, and can be replicated in other cities.*

Intellectual Property (IP) refers to creations of the mind, such as inventions, designs, artistic works, and symbols, which are protected by law. In engineering and research, protecting IP through patents, copyrights, trademarks, and trade secrets ensures that the creators retain rights over their innovations. This encourages innovation, prevents unauthorized use, and supports commercialization. Understanding IP is crucial for researchers to safeguard their work and contribute responsibly to technological and societal advancement.

Example: Suppose a team of engineers develops a new data compression algorithm *that reduces file size by 60% without losing quality. Since this is an original creation of the mind, they apply for a* ***patent*** *to protect it. By securing IP rights, no other company can copy or sell the same algorithm without permission. This not only gives recognition to the inventors but also allows them to license the algorithm to tech companies, encouraging innovation and helping society by improving storage and data transfer.*

1.2 Meaning of Research:

Research is a careful, objective, and systematic process of investigating an unknown or lesser-known problem to expand existing knowledge or develop new insights. It is not just about collecting information but about making an original contribution to a specific field.
A research cycle in a simple, logical, and continuous loop that starts with a practical problem and ends with a solution that can be applied back to the problem as illustrated in the following figure.



The cycle begins when a practical problem is identified—something that needs to be fixed or improved in the real world. This problem motivates a research question, which is a focused and specific query that aims to understand or solve some aspect of the problem. Once the question is clear, it defines a research project, where researchers plan and carry out systematic investigations—using methods like experiments, surveys, or simulations—to find answers. This project leads to a result or answer, which is the outcome of the study.

Finally, the result is used to help solve the original practical problem, thereby completing the cycle and often revealing new problems, starting the process again. This model emphasizes how research is a structured and repeatable approach to solving real-life issues through inquiry, evidence, and analysis.

Example-01: A computer scientist notices that traditional sorting algorithms perform poorly when handling massive datasets in big data analytics platforms. This practical problem (Step 1) raises concerns about processing speed and efficiency, motivating the researcher to explore improvements. This leads to the formulation of a research question (Step 2): "How can sorting algorithms be optimized for better performance in large-scale data environments?" *With this clear question in mind, the researcher initiates a research project (Step 3), designing and experimenting with new algorithmic strategies, running simulations, and analyzing outcomes. After rigorous testing and refinement, the study yields a result or answer (Step 4)—a new algorithm that sorts data more efficiently than existing methods. This outcome is then applied to help solve the original problem, demonstrating how the research cycle—starting from a real-world issue and proceeding through questioning, investigation, and solution—contributes both to theoretical advancement and practical innovation in computer science.*

***Example-02:** A cybersecurity researcher identifies a practical problem (Step 1): traditional rule-based email filters are increasingly ineffective against modern, sophisticated phishing attacks. Concerned by the rise in online scams and the limitations of current solutions, the researcher is motivated to ask a research question (Step 2):* "Can a deep learning-based approach improve the detection of phishing emails compared to existing methods?" *With this question, the researcher sets up a research project (Step 3), collecting a large dataset of phishing and legitimate emails, extracting features, and designing a neural network model. Through training and testing, the model learns to distinguish phishing emails with greater accuracy. The result or answer (Step 4) is a high-performing AI-driven phishing detection system that significantly outperforms traditional filters.*

This outcome not only solves the initial problem but also contributes to the advancement of cybersecurity research, showcasing how a structured research cycle leads from a real-world issue to an impactful technological solution.

1.3 Engineering Research:

Engineering research, is a systematic and disciplined process aimed at discovering new knowledge or improving & understanding existing knowledge specifically in the field of engineering. Unlike general or purely scientific research, which often focuses on understanding fundamental principles without immediate application, engineering research is application-

oriented—it is driven by real-world problems and aims to develop practical, innovative solutions that can be implemented to improve systems, technologies, or processes.

Engineering research is practical, problem-solving oriented, and closely tied to technological advancement. It combines theoretical understanding with experimentation and design to produce results that are not just informative, but usable in real-world engineering scenarios.

Example 1: Traffic Prediction using AI

A computer science engineering researcher observes that people often get stuck in unexpected traffic despite using maps. They begin a project to improve real-time traffic prediction using machine learning. By collecting data from GPS, road sensors, and past traffic patterns, they train a model that predicts congestion more accurately. This solution can be used in navigation apps.

This is engineering research because it applies computing techniques to solve a real-world problem.

Example 2: Energy-Efficient Data Centers

Data centers consume huge amounts of electricity. A researcher working in computer architecture analyzes processor usage patterns and proposes a smarter task-scheduling algorithm that reduces power consumption without affecting performance.This shows engineering research focused on optimization and sustainability.

Both examples illustrate how engineering research blends scientific understanding with technical design to optimize systems and directly benefit users and industries.

1.4 Objectives of Engineering Research

The main aim of engineering research is to find new and important problems and work on solving them, even if the final answer is not clear from the beginning. Researchers often start with an idea or guess based on experience or evidence and then test it through careful study. Some of the important objectives of engineering research are listed below.

S.No	Objective	Explanation
1	Innovation and Advancement	Developing new ideas, technologies, or methods to go beyond current knowledge and improve engineering fields.
2	Problem Solving	Finding practical and effective solutions to real-world problems using engineering knowledge.
3	Optimization	Making existing systems or products more efficient, cost-effective, and eco-friendly.
4	Knowledge Expansion	Understanding engineering topics better through study, experiments, and sharing results.
5	Interdisciplinary Collaboration	Working together with experts from other fields to solve complex and wide-ranging problems.
6	Education and Training	Helping students and engineers learn by sharing research findings through publications, teaching, and conferences.
7	Technological Transfer	Turning research results into useful tools, products, or services that can be used in real life by industries or the public.
8	Societal Impact	Improving daily life by addressing issues like infrastructure, healthcare, and sustainability through engineering solutions.
9	Quality and Safety Improvement	Enhancing the safety and quality of engineering systems and products, especially in sensitive areas like healthcare and transport.
10	Addressing Global Challenges	Solving worldwide problems such as climate change, public health crises, and resource shortages through innovative engineering research.

1.5 Motivation in Engineering Research.

Motivation is the driving force behind engineering research. It inspires researchers to explore new ideas, solve real-world problems, and contribute to the growth of knowledge and technology. People get motivated for different reasons, and these reasons are usually grouped into three types: intrinsic, extrinsic, or a mix of both**.**

Intrinsic motivation comes from within a person. It means doing research because you genuinely enjoy it, are curious, or want to learn and grow. You are not expecting any reward or recognition—you simply find the work interesting and satisfying.

For example, a student who loves robotics may do research to improve robot functions purely out of personal passion.

Extrinsic motivation comes from outside influences, such as rewards, recognition, money, or job promotions. In this case, the researcher may not be deeply interested in the topic but is motivated by what they can gain from it.

For example, someone may work on a research project just to get a promotion or to win a prize.

Mixed motivation is a combination of both intrinsic and extrinsic factors. A person may truly enjoy the research topic but is also influenced by rewards, career goals, or social appreciation.

For instance, a researcher might work on a government-funded AI project because they are both passionate about artificial intelligence and want to gain recognition or career benefits from their work.

Intrinsic Motivation		
Motivating Factor	**Explanation**	**Example**
Curiosity and Intellectual Interest	A strong desire to learn and understand how things work.	A researcher explores solar energy systems out of curiosity and develops efficient solar panels.
Personal Fulfillment	Research gives a sense of satisfaction, joy, or personal growth.	An engineer works on environmental solutions to feel useful and fulfilled.
Passion for Technology	A deep interest and enjoyment in working with technology.	A student passionate about robotics builds smarter autonomous robots.

Extrinsic Motivation		
Motivating Factor	**Explanation**	**Example**
Career Development	Research helps in getting jobs, promotions, fame, and success.	A researcher files a patent and earns recognition, boosting their career.
Competitive Drive	Desire to stay ahead of others or be the best in the field.	A professor publishes faster to compete with colleagues from other institutes.
Influence from Others	Being motivated by what friends, peers, or rivals are doing.	A student starts a research project because their friends are doing well in that area.
Terms of Employment	Doing research because of job requirements, salary, or promotions.	An engineer does research to fulfill promotion criteria or to maintain job security.

Mixed Motivation		
Motivating Factor	**Explanation**	**Example**
Doing Better Than the World	Motivated by inner desire to excel and also gain external recognition.	A researcher tries to beat existing AI models to set a new standard and gain fame.
Improving the State of the Art	A personal drive to innovate, along with industry or public recognition.	An engineer improves encryption methods to push technology forward and gain industry respect.
Contributing to Society	A blend of purpose-driven work and social/official appreciation.	Designing affordable medical devices to help society while receiving awards or media attention.
Fulfilling Historical Legacy	Inspired by cultural roots and expectations from society.	A researcher continues family legacy in education while also gaining social honor.
Government Directives & Funding	Attracted by financial support but also aligned with personal research interest.	Working on a government-funded green energy project that also matches the researcher's passion.

1.6 Types of Engineering Research

Research may be classified into different types to better suit the purpose, approach, and outcome of the investigation. Each type serves a specific goal, whether it's to describe a situation, solve a problem, or build new knowledge. This classification helps researchers choose the right method and tools based on the nature of the question. The following are broad classification of research with live example.

1. Descriptive versus Analytical Research

Descriptive research is used to describe the features or conditions of a particular topic without changing or controlling anything. It helps us understand the current situation by collecting facts and reporting them as they are.

For example, if a researcher is studying student usage of online learning platforms in computer science, they may collect data on how many students use Coursera, NPTEL, or edX, how many hours they spend on each, and which features they use most.

This is descriptive research because it shows the present usage pattern without explaining the reasons.

On the other hand, analytical research is used to examine data in detail to understand the causes behind a particular outcome.

The same researcher may now look into why students prefer one platform over another. They may analyze how platform speed, content quality, or ease of use affects student satisfaction. This research involves comparisons and drawing conclusions based on existing data.

So, while descriptive research answers "What is happening?", analytical research answers "Why is it happening?"

2. Applied versus Fundamental Research

Applied research focuses on solving specific real-world problems.

In our example, the researcher may design a course recommendation system that helps students choose the best online courses based on their interests and past behavior.

This research has a direct use and can be applied to improve the student learning experience.

Fundamental research, also called basic or pure research, is done to gain deeper theoretical understanding without immediate practical application.

In the same topic, the researcher might study how different recommendation algorithms behave under varying conditions—like collaborative filtering vs. content-based filtering—just to better understand how they work.

This research may not be used right away but can support future innovations in learning technologies.

3. Quantitative versus Qualitative Research

Quantitative research involves collecting and analyzing numerical data. It is used to find patterns or relationships using statistics.

In the context of online learning platforms, the researcher might conduct a survey where students rate their satisfaction from 1 to 5. The researcher then calculates average scores, identifies trends, and uses graphs to present the findings. This is a clear example of quantitative research.

Qualitative research, on the other hand, focuses on collecting descriptive and non-numerical information.

Here, the researcher might interview students to understand their personal experiences, challenges, and preferences while using online learning platforms.

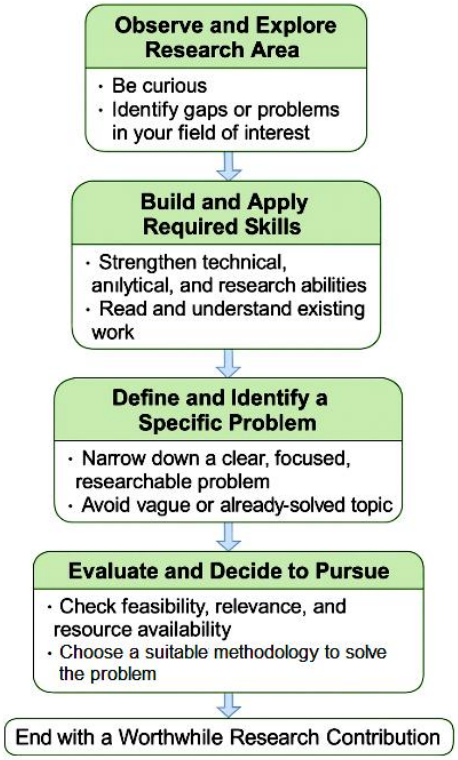
This type of research provides deep insights into the human side of learning and is helpful for understanding behavior, motivation, and feelings that numbers alone can't show.

The following table briefly summarizes the above.

Type of Research	Purpose	What It Does	Example
Descriptive	To describe a situation or behavior	Observes and records what is happening without explaining why	Tracking how many students use each online platform
Analytical	To understand reasons or causes	Analyzes data to explain why something is happening	Studying why students prefer one platform over another
Applied	To solve real-world problems	Develops practical solutions or tools	Creating a course recommendation system
Fundamental (Basic)	To gain deep theoretical knowledge	Builds understanding without immediate practical use	Studying how recommendation algorithms behave under different data types
Quantitative	To collect and analyze numerical data	Uses numbers, measurements, and statistics	Surveying students' satisfaction scores and analyzing them with charts
Qualitative	To explore experiences and opinions	Gathers detailed feedback using words, interviews, or open-ended questions	Interviewing students about their learning experience on different platforms

1.7 Finding and Solving a Worthwhile Problem

The journey of research begins with curiosity, grows through skills and observation, and results in real solutions through structured methods. The following represent some of the major steps followed to find and solve a worthwhile problem.



1. Observe and Explore Research Area

Finding a research problem is the starting point of any research activity. It involves noticing a gap, challenge, or inefficiency in the current systems, technology, or knowledge. A good research problem is one that is not fully solved and is important to users, industry, or society. This step often starts with observations, curiosity, and asking questions about how things can be improved.

Example: A computer science student notices that many students face issues finding relevant courses on online learning platforms. They wonder, "Why can't the system suggest courses based on the student's interests automatically?" This curiosity leads to a possible research problem.

2. Build & Apply Required Skills

To find and solve a research problem, a researcher needs a mix of technical, analytical, and soft skills. Important skills include critical thinking, creativity, technical knowledge of the subject, communication, and perseverance. The ability to read existing research, ask the right questions, and break down complex problems is essential.

Example: The student who identified the issue with course recommendations now needs to learn about machine learning algorithms, analyze user data, and communicate ideas clearly to begin building a solution.

3. Define & Identify a Specific Problem

Once the area of interest is selected, the next step is to narrow it down to a specific and manageable research problem. This means defining the scope of the problem clearly so that it can be solved within available time and resources. It also involves studying existing solutions to avoid duplicating efforts.

Example: The student defines the problem more clearly: "How can we use a student's past learning behavior to suggest the most suitable online course in real-time?"

4. Evaluate & Decide to Pursue

A worthwhile research problem should have the following characteristics:

- It should be original or innovative (not a copy of past work)
- It should be challenging but solvable
- It should have practical value or impact
- It should be based on clear objectives
- It should be researchable with available tools and methods

Example: The course recommendation system problem is worthwhile because it's useful for thousands of students, hasn't been fully solved in a personalized way, and can be approached using available AI techniques.

After identifying a problem, the researcher must decide whether or not to pursue it, based on interest, feasibility, available time, resources, and guidance. It's important to consider if the problem is within the researcher's ability and scope to address.

Example: The student checks if enough data is available, if they have the programming skills, and if they can complete it within a semester. After confirming, they decide to go ahead with the research.

Once the problem is chosen, the next step is to follow a research methodology, which is a step-by-step process used to solve the problem scientifically. This includes:

- Reviewing existing literature
- Forming hypotheses
- Collecting and analyzing data
- Designing and testing solutions
- Drawing conclusions and reporting findings

Example: The student begins by reading research papers on recommendation algorithms, collects user data from an online platform, trains a machine learning model, tests it for accuracy, and finally documents the results in a report or thesis.

1.8 Polya's Approach:

George Pólya (1887–1985) was a Hungarian mathematician known for his work in problem-solving and mathematical thinking. He proposed a four-step approach to solving problems: Understand, Explore, Implement, and Reflect. His method helps break complex problems into manageable steps. It is widely used in mathematics, science, and engineering research today.

1. Understand the Problem

First, make sure you really understand what the problem is about. Try to explain it in your own words. If needed, draw a diagram or note down important points. Ask yourself: *What exactly is being asked? Do I have all the information I need?*

Example: If you're trying to design a program to detect fake news, make sure you understand what fake news is, how it behaves, and what kind of data you have.

2. Explore Strategies

Next, think of different ways to solve the problem. Look for patterns, similar problems you've solved before, or methods that might work. Don't just jump into the first idea—consider your options.

Example: You might think about using a machine learning model, a keyword-matching system, or a combination of both to detect fake news.

3. Implement the Plan

Choose the best strategy and try it out. Start building your solution and see if it works. If it doesn't, don't worry—go back, try another plan, and keep improving. Trial and error is part of the process.

Example: You decide to implement a machine learning algorithm. If it doesn't give good results, you try improving the training data or testing another algorithm.

4. Reflect and Learn

Once you've solved the problem (or tried your best), take time to look back. What worked? What didn't? What could be improved next time? This reflection helps you grow and solve future problems better.

Example: After completing your fake news detector, you evaluate the results and think about how you could improve accuracy or make the system faster.

1.9 Ethics in Engineering Research

Ethics in engineering research is essential because it ensures that the work done by researchers is trustworthy, respectful, and responsible. Ethical research protects the rights, safety, and dignity of all participants, especially in studies involving human subjects. It also helps maintain the integrity and credibility of scientific knowledge by discouraging practices like plagiarism, data falsification, and fabrication. Without ethical guidelines, research outcomes could be misleading or even harmful to society, technology, and the environment.

Moreover, ethics promotes fairness in recognition and collaboration, making sure that all contributors are properly credited and that competitive pressure doesn't lead to dishonest behavior.

In today's world, where engineering research often involves sensitive data, AI, human interaction, or environmental impact, following ethical standards is more important than ever. It helps researchers make decisions that are not only technically correct but also socially and morally sound, ensuring that research serves the greater good.

In short, ethics is the foundation that builds trust between researchers, society, and the scientific community, and it is vital for sustainable progress in engineering and technology.

The importance of ethics in research has a strong historical background. One of the key milestones was the Nuremberg Code established in 1947, after World War II. This code was a response to unethical human experiments carried out by Nazi doctors. It laid down principles like informed consent, which means that people involved in research must agree to participate voluntarily and fully understand the risks.

Another major influence was the British Royal Society, formed in the 1600s, which helped set standards for giving credit to researchers. It introduced the idea that the first to publish findings should be given priority, helping to maintain fairness in recognition and publication. These historical events highlight how ethical thinking has developed over time to ensure research is carried out with honesty, respect, and responsibility.

1.10 Differences between Research Ethics and Responsible Conduct of Research (RCR):

In engineering research, it's important to understand the difference between research ethics and responsible conduct of research (RCR), even though they are closely related.

Research ethics refers to the moral rules that guide the outcome and impact of research. It ensures that the research is fair, honest, respectful, and considers how the results might affect people or society.

For example, when developing autonomous (driverless) cars, research ethics involves asking important questions such as: Are we designing this technology safely? Could it be misused? Are we protecting people's lives and rights? These are ethical concerns about how the final product will be used in the real world.

On the other hand, responsible conduct of research is about how the research work is carried out from start to finish. It focuses on integrity during the research process, such as avoiding data manipulation, giving proper credit to team members, managing projects honestly, and collaborating ethically.

In the same driverless car project, responsible conduct means: Are the researchers working with cyber security experts to avoid hacking? Are they openly sharing risks with the public and authorities? Are all contributors being acknowledged fairly?

In short, research ethics is about doing the right thing with the results, while RCR is about doing the right thing while conducting the research. Both are essential for building public trust, ensuring safety, and advancing engineering in a way that benefits society responsibly.

1.11 Ethics in Engineering Research Practice:

Ethics in engineering research is not limited to the lab or academic settings—it also plays a major role when engineers apply their knowledge to real-world technologies. Engineering researchers have a responsibility to ensure that the technologies they develop are used in ways that are safe, fair, and respectful of people's rights. This includes being careful about privacy, safety, and long-term impact on society. Ethical awareness helps guide the design, development, and decision-making process in technology. It includes the following aspects.

i) Ethical Concerns in Technological Developments:

As technology grows, ethical concerns like data privacy and surveillance become more important. Computer science engineers must protect users' personal data and get clear consent before using it.

For example, a traffic app using location data should not share it with advertisers without permission. Even convenient tools like facial recognition can raise issues if they are biased or inaccurate. Ethical practices help ensure technology is fair, safe, and respects user rights.

ii.) Ethical Decision-Making in Technological Choices:

Engineering research involves making key decisions that affect how technology will function in the real world. These decisions should always be guided by ethical thinking from the very beginning. Engineers can ensure ethical practices by setting rules, designing responsibly, and selecting the best alternatives. At the start, they can set ethical requirements to protect users.

For example, voice assistants like Alexa should only record when activated, ensuring privacy. During development, they can influence the design by prioritizing features that protect people—like adding automatic braking in AI-based driving systems. When choosing between options, they should go for the one with the least harm—such as using secure, encrypted cloud storage over cheaper, less safe options. These choices help build trustworthy and responsible technologies.

iii) Minimizing Unintended Consequences

Even well-planned technologies can sometimes cause unexpected problems. It's the engineer's ethical responsibility to think ahead and reduce these risks by using safe designs, backup systems, and careful planning. This helps protect both users and society.

Example: A team creates a machine learning program to help with hiring. If the data it learns from is biased, it might unfairly favor certain groups. To act ethically, the team should check for bias early, use fair data, and let humans review decisions to make sure everyone is treated equally.

1.12 Types of Research Misconduct:

In engineering research, maintaining honesty, fairness, and integrity is essential. The goal is to create useful and reliable technologies that advance society. However, when researchers behave unethically or break the rules of good scientific conduct, it is called research misconduct.

This includes actions like making up data, changing results dishonestly, copying others' work without credit, and violating publication rules. These actions can damage trust, mislead future

research, and delay progress. The following represent some of the common types of research misconduct.

1. Fabrication

Fabrication is when a researcher makes up or invents data or results that were never actually observed or tested. This is a serious violation of research ethics because it presents false findings as if they are true.

Example: Suppose a computer science student is working on a project that involves testing the performance of a new data compression algorithm. Due to lack of time or pressure from deadlines, they skip the actual testing and instead write fake results showing their algorithm is faster and more efficient.

Side Effects: This type of misconduct leads to false knowledge being published, which may mislead other researchers, waste resources, and slow down real progress. It also harms the reputation of the researcher and the institution, and makes it harder for honest work to stand out.

2. Falsification

Falsification involves changing, modifying, or misrepresenting data or results to fit the desired conclusion, even though the original data says something different. This includes altering figures, code, or results in a way that hides the truth.

Example: Imagine a researcher tests a machine learning model for spam detection and the model performs poorly. But to make the results look good, they adjust the output to show higher accuracy than what was actually achieved.

Side Effects: Falsification damages the trust others place in published work. It results in incorrect findings, which may be cited by others and spread errors across the research community. It also leads to wasted time and money trying to build on unreliable data.

3. Plagiarism

Plagiarism means copying someone else's words, code, ideas, or research without giving them proper credit. It includes using published content, figures, or even your own previously submitted work (self-plagiarism) without citation.

Example: A student working on a research paper copies several paragraphs from an online article on cloud computing but does not cite the source. Or, they reuse their old assignment from a previous semester without mentioning it's reused work.

Side Effects: Plagiarism violates intellectual honesty, and if discovered, can lead to academic penalties, damaged reputation, and rejection of papers or projects. It also disrespects the original author's work and discourages genuine innovation.

4. Deception and Fraud

Deception and fraud refer to intentionally misleading others by engaging in dishonest research practices. This includes actions like submitting the same paper to multiple journals, hiding mistakes, or claiming credit for someone else's work.

Example: A researcher submits the same AI paper to two journals at once to increase chances of publication, which is against publication rules. Or, if a developer finds a serious bug in their published app but hides it from users and reviewers to avoid criticism.

Side Effects: Fraudulent actions undermine trust in the research community, create publication barriers for others, and can cause long-term damage to both the researcher's career and public trust in science. If errors remain uncorrected, they continue to mislead future work.

1.13 Ethical Issues Related to Authorship.

Unethical authorship practices, though sometimes done with good intentions, can lead to serious consequences. Honest and fair recognition is essential for maintaining trust, responsibility, and respect in engineering and academic research. The following represent some of the common ethical issues related to authorship.

1. Gift or Guest Authorship

Gift or guest authorship happens when someone is listed as a coauthor on a research paper even though they did not make any real contribution to the work. This practice gives credit to someone who hasn't earned it, which is unfair to those who actually did the work. It can mislead readers about who is responsible for the content and weakens the value of true authorship.

For example, adding a professor's name to a student's software development paper just to impress others can harm the credibility of both the research and the people involved.

2. Career-Boost Authorship

Career-boost authorship involves adding someone—usually a junior researcher or student—as a coauthor simply to help them get a job or promotion, even if their contribution was minimal. While it may seem helpful, it distorts the record of who did what, leading to unfair academic advantages and damaging the trust others place in the publication.

For instance, if a faculty member includes a student on a published AI research paper despite minimal involvement, it sends the wrong message about merit and fairness.

3. Career-Preservation Authorship

This occurs when a researcher includes department heads or other senior figures as coauthors to maintain a good relationship or receive favors in return. This is problematic because it gives authorship credit to someone who didn't contribute meaningfully, which reduces transparency and fairness.

For example, listing the dean as a coauthor on a research paper about data privacy without their involvement can lead to biased recognition and reward systems within institutions.

4. Ghost Coauthorship

Ghost coauthorship is when someone who contributed significantly to the research is left out of the author list, often due to internal conflicts or personal interests. This hides their involvement and can affect the accuracy and integrity of the published work.

For example, if a researcher helps write most of a machine learning paper but is excluded because of workplace politics, readers may never know about their contribution or reach out for clarification, limiting the transparency of the study.

5. Reciprocal Authorship

In reciprocal authorship, two researchers agree to include each other as coauthors on their papers, even with little or no real collaboration. This can inflate their publication records dishonestly and damage the credibility of their research.

For instance, if two engineers working on unrelated topics add each other's names to boost their CVs, it undermines the value of authorship and leads to inflated reputations not based on merit.

6. Misrepresentation of Sole Authorship

Some authors wrongly present their work as being done entirely by themselves, even when others played important roles. By doing so, they take full credit and only mention collaborators in the acknowledgments. This misleads readers and fails to properly recognize those who contributed.

For example, if a student writes a paper on app security using another teammate's analysis but claims sole authorship, it creates confusion and denies the teammate their rightful credit.

7. Authorial Accountability

All authors listed on a paper are responsible for the content and should be aware of and agree to the submission. Problems arise when one author commits misconduct, such as falsifying data, and the others are unaware. Without clear communication and defined roles, it's hard to know who is accountable. This can harm innocent coauthors and affect everyone's reputation, especially in group projects like developing new software tools or AI models.

8. Double Submission

Double submission refers to submitting the same research paper to two different journals at the same time. While some do this to speed up publication, it violates journal policies and wastes reviewers' and editors' time. It also risks both journals rejecting the paper, which affects the researcher's credibility.

For example, submitting a cloud computing research article to two conferences simultaneously can lead to blacklisting from both, harming the author's publication record.

Brief summary:

Type	Description	Example	Impact
Gift Authorship	Adding someone who didn't contribute	Adding a professor to a student's app project	Unfair credit, misleads readers
Career-Boost Authorship	Listing juniors to help their career	Including a student with minimal input on an AI paper	Distorts academic record
Career-Preservation	Adding seniors for favors or good relations	Including dean in a data privacy paper for future support	Biased recognition, lack of fairness
Ghost Authorship	Leaving out someone who contributed	Excluding a teammate who wrote most of an ML paper	Hides true contributors, reduces transparency
Reciprocal Authorship	Mutual inclusion without real collaboration	Two researchers list each other on unrelated papers	Inflated reputation, undermines credibility
Misrepresented Sole Authorship.	Claiming full credit despite major help	Student uses teammate's work but claims full authorship	Denies credit to real contributors
Authorial Accountability	All authors must agree and share responsibility	One author falsifies data; others unaware	Blame shared, harms innocent coauthors
Double Submission	Submitting the same paper to multiple journals	Sending same cloud computing paper to two conferences	Wastes time, damages publishing reputation

QUESTION BANK.

5-Marks Questions

1. Define engineering research. How is it different from scientific research? Give one example.
2. Explain intrinsic and extrinsic motivation in engineering research with suitable examples.
3. Briefly describe the four steps in Polya's problem-solving methodology.
4. Differentiate between research ethics and responsible conduct of research with one example.
5. What is fabrication in research misconduct? Explain with an example and its impact.
6. List and explain any two ethical issues related to authorship in research.
7. Explain descriptive and analytical research with a common computer science example.
8. Why is it important to identify and solve a worthwhile research problem?
9. What are the main objectives of engineering research? Write any four.
10. What is plagiarism? How can it affect the credibility of research?

10-Marks Questions

1. Explain the research cycle in engineering research with two live examples from computer science.
2. Discuss the various types of engineering research: descriptive vs analytical, applied vs fundamental, quantitative vs qualitative with examples.
3. Describe the concept of motivation in engineering research. Compare intrinsic, extrinsic, and mixed motivations with examples.
4. What are the key ethical issues in engineering research practice? Explain with suitable examples from technology development.

5. Discuss the common types of research misconduct (fabrication, falsification, plagiarism, deception). Explain each with a computer science-related example.
6. Elaborate on the ethical issues related to authorship. Explain at least five unethical practices with examples.
7. Explain the step-by-step process of identifying and solving a worthwhile research problem. Illustrate with a live example from online education platforms.
8. Write a detailed note on the historical background and significance of ethics in engineering research.
9. Describe the importance of intellectual property (IP) in research. How does it benefit engineers and society?
10. With reference to Polya's approach, explain how researchers can effectively tackle complex engineering problems.

MODULE-02 LITERATURE REVIEW

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 Conceptualizing Research, Critical and Creative Reading, Taking Notes While Reading, Reading Mathematics and Algorithms, Reading a Datasheet.*
Attributions and Citations: *Giving Credit Wherever Due, Citations: Functions and Attributes, Impact of Title and Keywords on Citations, Knowledge Flow through Citation, Citing Datasets, Styles for Citations, Acknowledgments and Attributions, What Should Be Acknowledged, Acknowledgments in, Books Dissertations, Dedication or Acknowledgments.*

2.0 Introduction

A literature review and technical reading are essential in research because they help a researcher understand what has already been studied, identify gaps, and build a strong foundation for new work. By reviewing existing studies, a researcher avoids repeating past mistakes, ensures their work is original, and learns the best methods to apply.
Technical reading sharpens the ability to extract useful information from complex research papers, datasheets, and algorithms, which is necessary to understand the state-of-the-art technologies in the field.

For example, in computer science engineering, a student developing a new machine learning algorithm must first review previous models, analyze their strengths and weaknesses, and read technical papers carefully to decide which techniques can be improved. Without this process, the research may lack direction, be less credible, and fail to contribute something meaningful.

2.1 New and Existing Knowledge

Existing knowledge: It is the foundation on which all research is built. It includes the theories, methods, and findings already available in a field, and its significance lies in preventing researchers from repeating what has already been done while guiding them to focus on unexplored areas.
New research is always built on what is already known. Without existing knowledge, new ideas have no foundation. By understanding existing knowledge, researchers achieve the objective of identifying gaps, selecting appropriate methods, and ensuring their work is aligned with the current state of the field.
Its scope is broad, covering textbooks, published research papers, patents, and technical documentation that together form a reliable base for any new study. The necessity of existing knowledge is clear—without it, research would lack direction, risk duplication, and fail to gain credibility.

For example, a researcher studying online education must first review existing platforms like Coursera, edX, and Udemy to understand their features, usability, and limitations.

New Knowledge: It is the original contribution a researcher makes to advance the field. Its significance lies in creating progress—solving problems, improving current technologies, and opening new opportunities for development. The objective of producing new knowledge is to address gaps identified in existing work, develop innovative ideas, and offer practical solutions that benefit both academia and society.
Its scope includes any novel theories, models, methods, or technologies that did not exist before. The necessity of generating new knowledge is critical because, without innovation, fields like computer science would stagnate.

For instance, after analyzing current online education platforms, the same researcher may develop an AI-based system that personalizes course recommendations based on each student's learning pace and performance.

2.2 Analysis and Synthesis of Prior Art:

Analysis: It involves carefully examining each collected source—such as research papers, patents, or technical reports—to find important ideas, methods, and results. The goal is to understand the main hypothesis, models, and experimental setups, and then compare them to identify strengths, weaknesses, and patterns.

For example, a computer science student researching image compression techniques would review existing algorithms, see which perform best for high-resolution images, and note issues like quality loss for larger files.

A critical mindset is important here—claims that seem too perfect, like an algorithm claiming 100% spam detection accuracy, must be verified by checking datasets, methods, and references. Evaluating the reliability of each source (author's credentials, references, and journal quality) ensures that only trustworthy information is used.

Synthesis: It comes after analysis and focuses on combining the insights from multiple sources to see the bigger picture. This step helps identify gaps, unresolved problems, or areas for improvement.

For example, after comparing several image compression methods, the same student might realize that none are optimized for streaming applications, creating an opportunity to develop a new solution.

Synthesis also means organizing sources by categories or topics, making connections, and understanding how different studies build on each other.

By analyzing carefully and synthesizing results, researchers identify opportunities for innovation while building a strong foundation for their own work.

2.3 Bibliographic Databases:

Bibliographic databases are specialized collections that provide indexing and summaries (abstracts) of research articles from scholarly sources. They help researchers quickly find citation details and brief descriptions of published studies, saving time and effort during a literature search. However, depending on only one database can limit the quality of research because each database has its own strengths and weaknesses. To get comprehensive results, researchers should search across multiple databases instead of relying on just one.

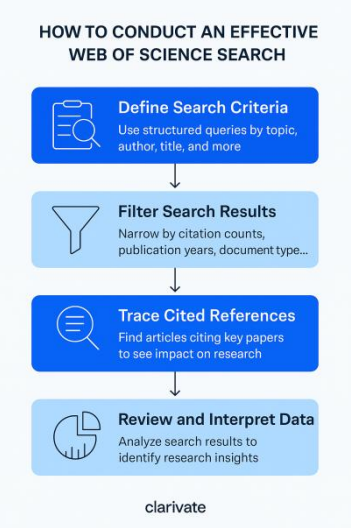
Example: A computer science student working on artificial intelligence might use IEEE Xplore to find technical papers, Scopus for broader citations, and Google Scholar for quick searches.

By combining these sources, the student ensures they gather a wider and more reliable set of articles rather than missing important studies that might not appear in a single database.

2.4 Web of Science

Web of Science is a widely used research platform (formerly called ISI or Thomson Reuters) that provides access to multiple scholarly databases and advanced search tools. It is typically available through institutional subscriptions and helps researchers locate academic materials on specific topics by allowing searches through fields such as title, topic, author, or institution using a dropdown menu.

Users can refine their searches by adding keywords, placing phrases in quotation marks, or using filters like date, language, type of material (e.g., peer-reviewed journals), and citation count. One of its valuable features is the *"Cited Reference Search,"* which enables researchers to track articles that have cited an earlier publication, making it easier to see how an idea has been used, modified, or extended over time. The process involved in web science search is illustrated in the following flow chart.



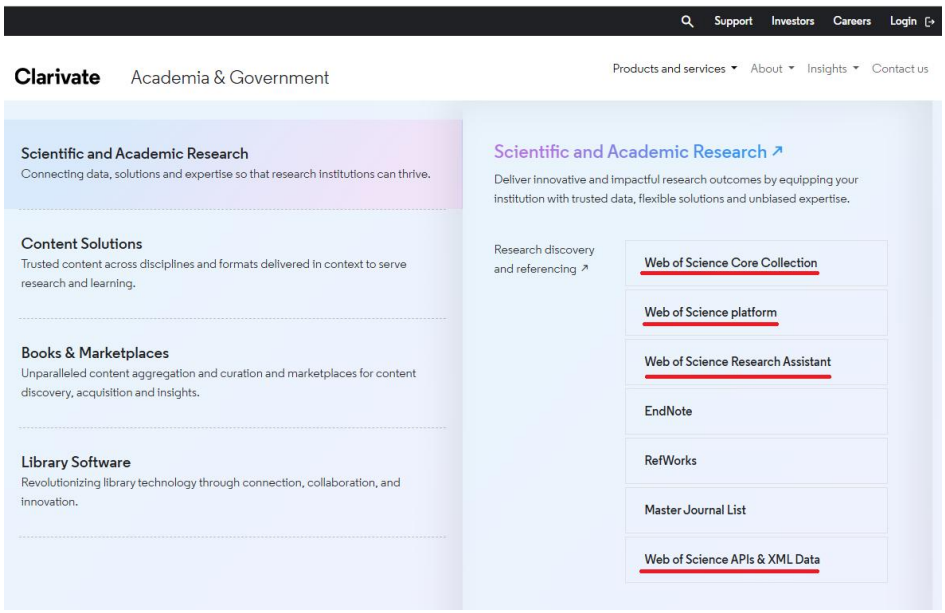
For example, a computer science student studying blockchain applications in cybersecurity could use Web of Science to find all articles on this topic, sort them by the number of citations to identify the most influential studies, and narrow results to recent peer-reviewed journals published in the last five years.

Each search result provides key details like the paper's title, authors, journal name, volume, issue, publication year, keywords, and an abstract. This allows the student to quickly decide whether downloading the full paper is worthwhile. By using structured search options and refinement tools, Web of Science ensures that the researcher spends time only on the most relevant and high-quality sources.

The following link may be used for referring web science platform managed by Clarivate

https://clarivate.com/academia-government/scientific-and-academic-research/research-discovery-and-referencing/web-of-science/

Web of Science is a widely respected research platform, but it has some limitations. It requires a paid institutional subscription, making it inaccessible to individuals without university or organizational support. Its coverage focuses mainly on journals indexed by Clarivate, which means some newer, regional, or open-access publications may be excluded, potentially limiting the diversity of available research.



2.5 Google and Google Scholar:

Google is often a good starting point for general searches because it provides quick access to a wide range of freely available information, such as reports from government agencies, organizations, or companies. However, it has major limitations—it searches the entire internet without quality control, so the reliability of results is uncertain. Additionally, it offers only basic search and filtering options, making it harder to narrow down to the most relevant academic sources.

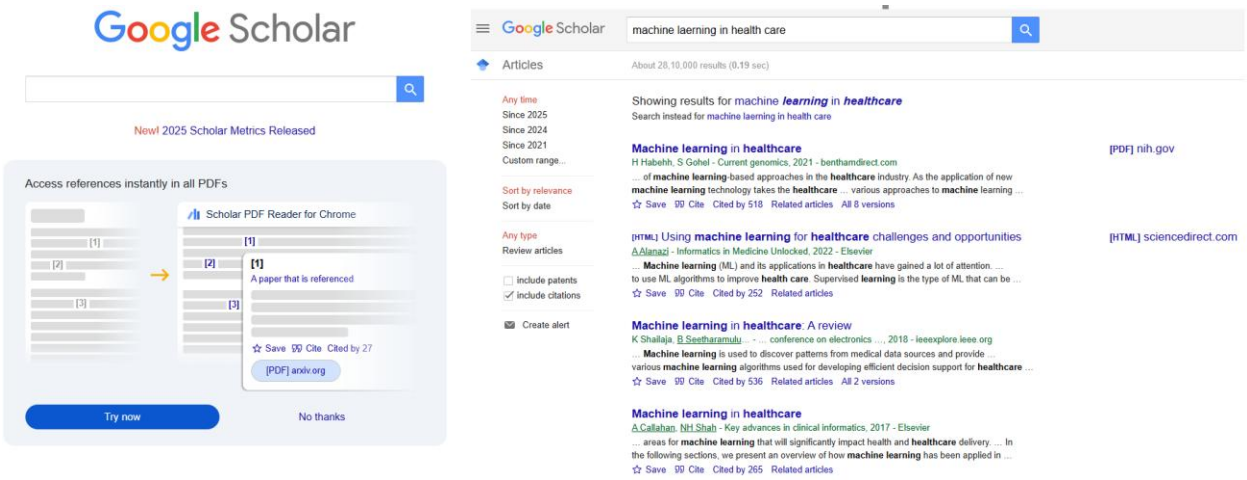
Google Scholar is a free and widely accessible tool that helps researchers find scholarly articles, theses, and conference papers across many disciplines. It allows users to track citations, see how often a paper has been referenced, and quickly access related studies. Many times, it also links to free PDF versions of pay walled articles, saving costs. Features like author profiles, citation export in multiple formats, alerts for new research, and the ability to save and organize articles make it useful for managing references. Additionally, it covers materials from different countries and languages, giving researchers a broad view of global academic work.

Still, it also has its drawbacks. Some items may appear academic but are not reliable sources, and not all publishers allow their content to be indexed, which means the database is not fully comprehensive. Its search refinement tools are limited compared to specialized academic databases

For best outcomes, researchers should not rely only on Google or Google Scholar. Academic databases like IEEE Xplore, Scopus, or PubMed offer higher-quality and more precise results because they include peer-reviewed materials, better filtering tools, and subject-specific indexing.

Example: *A computer science student researching machine learning in healthcare may start with Google to find government health reports and public datasets, then use Google Scholar to locate related scholarly articles, and finally move to IEEE Xplore to find peer-reviewed technical studies for accurate and in-depth information.*

https://scholar.google.com/



2.6 Effective Search the Way Forward:

Conducting an effective search is a vital step in any research process, especially in technical fields like engineering. Scholarly publications—such as peer-reviewed journal articles and academic books—are trusted sources written by experts and meant for researchers and students. These works include references and undergo review for accuracy.

For example, a computer science student exploring artificial intelligence should refer to journals like IEEE or Springer for reliable information.

However, useful content can also come from informal sources like blogs, magazines, or company reports, which provide insights into current trends. A student might read a tech blog to learn about the latest AI tools before diving into academic papers for deeper understanding.

Searching effectively requires multiple steps. Researchers must try different keywords and combinations, apply search filters (like date, author, or publication), and refine their search strategies. A good habit is to check the references in a useful article to find other relevant sources.

For example, if a paper on neural networks cites several foundational papers, following those citations can expand your understanding of the topic.

Not all valuable information is online—some may be in print or delayed in publication. Once the search is complete, researchers must critically read, compare ideas, and identify knowledge gaps. Literature review is not a one-time task—it continues throughout the project. As new studies emerge or understanding deepens, more searching may be needed. Ultimately, effective searching and reading lay the foundation for producing strong, original research.

2.7 Introduction to Technical Reading

Reading technical research papers—especially in engineering—is very different from reading news articles or casual blog posts. Since only a few of the available research papers are directly relevant to any one researcher, it's important to read efficiently and with a clear purpose. Below is a step-by-step strategy to make technical reading more effective:

Step 1: Choose the Right Sources

Start by identifying trusted sources such as peer-reviewed journals, conference proceedings, or books from reputed publishers like IEEE, Springer, or Elsevier. Avoid random blogs or unverified articles from the internet. For example, a computer science student researching blockchain should first look into journals like *IEEE Transactions on Computers*.

Step 2: Skim the Title and Keywords

Look at the paper's title and keywords. If these terms don't seem relevant or interesting to your topic, it's best not to spend time on that paper.

Step 3: Read the Abstract

If the title and keywords look promising, the next step is to read the abstract. This short summary gives a quick idea about the research question, methods, and results. If it still seems useful, continue reading.

Step 4: Check the Conclusion

Before going into full detail, jump to the conclusion. This helps to understand what the authors ultimately found and whether their results matter to your topic. If the findings relate to your research interest, proceed further.

Step 5: Review Figures, Tables, and Captions

Quickly scan the paper's figures, tables, and their captions. These visuals can provide a broad understanding of the data and experiments without reading the entire text. For instance, a machine learning paper might show accuracy comparisons between models, which can help you decide its relevance.

Step 6: Read the Introduction

Now read the introduction to understand the background, the problem being solved, and why this study was done. This section often connects the study with existing work in the field.

Step 7: Focus on Results and Discussion

This is the heart of the paper. Understand what was found and how the authors interpreted their findings. If this section is strong, the paper is likely very useful.

Step 8: Dive into Methods (Optional)

Only if you need detailed insight into how the work was done—for example, to replicate or expand upon the study—should you read the methodology section in depth.

Step 9: Keep Reading Regularly

As a researcher, stay updated by regularly scanning new papers. If you are working on a small project, your guide or supervisor may suggest one or two key papers. But for bigger projects, you'll need to search and manage your own reading list using this strategy.

Summary:

Step	Action	Purpose	Example
1	Choose trusted sources	Ensure information is credible and peer-reviewed	Use IEEE, Springer, Elsevier—not random web articles
2	Skim title and keywords	Quickly judge topic relevance	"Blockchain in supply chain" catches your interest
3	Read the abstract	Get an overview of the paper's goals and methods	Summary mentions smart contracts—continue reading
4	Check the conclusion	Understand final results and their value	Conclusion says 30% improvement in speed—relevant to you
5	Review figures, tables, captions	Grasp core data and trends quickly	Accuracy chart compares models visually
6	Read the introduction	Understand background, problem, and motivation	Shows what gap in research the paper addresses
7	Focus on results and discussion	Analyze findings and their interpretation	Explains why their model outperforms others

Step	Action	Purpose	Example
8	Read methods section (optional)	Learn detailed implementation (if needed)	Review training setup if replicating an ML model
9	Stay updated and repeat the process	Keep pace with evolving literature	Use alerts or regular searches to track new papers

2.8 Conceptualizing Research

Creating a strong research objective is one of the most important and challenging parts of doing research. A good research goal must aim to generate new knowledge that is original, meaningful, and accepted by other experts in the field. It should not only be interesting but also practical and solvable using available tools, techniques, and methods.

To create such a research objective, a researcher must already understand what has been done before—that means reading a lot of existing research papers, journals, and books. In fact, by the time a researcher is ready to define a proper research objective, they have already become very knowledgeable, almost like an expert at the edge of the subject.

For example, imagine a student in computer science who wants to work on improving face recognition algorithms. They can't simply start building something new—they need to understand what techniques already exist, such as convolutional neural networks (CNNs), and what limitations those methods have (like bias or poor accuracy in low light). Only then can they clearly identify a significant problem (e.g., poor recognition in real-time video), collect relevant knowledge to solve it, and finally propose a new solution (perhaps using a hybrid model combining CNNs with transformers). This is the process of conceptualizing a research idea.

However, not all research is large-scale like a Ph.D. project. For smaller projects (like a semester research assignment), students might not have the time or resources to become experts on their own. In such cases, guidance from a supervisor or an experienced researcher becomes important. Supervisors can quickly suggest the key papers or problems worth working on, saving students a lot of time and helping them focus their efforts.

In short, to conceptualize meaningful research, it must combine three things:

i. A relevant problem,
ii. The required knowledge to address it, and
iii. A clear approach or method.

And the best way to develop this understanding is by consistently reading and exploring the literature in the chosen field.

2.9 Critical and Creative Reading:

Reading a research paper is not just about accepting whatever the authors have written—it's about reading with a questioning mind. A good researcher must be critical, always asking:

Did the authors solve the right problem? Are there simpler or better solutions they missed? Are the assumptions they made realistic? Is the reasoning logical, or is there a flaw?

This process is called critical reading. It involves carefully checking if the data used actually supports the conclusions, and whether the information was collected and interpreted properly.

For example, suppose you're reading a paper on a new algorithm for detecting fake news using AI. As a critical reader, you would question whether the dataset used is balanced (covering all types of fake and real news), whether the evaluation metrics were fair (like accuracy or F1-score), and whether there are biases or assumptions that limit its application. You might even discover that the authors didn't test the algorithm in real-world scenarios, which is a major gap.

While it's often easy to find flaws or mistakes in a paper, it is much harder to do creative reading. Creative reading is about going beyond what is written. Instead of just finding problems, you ask:

What more can be done with this work? Can this method be applied in another area? Can I modify this idea to solve a different problem? This type of reading helps generate new research ideas and opens paths for innovation.

Using the same example, while reading about the fake news detection algorithm, creative thinking might lead you to consider using the model in another domain—like detecting spam emails or analyzing customer reviews for authenticity. Or you may think of extending the algorithm to work on voice data instead of text.

This kind of thinking pushes research forward.

In short, critical reading helps you evaluate the quality and correctness of the paper, while creative reading helps you think of new directions and future work based on it. Both are essential for meaningful research, especially in fields like computer science, where ideas evolve quickly and innovation is key.

2.10 Taking Notes While Reading

For any researcher, good writing begins with good reading—and the key link between reading and writing is taking notes. As the saying goes, *"The faintest writing is better than the strongest memory."* This is especially true in research, where important ideas, definitions, or questions can easily be forgotten without proper notes.

While reading a research paper, it's helpful to highlight or jot down key points, definitions, technical terms, and even your doubts or criticisms. Many students write notes in the margins of printed papers or use digital tools like Mendeley, EndNote, or Zotero to annotate PDFs.

For example, suppose a computer science student is reading a paper on using machine learning to detect malware. While reading, they might note down the algorithm used (e.g., Random Forest), key features analyzed (like file size, API calls), and the dataset used. They might also note a question:

"Why was the F1-score low even with a high accuracy?" or a criticism: *"The dataset seems outdated; maybe try a newer one."*

After reading, it's good practice to summarize the paper in a few sentences—what it aimed to do, what methods were used, and what was concluded. Then, the reader should also think critically:

Did the paper introduce a new idea, apply an existing method to a new domain, or combine different ideas in a novel way?

This kind of reflection helps in understanding the technical contribution and in comparing it with other papers in the same field.

By keeping organized notes, the researcher saves time later when writing a thesis, report, or review paper, since they already have a personalized summary and key takeaways ready. It's a habit that pays off greatly in the long run.

2.11 Reading Mathematics and Algorithms:

Mathematics plays a central role in engineering research. Many important advancements—especially in areas like artificial intelligence, cryptography, and signal processing—are built on strong mathematical foundations. For an engineering researcher, especially in computer science or electronics, it's nearly impossible to avoid dealing with mathematical formulas, derivations, or algorithms. These parts of a technical paper are not just optional extras—they're often the **core** of the paper and should not be skipped or quickly skimmed.

To understand the problem the researchers are solving, one must read the math or the algorithm step by step. This detailed reading helps in grasping how the solution works and why it was designed a certain way.

For example, if a student is reading a research paper on a new sorting algorithm, it's essential to follow how the algorithm works, what its time complexity is, and in which cases it performs better or worse than traditional methods like Merge Sort or Quick Sort.

Even if the student thinks the algorithm is correct, real understanding comes from trying to implement it. They might code it in C++ and find unexpected errors or cases where it doesn't behave as intended. This practical step helps validate whether the algorithm is genuinely useful or needs adjustments. It also deepens the student's understanding of both the logic and the practical issues involved in applying theoretical knowledge to real-world problems.

So, when reading a research paper with mathematics or algorithms, one should take time, revisit each step carefully, and even test it through code—because that's where true learning happens.

2.12 Reading a Datasheet.

Reading a datasheet is an essential skill for researchers in all fields of engineering, including Computer Science**,** Electronics**,** Mechanical**,** Civil**,** Chemical and others. A datasheet is a technical document that provides comprehensive information about a specific component, material, or system. It helps engineers understand key specifications, features, limitations, and safe usage guidelines before integrating the component into their research or projects.

For example, a Computer Science engineering student working on an embedded system or IoT project may need to use a microcontroller like the ESP32 or Raspberry Pi. The datasheet for such a device would provide vital details such as memory size, processing power, GPIO pin configurations, communication protocols supported (like Wi-Fi or Bluetooth), and power requirements.

Without referring to the datasheet, the student might miss crucial details that could result in system failure or inefficient design.

Similarly, a mechanical engineer selecting a stepper motor for automation, or a civil engineer choosing a type of cement or structural steel, would rely on datasheets for properties like torque, tensile strength, environmental durability, and operating conditions.

The process of reading a datasheet usually begins with skimming to get an overview—such as looking at the summary, features, and use cases. If relevant, the researcher proceeds to examine specific details like performance graphs, electrical or mechanical limits, timing diagrams, or pin configurations, depending on the field.

For computer science, especially in hardware-related domains, understanding timing diagrams, truth tables, and interface specifications becomes crucial.

These documents often include diagrams, tables, and technical terminology that require careful interpretation. Proper reading helps in informed decision-making during component selection, system integration, coding for hardware, or design implementation**.**

Overall, understanding datasheets helps researchers avoid design errors**,** improve safety**,** and enhance research efficiency, regardless of their branch, making it a universally important skill in technical research.

2.13 Attributions and Citations: Giving Credit Wherever Due.

Attribution is the practice of giving proper credit to the original developer of an idea, image, diagram, code, or any content we include in our own work. It is a broad and essential principle in academic writing that covers citations, references, and acknowledgments. By attributing work to its original author, you show integrity and honesty in our research.

For example, if we include a diagram developed by another researcher in our project, we should mention something like, "This diagram is adapted from the work of Dr. Smith (2018)." This makes it clear to the reader that the idea or visual was not created by us and gives credit to the right person.

Citation refers specifically to mentioning someone else's idea, method, or findings directly within our work. It usually appears in the body of our text with an in-text reference, indicating the source of the content we have used. Citations help support our arguments, acknowledge original contributions, and prevent plagiarism.

For instance, in a computer science research paper, we might write, "The Apriori algorithm is widely used for association rule mining (Agrawal & Srikant, 1994)." This citation should also link to a full reference at the end of our paper, which would provide complete publication details of the cited work.

Reference is the detailed information about the sources we cited in our work. It appears at the end of your document in a section often titled "References" or "Bibliography." Each citation in the text must match a reference entry so readers can locate the original source.

For the earlier example, the reference would be: Agrawal, R., & Srikant, R. (1994). Fast algorithms for mining association rules. In Proceedings of the 20th International Conference on Very Large Data Bases (VLDB), 487–499.

Accurate referencing builds credibility and allows others to explore our sources.

Acknowledgment is the section of our work where we thank those who helped us during our research journey but are not listed as authors. This includes guides, mentors, funding bodies, institutions, or even technical staff. It shows appreciation for support, whether academic, emotional, or resource-related.

A typical acknowledgment might read, "I sincerely thank Dr. XTZ for her valuable feedback and guidance throughout the project. I also acknowledge the support of the AI Research Lab at XYZ University for providing computing resources."

Including acknowledgments not only expresses gratitude but also reflects professional courtesy and transparency.

2.14 Functions of Citation

Citations in research serve three important purposes that go beyond just giving credit.

1. Verification Function:

Citations allow readers to check the accuracy of the information we've used. When we cite a source, others can go back to the original document to confirm whether our interpretation is correct or not. This helps avoid misleading claims or misrepresentation of ideas.

Example: If we claim that "80% of AI-based hiring tools show bias," and cite a published research article, a reader can verify whether the original study supports that statistic or if we misunderstood it.

2. Acknowledgment Function:

Citations are a way to give credit to the original authors who contributed ideas or findings that we are building upon. These citations help researchers gain recognition in their field, which is often important for career growth, securing grants, or job promotions.

Example: Citing a popular algorithm like ResNet by He et al., 2015 in our deep learning paper acknowledges their foundational work, and helps us connect our research to a broader academic community.

3. Documentation Function:

Citations also serve as a record of how knowledge has developed over time. They allow readers to track the history of an idea or technology and understand how it evolved.

Example: If we're studying the evolution of mobile networks, citing papers from 1G, 2G, up to 5G technologies shows the timeline and progress in the field.

2.15 Types and Issues Related to Citation

While citations are essential for academic integrity, there are certain citation practices that can be problematic or even unethical.

1. Spurious Citations:

These occur when an author includes a citation that is unnecessary or unrelated to the content, just for the sake of adding a reference. This can mislead readers and clutter the work with irrelevant sources.

Example: Citing a paper on climate change in a paragraph discussing encryption algorithms—just to increase the reference count—is a spurious citation.

2. Biased Citations:

This happens when authors intentionally cite friends, colleagues, or known individuals regardless of relevance, or ignore important contributions from others due to personal bias. Such practices harm the objectivity and fairness of academic writing.

Example: A researcher might avoid citing a rival's excellent work on a topic, just to not give them credit, even though the work is relevant and should be acknowledged.

3. Self-Citations:

Authors may cite their own previously published papers. This is acceptable as long as the earlier work is relevant and helps the reader understand the current research better. Excessive or irrelevant self-citation, however, can be viewed negatively.

Example: If we've previously published a study on image classification and now we're expanding on that in a new paper, citing our earlier work is justified.

4. Coercive Citations:

Sometimes, journal editors pressure authors to add citations from their own journal to artificially boost the journal's impact factor. This is unethical and compromises the integrity of scholarly publishing.

Example: An editor might say, "We'll accept our article if we add three citations from their journal," even if those papers are unrelated to our topic.

These functions and citation practices demonstrate how important proper citation is in maintaining transparency, fairness, and credibility in academic research. Using citations ethically helps build trust in our work and supports the academic community.

2.16 Impact of Title and Keywords on Citations:

Titles on Citations: The title of a research paper plays a very important role in how often the paper is read, downloaded, and cited by other researchers. A well-chosen title helps others understand what the paper is about and increases the chances of the paper being found during a literature search. Since the title is often the first thing a reader sees, it acts like a marketing tool for the paper. It should be informative enough to represent the main subject of the research and interesting enough to grab attention.

There are different aspects that influence how a title affects citations. These include the type of title, its length, and specific elements like punctuation or regional names. For instance, longer titles that mention the research method or main findings usually attract more citations. On the other hand, titles with question marks, colons, or that mention a specific geographic location tend to get fewer citations. Also, papers with result-focused titles are cited more than those with method-focused titles.

***Example**: A paper titled "Improving Energy Efficiency in Smart Homes Using IoT Devices" is more likely to be found and cited than a vague or unclear title like "Smart Living: A New Way", because the former clearly shows the topic, method, and outcome.*

Choosing the right kind of title is, therefore, essential to improve the paper's visibility and academic impact.

Keywords on Citations: Keywords are another vital part of a research paper that help it get discovered by readers and search engines. These are words or phrases that summarize the main ideas and subject of the research. When selected carefully, keywords make it easier for journals, digital libraries, and indexing services to categorize the paper correctly and recommend it to the right audience.

Using at least two strong and relevant keywords in the title or abstract increases the chances of the paper being found through search tools. This can lead to more downloads and higher citation rates. Keywords help researchers find our work when they search for information on a particular topic. Therefore, it's important to choose keywords that accurately reflect the content and field of the paper. Without proper keywords, even good research might go unnoticed because it won't appear in the right search results.

***Example:** If a Computer Science research paper is about using machine learning to predict heart disease, relevant keywords could be: "machine learning," "heart disease prediction," "healthcare data," "classification algorithm." These keywords help others working in healthcare AI or data science find the paper easily.*

2.17 Knowledge Flow through Citation:

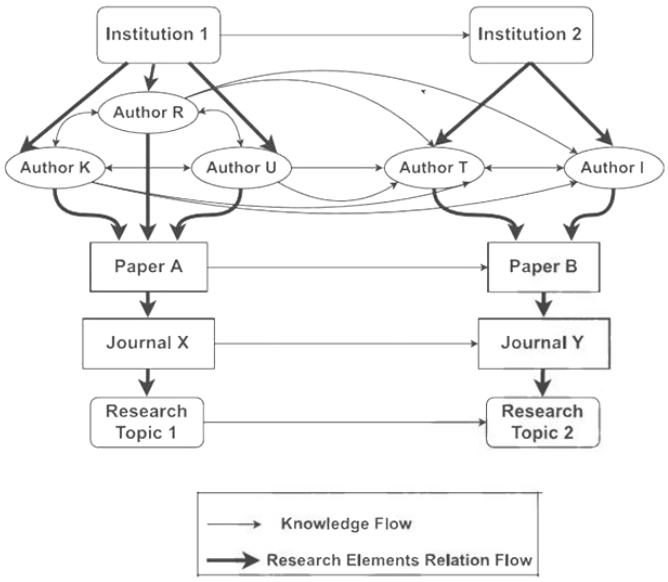
Knowledge flow across different research components:

In the research community, especially in engineering, knowledge flows from one researcher to another through various channels like books, research articles, thesis, patents, presentations, and even informal discussions. Among all these, citations in published papers are the most formal and traceable way to transfer knowledge.

When a researcher cites a previous work, it shows that the current research builds upon earlier findings. This creates a visible link of knowledge transfer**,** which helps new researchers understand what has already been done and what gaps still exist.

In engineering research, papers, journals, and thesis are key sources of such citation-based knowledge transfer.

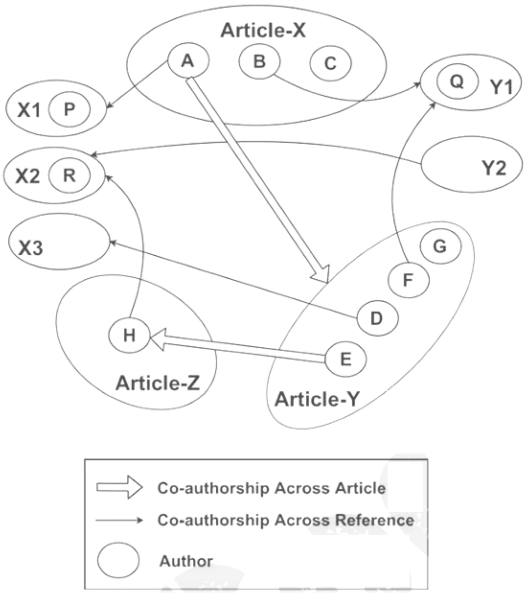
*For example, if Paper A presents an innovative idea and Paper B builds on that idea by citing Paper A, we can say that knowledge has "flowed" from Paper A to Paper B. This citation not only connects two ideas but also connects the authors**,** institutions**,** and research topics involved as illustrated in the following fig.*



The diagram illustrates how knowledge flows across different research components such as institutions, authors, papers, journals, and research topics. Researchers from two institutions—Institution 1 and Institution 2—collaborate through authors like K, R, U, T, and I. For instance, Authors K, R, and U (from Institution 1) co-authored Paper A, while Authors T, I, and R (from Institution 2) contributed to Paper B. These papers are published in different journals (Journal X and Journal Y) and contribute to different research topics (Topic 1 and Topic 2). Thick arrows in the diagram represent the flow of knowledge, such as through citation or idea sharing, while thin arrows show relationships like co-authorship or institutional affiliation. This visual clearly captures how collaborative efforts and citation networks help in transferring knowledge across people, institutions, and research areas.

Co-authorship and citation relationships:

The diagram illustrates how co-authorship and citation relationships connect different research articles and authors. In the figure, three main articles—Article X, Article Y, and Article Z—are connected through shared authorship and references as illustrated in the following fig.



- Article X is written by Authors A, B, and C.
- Article Y is authored by D, E, F, G, and A—showing that Author A has contributed to both Article X and Article Y, forming a co-authorship across articles (shown with thick double-line arrows).
- Article Z is co-authored by H and E, linking Article Y and Z through Author E.

The figure also includes five references:

- X1, authored by A and P, shows that Author A cited their own previous work, indicating self-citation.
- X2, authored by H and R, connects to Authors in Article Z and Article Y, suggesting co-authorship across reference citations (thin arrows).
- X3, by Author D, is a self-citation for Article Y.
- Y1, authored by Q, B, and F, shows that Authors B and F are being cited in Article Y—establishing a shared authorship and reference.
- Y2, authored by R, is cited by Article Y and connects to Author R, who is also connected to X2.

In summary, this figure demonstrates how citations and shared authorship create complex networks of collaboration and knowledge sharing. It highlights:

- Co-authorship links across multiple articles.
- Authors citing their own or each other's work.
- Overlapping references that strengthen research connections.

Such a visualization helps researchers understand how ideas evolve and how collaborations influence the development of knowledge across fields.

2.18 Citing Datasets:

In today's engineering research, the use of datasets has become just as critical as citing published research articles. Citing datasets properly is essential because data is often the foundation of experimental evidence and helps justify research findings. Just like traditional citations, data citations give proper credit to the original developers and contributors of the dataset. They also ensure transparency and traceability, allowing other researchers to find and reuse the data for further research.

A good data citation should include details that identify the dataset clearly, such as the title, source, contributors, publication or access date, and a reliable link. Even if the online link becomes invalid in the future, the citation should include enough descriptive information so others can still locate the dataset.

However, citing data can be tricky, especially when datasets are large, come from multiple contributors, or are funded by different organizations. In such cases, researchers must ensure that they have proper permission to use the data and that legal ownership or usage rights are respected.

For example, the citation: Weather Data, Indian Meteorological Department (IMD), Bengaluru, India (August 2022): [Accessed: 10 Jan 2023] Retrieved from https://mausam.imd.gov.in/

clearly shows the source, access date, and link. It helps the reader verify the dataset used in the research.

Another example is: Kumar, R. (2021). [Field experiment on soil moisture levels]. Unpublished raw data.

which refers to raw data that may not be publicly available but is acknowledged for its contribution to the research. This method ensures the original data creators are credited, and readers are informed of the sources behind the conclusions in a research work.

2.19 Styles for Citations:

Citation styles are essential in academic and research writing because they ensure consistency, credibility, and clarity in how sources are referenced. They help readers identify, locate, and verify the sources of information, data, and ideas used in a paper. Using standardized citation formats—like IEEE, ASCE, APA, or ASTM—not only gives proper credit to original authors but also avoids plagiarism, which is a serious ethical violation in research.

Each discipline often follows a preferred citation style that reflects its communication needs—for instance, IEEE is widely used in engineering and computer science for its concise numerical referencing, while APA is common in social sciences for its emphasis on the date of publication. Proper citation styles also make the work more professional and easier to follow, helping readers trace the evolution of ideas, compare methods, or explore related studies. In summary, citation styles are a vital part of responsible scholarship, supporting academic integrity and facilitating the smooth flow of knowledge.

The following represent brief summary of common citation styles—specifically ASCE**,** IEEE**,** APA, and ASTM—presented in table format for different types of sources such as books**,** journal articles**,** conference papers and websites**:**

1. IEEE Style (Engineering):

For books: In the IEEE style, book citations are formatted with the author's initials followed by the surname, then the book title in italics, followed by the publisher, city, and year of publication.

Example: [1] D. Knuth, *The Art of Computer Programming***,** Addison-Wesley, Boston, 1997.

For journal articles: IEEE style includes the author's initials and surname, article title in quotes, journal name in italics, volume number, issue number, page range, and year.

Example: [2] A. Rezi, "Array processing," *IEEE Trans. Signal Process.*, vol. 12, no. 3, pp. 22–30, 2015.

For conference paper: the format includes the author's initials and surname, the paper title in quotes, the conference name in italics, location, year, and page numbers.

Example:[3] M. Kumar, "AI Trends," in *Proc. ICML*, New York, 2023, pp. 45–50.

For websites: IEEE format lists the organization or author, the title in quotes, the full URL, and the access date in parentheses.

Example: [4] IEEE, "Ethics in AI," https://www.ieee.org/ai-ethics.html (accessed Jan. 10, 2025).

2. ASCE Citation Style (commonly used in Civil Engineering)

For books: References begin with the author's surname followed by their initials, year in parentheses, the title in italics, the publisher, and city of publication.

Example: Smith, J. (2005). *Concrete Technology*. Wiley, NY.

For journal articles: The citation includes the author's surname and initials, year, article title in quotes, journal name in italics, volume number with issue in parentheses, and the page range.

Example:Johnson, L. (2014). "Climate Change Dialogue." *ASCE J. Env. Eng.*, 140(4), 1–160.

For conference paper: Citations follow a similar format, including the author's name, year, paper title in quotes, conference name in italics, location (city and state), and pages.

Example: Brown, T. (2018). "Urban Drainage Modeling." *ASCE EWRI Conf.*, Chicago, IL, 35–40.

For web: Citations, ASCE includes the author or company name, year, the title in quotes, the full URL, and the access date in parentheses.

Example: Blade Cleaning Services (2015). "Problems in HVAC." http://www.bladecleaning.com (Accessed Oct. 29, 2016).

IEEE (Engineering/CS)			
Books	**Journals**	**Conferences**	**Websites**
[1] A. Author, Book Title, Publisher, City, Year. Ex: [1] D. Knuth, The Art of Computer Programming, Addison-Wesley, Boston, 1997.	[2] A. Author, "Title," Journal Name, vol. X, no. Y, pp. xx–yy, Year. Ex: [2] A. Rezi, "Array processing," IEEE Trans. Signal Process., vol. 12, no. 3, pp. 22–30, 2015.	[3] A. Author, "Title," in Proc. Conf. Name, Location, Year, pp. xx–yy. Ex: [3] M. Kumar, "AI Trends," in Proc. ICML, New York, 2023, pp. 45–50.	[4] Name of Site, "Title," URL (accessed Date). Ex: [4] IEEE, "Ethics in AI," https://www.ieee.org/ai-ethics.html (accessed Jan. 10, 2025).
ASCE (Civil Engg.)			
Author Surname, Author Initial. (Year). *Title*. Publisher, City. Ex: Smith, J. (2005). *Concrete Technology*. Wiley, NY.	Author Surname, Author Initial. (Year). "Title." *Journal Name*, Volume(Issue), Pages. Ex: Johnson, L. (2014). "Climate Change Dialogue." *ASCE J. Env. Eng.*, 140(4), 1–160.	Author Surname, Author Initial. (Year). "Title." *Conference Name*, City, State, Pages. Ex: Brown, T. (2018). "Urban Drainage Modeling." *ASCE EWRI Conf.*, Chicago, IL, 35–40.	Author or Company Name (Year). "Title." http://URL (Accessed Date). Ex: Blade Cleaning Services (2015). "Problems in HVAC." http://www.bladecleaning.com (Accessed Oct. 29, 2016).

2.20 ACKNOWLEDGMENT

In engineering research, it is important to recognize and appreciate the help and contributions of others, even if they are not listed as authors. This recognition is done through the acknowledgment section of a research paper. Acknowledgments are used to thank people, institutions, or organizations who supported the work in various ways—by providing funding, technical assistance, data, lab space, or even valuable suggestions.

This section is typically placed at the end of the research paper or as a footnote, especially if no specific format is prescribed by the journal or conference. It creates a clear picture of the relationships and collaborations involved in the research process.

For example, a lab assistant who helped with experiments, or a colleague who reviewed the paper and gave helpful feedback, may not be co-authors, but their role should still be recognized. It is very important to acknowledge.

Because giving proper credit—even for minor contributions—shows academic honesty and encourages a culture of transparency and gratitude. It also highlights the collaborative nature of scientific work, which often involves many people working behind the scenes. This is especially

crucial in engineering, where research often depends on access to expensive equipment, teamwork, and external grants or sponsorships.
Acknowledgment also builds credibility and trust with readers and funding bodies. It gives visibility to supporting institutions and helps track contributions of various stakeholders.

Example:"The authors sincerely thank Dr. Ramesh K. for his insightful feedback on the simulation results. We also acknowledge the Department of Electronics, ABC Institute of Technology, for providing lab equipment and resources. This work was partially supported by the AICTE Research Grant (Grant No. AICTE/2023/Innovate/1462)."

2.21 What Should Be Acknowledged:

When writing a research paper, thesis, or technical report, it is important for every author to understand what contributions should be formally acknowledged. Acknowledgment is a way of showing academic honesty, transparency, and gratitude to those who helped make the research possible. The following represent different stages of acknowledgments.

1. Quotations and Paraphrasing*:* In engineering and technical writing, direct quotations are rare, but if we use exact sentences or phrases from another source, we must enclose them in quotation marks and clearly cite the source. This is known as a direct quotation.
If we summarize or rewrite someone else's idea in our own words (called indirect quotation or paraphrasing), we must still acknowledge the original author and the year.

Example:Direct: "The strain gauge technique is one of the most reliable methods for stress analysis" (Smith, 2019).
Indirect: Smith (2019) described the strain gauge method as a highly reliable tool for stress evaluation.

2. Acknowledging People and Technical Support: We must acknowledge anyone who contributed scientifically or technically to the research—even if they are not co-authors. This includes those who participated in discussions, provided valuable feedback, shared insights, or helped in the experimental or analytical work (like lab assistants, students, technicians, or programmers).

Example:"We thank Mr. Arjun Kumar for assisting with the simulation coding and Ms. Neha R. for her help with the tensile strength testing in the materials lab."

We typically do not acknowledge individuals who helped in non-research ways (like moral support, typing, or printing)—unless it's a thesis, where broader acknowledgments are more common.

3.Acknowledging Funding and Grants: If your work was supported by a funding agency or grant, it is mandatory to acknowledge that source. This includes mentioning the organization's name, the type of funding, and the grant number, if applicable. Failing to do so can lead to loss of current or future funding.

Example:"This research was supported by the Indian Council of Scientific Research (ICSR) under Grant No. ICSR/ENGR/2023/0456."

4. Use of External Facilities and Resources: If your research used laboratories, software, or other facilities not owned by your institution, you should also thank those institutions or centers.

Example:"We gratefully acknowledge the Nano Fabrication Facility at the National Institute of Technology, Trichy, for providing access to their cleanroom environment."

5.Acknowledging Prior Presentations of Results: If your findings were previously presented as a poster, abstract, or conference paper, this should also be acknowledged to maintain transparency.

Example:"Preliminary results from this study were presented at the International Conference on Mechanical Systems (ICMS 2023), held in New Delhi, India, from July 10–12, 2023."

This helps readers understand the publication history of your results and avoid any concerns of duplication.

6.Acknowledgment Ethics – What to Avoid: It is considered inappropriate to thank reviewers of the journal during submission. Many technical journals discourage this practice, as it could be seen as a way to influence or flatter reviewers, which compromises the objectivity of peer review.

Avoid this:"We thank the anonymous reviewers for their valuable comments." (Instead, such thanks can be added later after the paper is accepted.)

2.22 Acknowledgments in Books/ Dissertations:

In academic books and dissertations, a dedicated acknowledgment page is typically placed right after the table of contents. This section is more detailed and extensive compared to the short acknowledgment statements commonly seen in journal articles or conference papers. It allows the researcher to formally thank all individuals and institutions who contributed in any way to the successful completion of the research work.

Writing this section requires thoughtful consideration about who should be acknowledged and in what order**.** Usually, appreciation is expressed to the main supervisor**,** co-supervisor**,** laboratory colleagues**,** faculty members**,** technical and administrative staff**,** and sometimes family and friends for their emotional support. It's important that the tone remains professional and that overly emotional or flowery language is avoided. The length of acknowledgments typically depends on the type of document. In journal articles, they are usually one or two sentences. In technical reports, they may be a paragraph, and in theses or dissertations, acknowledgments are often longer and more detailed.

Example:

"I would like to express my heartfelt gratitude to my project guide, Prof. XYZ, for her expert guidance, constant motivation, and support throughout the project on intelligent traffic prediction using deep learning.

I also extend my sincere thanks to Dr. XYZ, Head of the Department of Computer Science Engineering, for providing academic support and encouragement.

I am thankful to our respected Principal, Dr. XYZ, for offering a stimulating research environment at our institute.

I acknowledge all the teaching faculty members of the department for sharing their subject knowledge, which helped in shaping the direction of my project.

Special thanks to the lab assistant Mr. xyz and the technical staff for their timely help during system testing and data collection.

I am also grateful to my friends for their cooperation and moral support during challenging times.

Last but not least, I deeply thank my parents and family members for their unwavering encouragement, patience, and faith in me throughout this journey."

This type of acknowledgment reflects professionalism and sincere appreciation, recognizing both academic and personal support in a structured and meaningful way.

2.23 Dedication:

In academic and technical writing, dedication and acknowledgment serve different purposes and are used in different types of documents. Dedication is typically found only in longer works like books, theses, or dissertations—it is not used in journal papers, conference articles, or patents**.** A dedication is a personal note from the author**,** expressing deep appreciation or emotional connection to a specific person or entity. It could be addressed to a spouse, parent, friend, mentor, pet etc**,** depending on what the author feels is most meaningful.

On the other hand, an acknowledgment is a formal section where the author gives credit to individuals or organizations who directly contributed to the completion of the research or writing. This might include technical help, guidance, feedback, funding, or emotional support. It is perfectly acceptable to mention someone in both the dedication and acknowledgment sections.

For instance, an author may dedicate the thesis to a spouse and also acknowledge them for their moral support during stressful times**.**

Example: This work is dedicated to my beloved parents, who have always believed in me and to my mentor, who inspired my interest in Artificial Intelligence.

QUESTION BANK:

5-MARK QUESTIONS

1. Define bibliographic databases and explain their importance in research.
2. List any five search operators used in Google/Google Scholar and explain their use.
3. Differentiate between citation and reference with suitable examples.
4. Why is it important to take notes while reading technical literature?
5. State the key attributes that affect the citation rate of a research paper title.
6. What is meant by critical and creative reading? Give one example of each.
7. What should be included in an acknowledgment section of a research paper?
8. Explain the necessity of citing datasets with a suitable example.
9. Briefly describe the purpose of the conclusion in a literature review process.
10. What are the different styles of citation? List any three with examples.

10-MARK QUESTIONS

1. Explain the step-by-step process of reading a technical research paper effectively.
2. Discuss the functions and types of citation with examples.
3. Write a detailed note on the impact of titles and keywords on the citation rate of research articles.
4. Explain the importance and process of taking notes while reading technical literature.
5. Discuss in detail the significance of proper acknowledgment and attribution in academic writing.
6. What is the role of Web of Science in literature search? Explain its features with an example.
7. Elaborate on the structure and importance of reading mathematical content and algorithms in engineering papers.
8. Illustrate knowledge flow through citation using a network diagram or example.
9. Differentiate between direct quotation, indirect quotation, and paraphrasing. Why is each important in research writing?
10. Explain various citation styles (IEEE, ASCE) for books, journals, conferences, and websites in tabular form.

MODULE-03 INTELLECTUAL PROPERTY

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

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

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

3.0 Introduction

Intellectual Property refers to ideas, inventions, and innovations that come from a person's intelligence, creativity, and imagination, and that have commercial value — even though they do not have a physical form. In simple words, if you invent something original that can be useful or valuable to others, it can be considered your Intellectual Property.

For example, a software engineer developing a new mobile app, a researcher designing an AI algorithm, or a computer engineer creating a unique microprocessor architecture — all of these are forms of IP.

Intellectual Property Rights (IPR) are the legal privileges given to the person (called the inventor or author) who invented the IP. These rights ensure that the inventor has control over how their invention is used, sold, or shared. In return for receiving these rights, the inventor must share the details of the invention publicly so others can learn from it.

For example, if a computer scientist develops a new data compression algorithm, they can patent it. This gives them the right to decide who can use it, while preventing others from using it without their permission.

Broadly, IP is divided into two main branches:

1. **Copyrights and Related Rights** – These protect creative expressions in literature, art, and media. In computer science, this could include writing a textbook on machine learning, creating a 3D model for a game, composing original background music for software, or developing a unique computer program or database.

   For example, the source code of the Linux kernel is protected under copyright laws.

2. **Industrial Property Rights** – These cover inventions and signs that distinguish products or services. They include:

   Patents – For example, a patent on a new hardware cooling system for high-performance servers.

   Trademarks – Like the Intel® logo or the Python® programming language logo, which identify the brand.

   Industrial Designs – For instance, the unique shape and design of an ergonomic computer mouse.

   Geographical Indications – Less common in engineering, but could apply if a region becomes famous for producing a specific type of electronic product.

   In the field of Engineering, IPR plays a crucial role in protecting inventions — from the design of processors and IoT devices to AI models and software applications. Without IPR, inventors could lose the benefits of their hard work, and others could freely copy and profit from their ideas without giving credit or compensation.

3.1 Role of IP in the Economic and Cultural Development of the Society:

Creativity and innovation are the foundation of progress in any society. Economic growth, technological advancement, and cultural development all depend on the ability of individuals to think creatively and invent new solutions.

In the field of Computer Science & Engineering, innovations such as artificial intelligence algorithms, cybersecurity tools, and faster microprocessor designs play a crucial role in shaping industries and improving quality of life.

Intellectual Property Rights (IPR) act as an incentive for inventors. By protecting their inventions, IPR motivates engineers, researchers, and developers to create more, knowing their work will not be freely copied without permission.

For example, if a research team develops an AI-based traffic control system that can reduce city traffic congestion by 40%, IPR ensures they control how the technology is implemented and can license it to smart city projects, motivating them to continue developing advanced solutions.

However, overly strict enforcement of IPR can sometimes slow down progress.

For example if basic algorithms or essential programming tools were locked behind expensive licenses, it could prevent startups, researchers, and students from experimenting and building new technologies.

To avoid these negative effects, laws provide exceptions and limitations to balance the rights of inventors and the needs of the community. Such as

- **Fair Use in Education** – Under copyright law, teachers and students can use copyrighted material such as software code snippets, research papers, or diagrams for teaching and learning without infringement.
- **Compulsory Licensing** – In times of crisis, a government can allow the use of patented technology without the inventor's consent.

  For example, during a cybersecurity emergency, if a patented security patch is essential to protect national infrastructure, the government can authorize its use to safeguard public interest.
- **Rejection of Harmful Inventions** – If a technology poses a serious risk to society, it may not be granted IP protection.

  For example in engineering, this could mean refusing patents for malicious AI programs capable of large-scale cyberattacks or for creating computer viruses that can damage global systems.

These rules ensure that IPR serves both inventors and society. While it rewards innovators — such as engineers developing new processors, IoT systems, or robotics solutions — it also ensures that essential knowledge and life-saving technologies are accessible when needed. This balance supports both economic growth and cultural progress, enabling society to benefit from technological advancements without stifling innovation.

3.2 IP Governance:

Since Intellectual Property (IP) plays an important role in innovation and economic growth, every country has agencies responsible for making rules, implementing them, and enforcing laws related to IP. These agencies ensure that inventors' rights are protected and that IP systems run smoothly.

In India, most categories of IP — such as patents, trademarks, copyrights, and industrial designs are governed by the ***Department for Promotion of Industry & Internal Trade (DPIIT)*** under the Ministry of Commerce and Industry. One exception is the Plant Variety and Farmers Rights Act, which is managed separately.

To promote a strong patent ecosystem, the Indian government has also set up special organizations:

- ***Technology Information Forecasting and Assessment Council (TIFAC)*** – Helps in identifying new technology trends and encouraging innovations, such as predicting the demand for advanced computing chips or AI tools.
- ***National Research Development Corporation (NRDC)*** – Supports commercialization of research results, for example, turning a university's AI-based medical diagnosis software into a licensed product for hospitals.
- ***Cell for IPR Promotion and Management (CIPAM)*** – Creates awareness about IPR in schools, colleges, and industries, including training computer engineering students on how to patent their software or hardware designs.

IP is not just a national concern — it is global. Since inventors in Engineering often work on products and software that can be used worldwide, it is important to have minimum international standards for IP rights, enforcement, and exceptions. This helps avoid legal confusion and ensures fair treatment across countries.

To achieve this, the United Nations established the ***World Intellectual Property Organization (WIPO)***. WIPO manages international filing and registration of IP through various Conventions and Treaties, such as:

Paris Convention – Ensures that if a company patents a new microchip design in one member country, they can claim the same filing date in other member countries.

Patent Cooperation Treaty (PCT) – Allows inventors, such as a startup developing a new blockchain security protocol, to apply for patents in multiple countries through one unified process.

Berne Convention – Protects creative works like programming books, software source code, and technical diagrams across member countries.

Rome Convention – Protects the rights of performers and producers, which could apply to recorded engineering lectures or technical video tutorials.

By having both national and international governance, IP systems encourage innovation in technological fields while ensuring that inventors can protect and share their work in a fair and standardized way across the world.

3.3 IP as a Global Indicator of Innovation:

Intellectual Property (IP), especially patents**,** is one of the key indicators used to measure how innovative a country is. When evaluating the innovation index of a nation, global ranking organizations often look at the number and quality of patents, along with other IP-related factors. This helps assess the strength of a country's Science, Technology, and Innovation (STI) ecosystem.

For example, the Scimago portal (an online platform that ranks journals and countries using data from Scopus) reported in 2020 that India ranked 4th in the world for the number of research publications, but 50th for Intellectual Property Rights. This means that while Indian researchers and engineers are publishing a lot of work, fewer patents and other IP protections are being filed — indicating a gap between research output and innovation protection.

To improve global rankings, it is important to raise awareness among teaching faculty, researchers, and students about the importance of protecting inventions through IPR. Institutions should also create dedicated infrastructure — such as IP facilitation cells — that guide innovators through patent filing, copyright registration, and commercialization**.**

3.4 Origin of IP:

The exact origin of Intellectual Property is not officially recorded, but historians believe that a basic form of IP was being practiced as early as 500 BCE in Sybaris, a state in ancient Greece. In that time, residents who created any new improvement in luxury — such as unique clothing designs, culinary recipes, or entertainment methods — were granted one year of exclusive rights to use and benefit from their ideas. This early concept is similar to how, today, inventors get temporary exclusive rights through patents or copyrights.

The modern approach to IP governance began in medieval Europe**.** In 1623, Britain passed an Intellectual Property law that allowed guilds (associations of skilled artisans or merchants) to create innovations and bring them to market for profit. In today's terms, this would be similar to a group of engineers being granted exclusive rights to develop and sell a new computer architecture or specialized software system. However, this law caused public resentment because it gave excessive power to certain groups.

To address this, Britain replaced it with the Statute of Monopolies, which granted rights directly to the original inventor for 14 years**.** This was an important shift, as it recognized the individual inventor's role — much like a programmer today who writes a new operating system and receives a software patent in their own name.

Later, in 1710**,** the Statute of Anne was introduced. This was the first modern copyright law, giving authors the right to control the reproduction and distribution of their work for 14 years, with the option to renew for another 14.

By the late 18th century and early 19th century**,** countries around the world began establishing their own IP laws to protect novel inventions and creative works. This laid the foundation for today's global Intellectual Property systems.

3.5 History of IP in India.

India's journey with Intellectual Property (IP) laws began during British rule. The first Indian patent law, Act VI of 1856, was modeled on the British Patent Law of 1852 and aimed to encourage inventions in manufacturing processes. In 1911, all previous laws were consolidated into the Indian Patents and Designs Act, providing inventors with a legal framework to protect their inventions.

Between the 1940s and 1950s, amendments were introduced to prevent misuse of patents and to ensure affordability of essential goods such as food and medicine. The modern patent framework took shape with the Patents Act, 1970. With globalization and India's entry into the WTO, the Patents (Amendment) Act, 1999 introduced product patents for pharmaceuticals and agrochemicals. Further amendments in 2002 and 2005 brought the law in line with global standards, adding measures such as a ban on evergreening, provisions for pre- and post-grant opposition, and compulsory licensing for public interest.

Copyright protection in India began in 1847 and initially covered books and written works. The Copyright Act of 1957, still in force with several amendments, now provides protection for a wide range of creative works and aligns with international treaties such as the WIPO Copyright Treaty.

Trademark law was first introduced through the Trade Marks Act of 1940, later replaced by the Trade and Merchandise Marks Act of 1958, and eventually by the Trade Marks Act of 1999, which modernized the system and expanded protection for brand names and logos.

The Geographical Indications of Goods (Registration and Protection) Act, 1999 safeguards products that are unique to a particular region, such as Darjeeling Tea. Industrial Designs protection dates back to 1872, ensuring legal rights over the aesthetic aspects of products.
From colonial-era legislation to comprehensive, WTO-compliant frameworks, India's IP laws have evolved to address changing technological, economic, and social needs. These laws now serve as a strong foundation for fostering innovation, protecting inventors, and enabling fair use for public benefit.

3.6 Major Amendments in IP Laws and Acts in India:

Category	Year	Amendment / Act	Brief Description
Patents	1911	Indian Patents & Designs Act	First consolidated IP law covering patents & industrial designs.
	1940–1950s	Essential Goods Focus	Prevented misuse; ensured affordable access to key goods & medicines.
	1970	Patents Act, 1970	Modern framework; only process patents for pharma & food to boost local industry.
	1999	Product Patents (Pharma & Agro)	"Mailbox" applications & EMRs introduced for WTO-TRIPS compliance.
	2002	Major Modernization	20-year patent term, pre/post-grant opposition, stronger safeguards.
	2005	TRIPS Compliance	Allowed product patents in all fields; banned evergreening; compulsory licensing added.
Copyright	1957	Copyright Act, 1957	First law protecting authors, artists, and creative works.
	Various	Amendments	Digital rights, performer's rights, WIPO Internet Treaties compliance.
Trademarks	1958	Trade & Merchandise Marks Act	Basic protection to brand names and trade marks.
	1999	Trade Marks Act, 1999	TRIPS-aligned; added service marks, collective marks, well-known marks.
Geographical Indications	1999	GI Act Passed	Protected region-specific goods (e.g., Darjeeling Tea).
	2002	GI Rules	Defined procedures for GI registration & protection.
	2003	GI Act Enforced	Law came into effect; producers could register GI goods.
Industrial Designs	2000	Designs Act, 2000	Separate TRIPS-aligned law for industrial designs.
	2001	Designs Rules, 2001	Procedures for design registration & protection notified.

Summary:

Patents

1911 – *Indian Patents and Designs Act, 1911* (first consolidated law).
1940–1950s – Amendments to prevent misuse & ensure essential goods affordability.
1970 – *Patents Act, 1970* (modern patent framework).
1999 – Product patents introduced for pharma & agrochemicals.
2002 – Major modernization: safeguards, opposition systems.
2005 – WTO-compliant, "no evergreening," compulsory licensing.

Copyright

1957 – *Copyright Act, 1957* (foundation law).
Subsequent amendments – periodic updates to align with WIPO treaties.

Trademarks

1958 – *Trade and Merchandise Marks Act, 1958*.
1999 – *Trade Marks Act, 1999* (TRIPS-aligned, expanded protection).

Geographical Indications (GI)

1999 – GI Act passed.
2002 – *GI of Goods (Registration & Protection) Rules*.
2003 – GI Act came into force.

Industrial Designs

2000 – *Designs Act, 2000* (separated from patents).
2001 – *Designs Rules, 2001* notified.

3.7 Patent

A patent is a legal right given to an inventor for a new idea, process, or product that solves a problem or improves the way something is done. It prevents others from making, using, or selling the invention without permission. In return, the inventor must clearly describe the invention so that someone skilled in the field can reproduce it.

For example, in Engineering, if a research team develops a new algorithm that encrypts data twice as fast as existing methods while using less power, they can apply for a patent. This patent will legally stop others from copying the algorithm or integrating it into their software without permission. Similarly, if an engineering student designs a hardware accelerator chip that speeds up AI model training by 40%, a patent would protect this design. This system ensures that innovators are rewarded for their work while also sharing their ideas in a way that others can learn from, leading to further technological progress.

3.8 Conditions for Obtaining a Patent Protection:

For an invention to get patent protection under Section 2(1)(j) of the Patents Act, 1970, it must meet three main conditions:

1. Novelty – The invention must be completely new and not part of the "state of the art." This means it should not have been known to the public, published anywhere, or already claimed by someone else.

For example, if a researcher develops a unique AI-based image compression method that no one in the world has used or documented before, it can qualify as novel.

2. Inventive Step – The invention must show a significant technical improvement over existing knowledge or have economic importance, and it should not be obvious to someone skilled in that field.

For example, creating a new machine learning algorithm that reduces training time by 80% compared to all current methods would be considered an inventive step, as it is not an obvious solution for experts.

3. Industrial Application – The invention must be capable of being used or manufactured in an industry to benefit society.

For example, a cybersecurity tool that detects and blocks phishing attacks in real-time can be used by IT companies, banks, and e-commerce platforms, making it industrially applicable.

In short, a patent can only be granted if an invention is new, non-obvious, and useful in industry.

3.9 To Patent or Not to Patent an Invention:

When an inventor develops something new, they must decide whether to protect it for personal gain under the laws of the country or make it freely available for public use. Most inventors choose to protect their work, while only a small number release it without claiming any rights.
If an invention is placed in the public domain, anyone can use, modify, or sell it without paying the inventor.

For example, if a programmer creates a simple mobile app for note-taking and uploads the source code online without restrictions, other developers can use or improve it freely.

If the inventor wants to earn financial benefits, they can either patent the invention or keep it as a trade secret. Trade secrets are best when the invention can be kept hidden for many years and is hard to figure out, meaning there's little risk of reverse engineering—the process of analyzing a product to understand and recreate it.

For example, a unique internal data compression algorithm that is never shared outside a company could be a trade secret because it's very difficult for outsiders to reconstruct it.

On the other hand, if the invention has a short lifespan, if it is easy to copy, or could be quickly figured out once released (high chance of reverse engineering), patenting is the safer option.

For instance, a new type of USB connector design could be patented because once it's sold, others can easily examine and replicate it.

3.10 Rights Associated with Patents:

In the eyes of the law, a patent owner has the power to decide who can or cannot use their invention. This means no one is allowed to make, use, sell, import, or distribute the invention for commercial purposes without the owner's permission.

For example, if a computer engineer patents a new AI-based image compression algorithm, other companies cannot integrate it into their software products unless they get approval from the patent holder.

The owner can allow others to use the invention through a license agreement, where both parties agree on certain terms—such as payment of royalties or limits on usage. Patent rights are considered negative rights because they do not directly give the owner the right to use the invention in every possible way, but rather give them the power to prevent others from using it without consent.

For example, suppose you invent a new type of drone navigation system and get a patent for it. Even though you own the patent, you might still need government approval to use drones in certain areas (like near airports).But your patent does give you the power to stop other companies from making or selling your navigation system without your permission.

If someone uses the patented invention without permission—*say a tech startup copies a custom-designed robotics controller circuit*—the patent holder can take legal action to stop the infringement and may also demand compensation for losses caused by the unauthorized use.

3.11 Enforcement of Patent Rights:

Enforcement of patent rights means making sure that the rules protecting an invention are followed. In most cases, if someone uses a patented invention without permission, the issue is handled by the courts. The court has the power to stop the infringement and prevent further misuse. However, it is mainly the patent owner's responsibility to watch for violations, identify who is infringing, and take legal action if necessary.

For example, if a software company has a patented algorithm and another company uses it in their product without permission, the original owner must gather proof, file a case, and request the court to stop the use and possibly award compensation.

3.12 Inventions Eligible for Patenting:

Patents can be granted for inventions in almost any field — from something as simple as a paper clip to something as advanced as a nanotechnology-based processor. Many people think patents are only for groundbreaking scientific discoveries, but that's not true. In fact, most patents are for improvements to existing inventions.

For example, in Computer Science and Engineering, a company might patent a new version of an existing search algorithm that makes it faster or more secure. Just like penicillin has multiple generations with improved properties, software or hardware can have multiple patented versions — such as newer generations of microprocessors that consume less power or work faster.

In our everyday tech usage, many items we use contain multiple patented inventions. A laptop, for example, has hundreds of patented technologies — from its battery design and cooling system to the operating system's user interface and the keyboard's layout. Similarly, smartphones, cars with AI-assisted driving, and even modern TVs combine numerous patented innovations into a single product.

3.13 Non-Patentable Matters:

Not everything can be patented. The Patent Act, 1970 clearly mentions certain products and processes that are excluded from patent protection.

First, inventions that go against public morality cannot be patented.

For example, a method for human cloning or software designed for online gambling. Similarly, mere discoveries are not eligible; for instance, simply finding a new micro-organism in nature or stating a scientific law like gravity cannot be patented.

Another exclusion is the discovery of a new use or form of something already known.

For example, aspirin was originally patented for treating fever and pain, but later using it for heart treatment is not patentable because it is just a new use of an existing drug. The same applies in computing — if someone just takes an existing sorting algorithm and uses it in a different application without real improvement, it cannot be patented.

Frivolous inventions are also not allowed.

Something like a dough recipe with added herbs or a computer program that only changes a screen's background color without any technical advancement would be rejected.Likewise, trivial arrangements or rearrangements, such as attaching a torch to a bucket or adding a fan to an umbrella, are not considered patentable.

Certain inventions are specifically restricted by law and are not patents, such as those related to nuclear materials under the Atomic Energy Act, 1962.

In Computer Science and Engineering, works like books, paintings, source code, or mathematical formulas are protected under copyright law, not patents. Similarly, the layout design of integrated circuits is separately protected under the Semiconductor Integrated Circuit Layout Designs Act, 2000.

Plants, animals, and biological processes for producing them also cannot be patented. Finally, traditional knowledge is excluded. For example, using turmeric or neem for healing, or repackaging a commonly known open-source encryption method without adding originality, cannot be patented.

In short, patents are meant for genuine technical inventions or improvements, not for discoveries, trivial changes, or things already protected under other laws.

3.14 Patent Infringements:

Once a patent is granted, the inventor becomes the legal owner of that invention and has the right to use or commercialize it. If someone else uses the invention without the owner's permission, it is called patent infringement. In simple terms, infringement means breaking the owner's rights.

There are two main types of patent infringement.

1. *Direct Infringement and*
2. *Indirect Infringement*

Direct Infringement happens when someone makes, sells, or markets a product that is very similar or identical to a patented one without permission.

For example, imagine a company patents a unique data compression algorithm for faster video streaming. If another company copies the same algorithm and sells a video player using it without a license, that is direct infringement.

Indirect Infringement occurs when the violation is unintentional or involves some deceit.

For instance, a software developer may unknowingly use a patented encryption method while building an app, not realizing it is patented.

Even if it was accidental, the act still counts as infringement, and the patent owner can take legal action.

Patent owners have the right to approach courts to stop such violations. The court can provide different types of remedies such as:

Temporary (interim) injunction – stopping the infringer immediately until the case is resolved.

Damages or profit recovery – the infringer may have to pay money equal to the loss caused or give up the profits earned from the violation.

Permanent injunction – a long-term order stopping the infringer from ever using the invention again.

3.15 Avoid Public Disclosure of an Invention before Patenting:

Before filing a patent, it is very important not to publicly share or display the invention, because once it is disclosed, the invention may lose its novelty (newness), which is one of the main requirements for getting a patent.

For example, if a Computer Science student develops a new AI-based plagiarism detection tool and uploads the full details on a public blog before filing a patent, the invention becomes public knowledge and cannot be patented anymore.

However, the law provides some flexibility. Under the Patents Act**,** there is a grace period of 12 months in certain situations. This means that if an invention was shown at a recognized exhibition, presented at a scientific conference, or published in a journal, the inventor still has up to one year to file the patent application without losing the chance to claim novelty.

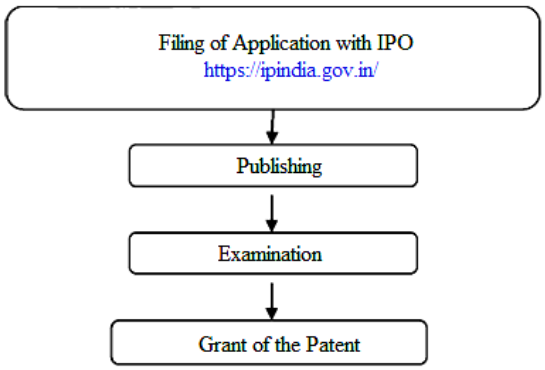
For instance, a research team that publishes a paper about a new cloud data optimization technique in a reputed conference may still file a patent within the next 12 months.

Sometimes, inventors need to share their idea before patenting—for example, when showing it to an investor, company, or business partner to check its commercial potential. In such cases, it is risky to disclose everything openly. To stay protected, inventors should sign a Non-Disclosure Agreement (NDA) or any confidentiality contract.

For example, if an engineering startup develops a new energy-efficient processor design, they should make the investor sign an NDA before revealing the full technical details. This ensures the idea remains safe until the patent is filed.

3.16 Process of Patenting:

The process of getting a patent in India, as shown in the figure, is lengthy and may take three to four years or more.



The first stage is Filing, where the inventor submits an application to the Indian Patent Office (IPO). Before filing, a prior art search is done to check whether the invention already exists. Depending on the progress, the inventor may file a provisional application if the invention is still being developed or a complete application if it is ready.

Example, a startup creating a new cybersecurity tool may file a provisional application while they refine the software.

The second stage is Publishing, where the application is made public in the Patent Journal after 18 months, unless the inventor requests early publication. This step ensures that others are aware of the invention and can examine its details.

For instance, a team filing a patent for a blockchain-based system will see their invention published in the journal after this stage.

The third stage is Examination, in which a patent examiner carefully studies the application to see if it meets the required conditions like novelty, usefulness, and non-obviousness. If there are objections, the inventor must clarify or modify the application. Additionally, others can raise a pre-grant opposition if they believe the invention should not be patented.

For example, if an invention is very similar to an existing algorithm, another researcher may file an objection during this stage.

The final stage is the Grant of Patent, where the invention is approved if all conditions are met. The inventor is then given exclusive rights over the invention, usually for 20 years. However, even after the grant, the patent can still face post-grant opposition if someone challenges it.

For example, if an engineering team patents a new processor design, they will gain the right to stop others from copying it for two decades.

3.17 Prior Art Search:

Before filing a patent, an inventor must make sure that the invention is new (novel) and not already known to the public. This process is called a prior art search. Prior art refers to any information that already exists in the public domain before the filing date of the patent application. It can include previously published patents, research papers, technical reports, books, websites, or even online videos.

To perform a prior art search, inventors must check both

1. *Patent databases and*
2. *Non-patent literature (NPL).*

Patent databases include resources like the Indian Patent Advanced Search System (InPASS), WIPO Patentscope, Espacenet (EU), USPTO (USA), Google Patents, Orbit Intelligence, and Derwent Innovation.

Non-patent literature includes scholarly journals (such as IEEE, Springer, ResearchGate, Wiley), textbooks, dissertations, technical reports, industry magazines, blogs, YouTube demonstrations, or even posts on social media. Some of these sources are free, while others require paid subscriptions.

A prior art search is done based on key parameters such as novelty (is it new?), patentability (is it eligible for patent?), infringement (does it overlap with someone else's rights?), validity (will it hold in court?), and freedom to operate (can it be used without legal restrictions). This helps inventors avoid wasting time on ideas that are already patented and also prevents future patent infringement disputes.

Example: Imagine a group of students design a new AI-based code optimization tool. Before filing a patent, they must search IEEE, Springer, Google Patents, and USPTO databases to confirm that no one else has already patented or published a similar algorithm. If they find similar prior art, they may need to modify their idea to make it truly novel.

3.18 Choice of Application to be filed:

After deciding to patent an invention, the next important step is to choose what type of patent application should be filed. In India, there are two main options:

1. *Provisional Patent Application or*
2. *Complete (Final) Patent Application.*

A provisional application is often the first choice because it is cheaper, quicker to file, and requires fewer formalities. It does not need the full technical details of the invention. Instead, it allows inventors to file even if some experiments are still incomplete or more data needs to be collected. Any later improvements or changes in the invention can be added when filing the final application.

One major benefit of filing a provisional application is that it secures a priority date. This means the date on which the provisional application is filed will be considered the official date of the invention. If anyone else tries to file a similar invention afterward, the earlier filing date gives the original inventor legal advantage.

Example: Suppose a team of Engineering students develops an early version of a quantum cryptography algorithm. They are still testing it, but they don't want someone else to claim the idea first. They can file a provisional application with the basic details, and later, once they finish experiments and improve the algorithm, they file the complete application with full specifications.

On the other hand, a complete application is filed when the invention is fully developed. It must contain the complete details, drawings, and claims, and is necessary for the actual grant of the patent**.**

3.19 Patent Application Forms:

When an inventor applies for a patent in India, they must use specific forms as per the Patent Act, 1970 and the Patent Rules, 2003. The two most important forms are

1. *Form-1 and*
2. *Form-2.*

Form-1 is general and collects basic details such as the title of the invention, the names of the applicants and inventors, and the type of application being filed (for example, Ordinary, Convention, PCT-National Phase, Divisional, or Patent of Addition).

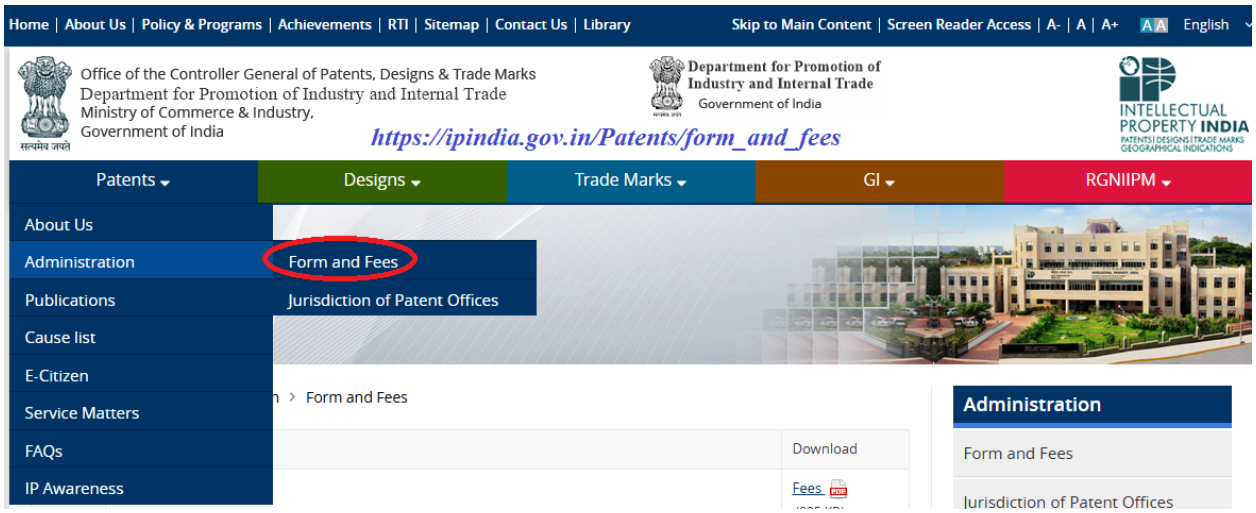
Form-2 deals with the technical details of the invention. If the inventor is filing a Provisional Application, only the description of the invention and an abstract are needed. But if they are filing a Complete Application, they must provide the full description, abstract, claims, and explanation of how the invention works.

The claims are the most important part because they define the exact boundaries of the invention—what is covered and protected, and what is not.

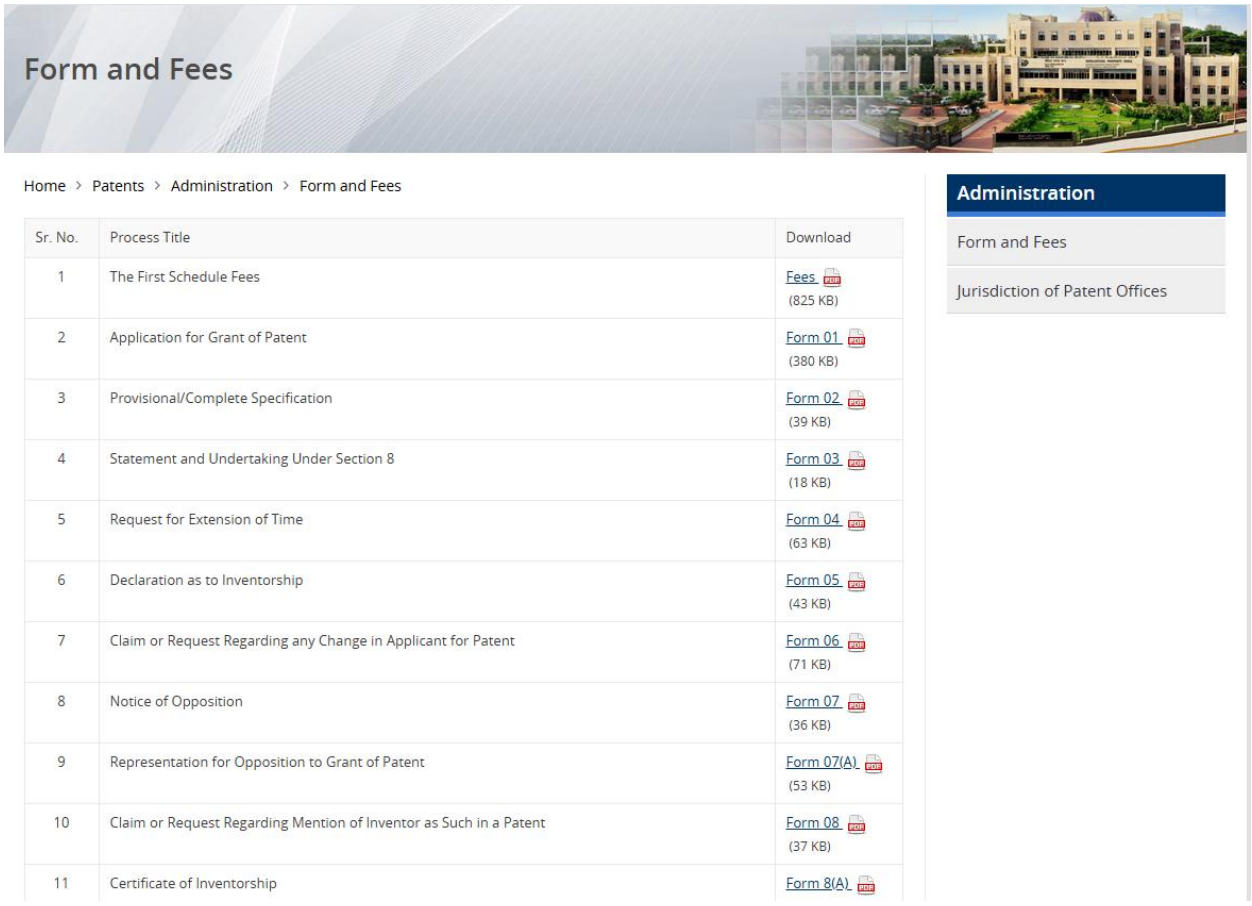
For example, if a team develops a new machine learning algorithm for fraud detection, the claims would clearly state what is unique about the algorithm (e.g., its learning technique, speed improvements, or the way it handles large datasets).

This ensures that no one else can copy or misuse the patented part of the invention without permission.

Example: Suppose a startup files Form-1 for a patent titled "Blockchain-Based Secure Voting System." In Form-2, for a provisional application, they only provide the description and abstract of how blockchain ensures security. Later, when filing the complete application, they include detailed technical specifications, flow diagrams, and claims showing exactly what part of their blockchain model is protected by the patent.



There are nearly 35 types of forms available in the website which can be downloaded from https://ipindia.gov.in/Patents/form_and_fees.



Sr. No.	Process Title	Download
1	The First Schedule Fees	Fees (825 KB)
2	Application for Grant of Patent	Form 01 (380 KB)
3	Provisional/Complete Specification	Form 02 (39 KB)
4	Statement and Undertaking Under Section 8	Form 03 (18 KB)
5	Request for Extension of Time	Form 04 (63 KB)
6	Declaration as to Inventorship	Form 05 (43 KB)
7	Claim or Request Regarding any Change in Applicant for Patent	Form 06 (71 KB)
8	Notice of Opposition	Form 07 (36 KB)
9	Representation for Opposition to Grant of Patent	Form 07(A) (53 KB)
10	Claim or Request Regarding Mention of Inventor as Such in a Patent	Form 08 (37 KB)
11	Certificate of Inventorship	Form 8(A)

3.20 Jurisdiction of Filing Patent Application:

The jurisdiction of filing a patent application in India is divided region-wise to make the process systematic and accessible. Applicants must file their patent at the regional patent office that corresponds to their place of residence, domicile, or business**.** India has four patent offices – Delhi (North), Chennai (South), Mumbai (West), and Kolkata (Rest of India)**.**

Region	States / UTs Covered	Patent Office Address	Contact
NORTH	Haryana, Himachal Pradesh, Punjab, Rajasthan, Uttar Pradesh, Uttarakhand, Delhi, UT of Chandigarh, Jammu & Kashmir, Ladakh	Intellectual Property Office Building, Plot No. 32, Sector 14, Dwarka, New Delhi-110078	Phone: 011-28032491Fax: 011-28034301 Email: delhi-patent@nic.in
SOUTH	Andhra Pradesh, Karnataka, Kerala, Tamil Nadu, Telangana, UTs of Pondicherry & Lakshadweep	Patent Office, Intellectual Property Building, G.S.T. Road, Guindy, Chennai-600032	Phone: 044-22505242Fax: 044-22502066 Email: chennaipatent@nic.in
WEST	Maharashtra, Gujarat, Madhya Pradesh, Goa, Chhattisgarh, UTs of Daman & Diu, Dadra & Nagar Haveli	Boudhik Sampada Bhawan, Antop Hill, S. M. Road, Mumbai – 400037	Phone: 022-24153651 / 24148165Fax: 022-24130387 Email: mumbaipatent@nic.in
REST OF INDIA	Remaining States	Intellectual Property Office Building, CP-2, Sector V, Salt Lake City, Kolkata-700091	Phone: 033-23679101 / 23671987Fax: 033-23671988 Email: kolkatapatent@nic.in

3.21 Publication

Once a patent application is filed at the Regional Patent Office, it is kept confidential for 18 months. After this period, the application is published in the Official Journal of the Patent Office so that the public can know about the invention. The purpose of publication is transparency and to let others be aware of new innovations.

For example, if a group of computer science students invents a new algorithm for real-time fraud detection in online banking, their patent application will remain secret for 18 months. Later, it will be published publicly so that companies, researchers, and even competitors know such an invention exists.

This also gives time for potential investors or industries to approach the inventors.

3.22 Pre-Grant Opposition

After publication, anyone who feels that the invention is not new or violates existing knowledge can file an objection. This must be done within 6 months of publication. This process is called Pre-grant Opposition.

For instance, suppose a researcher claims a patent for a face recognition system using AI, but another company proves that a very similar system was already published in their earlier research papers. In that case, the Controller of Patents may reject the application or allow it only after proper clarification.

This ensures that patents are granted only for genuinely new and original work.

3.23 Examination

A patent is not automatically examined after publication. The applicant must file a request for examination (Form-18A) within 48 months of filing. In the examination stage, the patent office experts check whether the invention is novel, useful, and involves an inventive step. Usually, the examiner may raise questions or ask for clarification from the inventors.

For example, if a patent is filed for a new data compression method in cloud storage, the examiner may ask the inventors to prove how their method is different from existing compression algorithms like Huffman coding or LZW.

Once the examiner is satisfied, the application moves towards the grant stage.

3.24 Grant of Patent

When all objections and requirements are cleared, the patent is granted to the applicant. The grant is then published in the Patent Office Journal, which is released every Friday. This journal includes granted patents, notices, and other patent-related updates.

For example, if a CSE professor develops a blockchain-based secure voting system and successfully clears all objections, the patent will be officially granted and published.

The inventor then enjoys exclusive rights to use, sell, or license the invention.

3.25 Validity of Patent Protection

In India, a patent is valid for 20 years from the date of filing. However, the patent holder must pay annual renewal fees to keep it active. If the renewal fee is not paid, the patent can be cancelled.

For example, if a startup patents a new cybersecurity tool for detecting phishing websites, they must renew it every year until 20 years are complete. This ensures they enjoy full protection from competitors.

In some countries, the validity can be extended beyond 20 years, especially when product approvals take long (e.g., in pharmaceuticals). In computer science, patents usually stick to the 20-year period.

3.26 Post-Grant Opposition

Even after a patent is granted, it can be challenged within one year of publication, either in the Patent Office or in a Court of Law. If valid, the patent may be canceled.

For example, if someone patents a machine learning algorithm but another researcher proves it was copied or already published, the patent can be revoked.

Similarly, if the invention was already publicly used, such as an open-source image recognition tool, it cannot be patented later.

A patent can also be opposed if it is too obvious (e.g., simply adding more servers to increase storage) or if it falls under non-patentable subjects like mathematical formulas. Additionally, if the specifications are unclear—for instance, claiming a "program for cloud security" without explaining the process—the patent may be invalidated.

3.27 Commercialization of a Patent

Once a patent is granted, the patent owner (called the patentee) gets exclusive rights to use, make, and sell the invention. However, the patentee may not always have the resources, facilities, or time to bring the invention to the market. In such cases, the patent can be commercialized by granting permission (license) to other individuals, organizations, or industries under agreed terms and conditions.

For example, imagine a Computer Science professor patents a new data compression algorithm that reduces video file sizes by 70% without losing quality. Since the professor is more focused on teaching and research, he may not wish to build a full-scale software company. Instead, he can license the patent to a tech company like Adobe or Microsoft, who can use this algorithm in their products. This way, the invention reaches the market, benefits society, and generates revenue for the patent owner.

Patent licensing can be of two types: exclusive and non-exclusive. In an exclusive license, the rights to use the invention are given to only one company or organization for a fixed time.

For instance, if our professor grants the exclusive license of his algorithm to Microsoft, then only Microsoft can use it, and no other company can exploit the patent during that period.

In contrast, in a non-exclusive license, the patent can be sold or licensed to multiple parties.

For example, the same professor may license the algorithm to Google, Netflix, and Amazon simultaneously, so all of them can use it in their platforms.

The law also ensures that patented inventions are actually put to use for the public's benefit. In India, if the patent is not commercialized within three years of grant, anyone can apply for Compulsory Licensing.

For example, suppose a researcher patents a new cybersecurity framework that can prevent major hacking attempts but does not make it available in India at an affordable price.

In that case, another company can request the Controller of Patents for compulsory licensing, so that the invention becomes accessible and affordable to society.

3.28 Need for a Patent Attorney/Agent

While inventors can file a patent themselves, patent documents are often very technical and legally complex. This is why it is advisable to consult a patent attorney/agent who is trained to draft applications correctly.

For instance, if a computer science student invents a new encryption algorithm, writing vague claims may cause the patent to be rejected.

A patent attorney ensures that the claims are precise, legally valid, and cover all possible applications of the invention. Moreover, many countries legally require foreign applicants to be represented by a local patent attorney/agent.

3.29 Can a Worldwide Patent Be Obtained?

There is no such thing as a universal or worldwide patent. Patent rights are territorial, meaning they only apply in the country where they are granted.

For example, if a startup develops an innovative AI-powered traffic management system in India, filing a patent in India alone will not protect the idea in the U.S. or Europe.

Filing in multiple countries separately can be costly and time-consuming. To address this, regional patent offices like the European Patent Office allow inventors to cover multiple nations with a single application. For wider protection, inventors can file under the Patent Cooperation Treaty (PCT), which India and 190+ countries are part of. This system allows inventors to secure patent rights in multiple countries through a single international application.

3.30 Do I Need to File a Patent First in India?

According to Indian patent law, if you are an Indian resident or have your principal place of business in India, you are required to file the patent application first in India before filing it in any other country.

This rule ensures that the Indian Patent Office has a record of inventions originating in India and can review whether the invention involves sensitive technologies (like defense, atomic energy, or national security-related innovations).

After filing in India, the inventor can apply abroad, but usually only after obtaining approval from the Indian Patent Office. However, there are exceptions:

1. If the applicant is not an Indian resident –
   Example: An American company developing a cloud computing optimization system with no Indian inventors can file directly in the U.S. without filing in India.
2. If six weeks have passed since filing in India –
   Example: An Indian software engineer who files a patent in India for a new machine learning-based fraud detection algorithm can apply abroad after six weeks without needing special permission.
3. If the invention is developed jointly with foreign researchers –
   Example: Suppose an Indian AI researcher and a German researcher co-develop a cybersecurity framework for IoT devices, and they want to patent it in Europe first.
4. The Indian inventor must request Foreign Filing Permission (FFP) before applying outside India.
5. If the invention relates to defense, atomic energy, or restricted technologies –
   Example: A patented AI-based drone navigation system or software for nuclear plant monitoring must be filed in India first, and the inventor must seek explicit clearance before filing abroad.

This rule balances national interest with the global rights of inventors. It ensures India retains control over sensitive technologies while still allowing inventors to protect and commercialize their ideas internationally.

3.31 Types of Patent Applications:

There are different types of patent applications, depending on the stage of the invention and the protection needed. They are

1. *Convention Application*
2. *Patent of Addition*
3. *Divisional Application*
4. *PCT Application*
5. *Ordinary Application*
6. *Provisional Application*

A Provisional Application is filed when the invention is still under development, but the inventor wants to secure an early priority date.

For example, if a researcher is building a new AI-based image recognition system but hasn't fully completed the model, they can file a provisional application.

An Ordinary Application is filed with complete details and claims, without referring to any earlier priority.

For instance, a fully developed algorithm for faster database indexing can be filed as an ordinary application.

A PCT Application (Patent Cooperation Treaty Application) allows an inventor to file one international application that can be extended to over 190 member countries.

For example, a cybersecurity software invented in India can be protected in the US, Europe, and Japan through a PCT filing.

A Divisional Application is used when one patent application contains more than one invention.

Suppose a computer science researcher files for a patent covering both a new data compression method and a new encryption method—these may need to be separated into two divisional applications.

A Patent of Addition is filed when the invention is only a slight improvement over an earlier one.

For example, if a researcher already has a patent on a compiler optimization technique and later develops a small modification to improve execution speed, they can file a patent of addition.

This doesn't require a separate renewal fee and expires along with the original patent.

Finally, a Convention Application is filed when an invention first patented in India is later applied for in other convention countries (like under the Paris Convention) while keeping the same priority date.

For instance, if an Indian inventor patents a blockchain-based supply chain system in India, they must file in convention countries within 12 months to keep the same priority date.

3.32 Commonly Used Terms in Patenting:

Sl. No	Term	Definition
1	Inventor	The person who creates or develops an invention.
2	Applicant	An individual, organization, or company that files a patent application.
3	Patentee	The person or organization that legally owns the granted patent.
4	Licensee	An individual, organization, or company that gets permission (license) from the patentee to use the patent for commercial purposes.
5	Assignee	A person or organization to whom the patent rights are legally transferred (assigned).
6	In Force	A patent that is still active because the owner pays the renewal (annuity) fees regularly.
7	Working of a Patent	Using or selling the patented invention for commercial purposes.
8	Patent Specification	A written description of the invention, including how it works and how it can be made or used.
9	Priority Right	A special right that starts from the date the first patent application is filed, giving the inventor a time advantage.
10	Priority Date	The exact date when the first application for the invention was filed.

Sl. No	Term	Definition
11	Patent Claims	The legal statements in a patent that define what part of the invention is protected.
12	National Phase Application	A patent application filed in different countries based on a single International (PCT) application.
13	Patent Revocation	Cancellation of a granted patent due to reasons like lack of originality or wrongful ownership.
14	Restoration of Patent	Bringing back a patent that has expired (e.g., due to non-payment of fees) by paying the required fee within the allowed time.

3.33 National Bodies Dealing with Patent Affairs:

National bodies dealing with patents were set up to manage patents, promote industrial growth, forecast future technologies, and transfer research into practical use. Their significance lies in protecting innovations, guiding policy, supporting industries, and ensuring that research benefits society and the economy. The following represent some of the major national bodies.

Sl. No	Body/Organization	Simple Role / Function
1	Indian Patent Office (IPO)	Works under the Controller General of Patents, Designs & Trademarks. It handles patents, designs, and trademarks in India.
2	Department for Promotion of Industry and Internal Trade (DPIIT)	Earlier called Department of Industrial Policy and Promotion (DIPP). Part of the Ministry of Commerce & Industry. Main body for industrial regulation and India's top authority for Intellectual Property (IP).
3	Technology Information, Forecasting and Assessment Council (TIFAC)	Formed under the Department of Science & Technology (DST). Assesses current technologies, predicts future trends, and guides technology development in India.
4	National Research Development Corporation (NRDC)	Set up under Department of Scientific & Industrial Research (DSIR) in 1953. Promotes, develops, and transfers technologies from universities, research labs, and Public Sector Undertakings (PSUs) to industries. Holds 2500+ technologies, 1700+ patents, and has transferred 5000+ technologies in various fields (electronics, biotech, healthcare, mining, etc.).

3.34 Utility Models:

Sometimes, inventions are not completely new but are small improvements over existing products. These may not meet the strict requirements of novelty and non-obviousness needed for a full patent, but they can still be protected in many countries under a system called Utility Models (also known as Petty Patents or Innovation Patents).

The rules for novelty and inventiveness are more relaxed compared to patents, but the invention must still be useful and applicable in industry.

Utility Models are especially helpful for Micro, Small, and Medium Enterprises (MSMEs) because they cost less and are granted more quickly than full patents.

For example, in Computer Science and Engineering, if a startup improves an existing data compression algorithm to make it slightly faster for mobile devices, or designs a more efficient cooling system for a computer motherboard, these changes might not qualify for a full patent but can still be protected as a Utility Model.

This allows the company to legally safeguard its small but meaningful innovation and benefit financially.

Unlike patents, which usually last 20 years, Utility Models have a shorter lifespan (7–15 years depending on the country). Countries like Germany, Japan, China, South Korea, and Spain already provide legal protection for such small-scale inventions.

Unfortunately, India does not currently recognize Utility Models mainly due to the risk of low-quality or trivial patents, possible patent flooding, and increased legal disputes. Existing protections like design and copyright already cover minor innovations. The government is cautious, as it may encourage quantity over quality in innovation.

QUESTION BANK:

5 Marks Questions

1. Define Intellectual Property Rights (IPR). Why are they important in engineering and technology?
2. Differentiate between patent and copyright.
3. What is meant by trade secret? When is it preferred over patenting?
4. Write a short note on reverse engineering.
5. Explain the concept of novelty in patenting.
6. What are utility models? How do they differ from patents?
7. Explain patent revocation with a simple example.
8. What is compulsory licensing in patent law?
9. Define exclusive license and non-exclusive license with examples.
10. Write a note on patent specification and its importance.
11. Why should inventions not be disclosed before filing a patent application?
12. What is the validity period of a patent in India? How can it be renewed?
13. Mention any four common databases used for prior art search.
14. Define patent infringement. Differentiate between direct and indirect infringement.
15. Explain in brief post-grant opposition.

10 Marks Questions

1. Explain in detail the process of patenting in India with steps.
2. Discuss the rights associated with patents and why they are called negative rights.
3. What are the inventions not patentable under the Patents Act, 1970? Explain with examples.
4. Explain the role of Patent Attorneys/Agents in filing a patent.
5. Discuss the significance of jurisdiction of patent filing in India with regional offices.
6. Explain publication, examination, grant, and opposition in the patenting process.
7. Describe commercialization of a patent. Explain licensing types with examples.
8. What is prior art search? Explain its importance and methods.
9. Explain the different types of patent applications (Provisional, Ordinary, PCT, Divisional, Patent of Addition, Convention).
10. What are national bodies dealing with patent affairs in India? Explain their functions.
11. Discuss in detail utility models (petty patents) and their global acceptance. Why does India not recognize them?
12. What is enforcement of patent rights? Explain with remedies available to a patentee.
13. Write short notes on:
    a) Patent claims
    b) Priority date and priority rights
    c) Restoration of patents
    d) Working of patents
14. What are the challenges and remedies for patent infringement? Explain with case examples.
15. Explain why there is no worldwide patent. How does the Patent Cooperation Treaty (PCT) help in international filing?

MODULE-04 COPYRIGHTS & TRADEMARKS

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. Validity of Copyright. Copyright Profile of India. Copyright and the word 'Publish'. Transfer of Copyrights to a Publisher. Copyrights and the Word 'Adaptation'. Copyrights and the Word 'Indian Work'. Joint Authorship. Copyright Society. Copyright Board. Copyright Enforcement Advisory Council (CEAC). International Copyright Agreements, Conventions and Treaties. Interesting Copyrights Cases.
Trademarks: Eligibility Criteria. Who Can Apply for a Trademark. Acts and Laws. Designation of Trademark Symbols. Classification of Trademarks. Registration of a Trademark is Not Compulsory. Validity of Trademark. Types of Trademark Registered in India. Trademark Registry. Process for Trademarks Registration. Prior Art Search. Famous Case Law: Coca-Cola Company vs. Bisleri International Pvt. Ltd.

4.0 Copyrights and Related Rights

Copyright is the legal right given to the original inventor of a work. In Computer Science, this includes software programs, mobile applications, research papers, and technical articles. Copyright ensures that the inventor has control over how their work is used, shared, or reproduced. In India, copyrights and related rights are protected under the Copyright Act, 1957. This law allows inventors to reproduce their work, communicate it to the public, adapt it into new forms, or translate it into other languages.

For example, if a computer science student develops a new learning software, no one else can copy, sell, or translate it without permission.

4.1 Classes of Copyrights:

Copyright protection is available for different categories of works:

1. ***Literature*** – This includes books, essays, research articles, oral lectures, computer programs, software, and databases.
   For instance, a professor writing a textbook on Artificial Intelligence or a student building a database system will have their work protected.
2. ***Dramatics*** – Works such as scripts and dramas.
   A drama script written for a college tech fest on "AI vs Human" falls under this category.
3. ***Sound Recordings*** – Any recording of sounds stored in CDs or digital formats.
   A podcast created by a student on "Cybersecurity Awareness" is an example.
4. ***Artistic Works*** – Drawings, paintings, logos, maps, photographs, or architectural designs.
   For example, a CSE student designing a unique logo for their start-up app or creating a data flow diagram can claim copyright.
5. ***Musical Works*** – Musical notations or compositions, even without lyrics.
   A student composing background music for their coding tutorial videos can protect it.
6. ***Cinematograph Films*** – Visual recordings with or without sound, such as movies, TV programs, or digital videos.
   A student making a documentary on "The Evolution of Computers" for YouTube owns the copyright.

4.2 Criteria for Copyright:

For a work to qualify for copyright protection, it must satisfy some conditions.
1. The first condition is that the work must exist in some physical or digital form, either written, recorded, or stored.

For example, a new algorithm idea that exists only in a student's mind cannot be protected, but if the algorithm is coded and saved in a file, it qualifies.

2. The second requirement is originality. The work must come from the inventor's independent thinking and not be copied. Even if it looks similar to other works, it should not be the same. Such works are called Original Works of Authorship (OWA).

For example, if two students independently create a Library Management System project, both can get copyright as long as they did not copy each other's code.

3. The third criterion is creative effort. Some level of creativity must be present. Even minimal creativity is enough, but it must go beyond duplication.

For example, simply changing font size in a book does not qualify, but designing an innovative e-book reader software does.

4. The fourth point is that the work does not need to be of high quality or visually appealing. Even simple or rough work is protected if it is original.

For instance, a rough C program written for solving matrix multiplication can still qualify for copyright.

5. Finally, straightforward mechanical work is not protected.

For example, an alphabetical address book of phone numbers cannot be copyrighted, but a creatively designed student contact management software with features such as searching, sorting, and visualization can be protected.

This makes it clear that copyright helps inventors in Engineering protect their software, projects, research, and creative ideas from being copied or misused. Even small efforts like writing code, preparing a project report, or recording a tutorial can qualify for protection as long as they are original and in a tangible form.

4.3 Ownership of Copyright

The first owner of copyright is always the person who originally invents the work.

For example, if a Computer Science student writes a unique Python program, he or she automatically becomes the first copyright owner.

If an employee develops a program, website, or database as part of their job in a company, then the copyright belongs to the employer (the company or proprietor) and not the employee.

For example, if a software engineer working for Infosys develops an e-commerce platform as part of a project, the copyright belongs to Infosys.

In the case of government work, the copyright belongs to the government unless there is a special agreement.

For instance, if a programmer is hired by the government to develop a digital land-record system, the government will be the copyright owner.

If someone delivers a speech or lecture, the person who delivers it owns the copyright for that speech.

For example, if a professor gives a lecture on Artificial Intelligence and the lecture is recorded, the professor is the first copyright holder.

When someone wants to use copyrighted material, they must request permission from the legal owner, who may be the original inventor, a legal heir (if the inventor has passed away), or a publisher. The request must include details such as the title of the work, the name of the inventor, the material to be used, the number of copies, the purpose (for example, research or education), the method of distribution (such as classroom printouts or an online post), and whether the material will be sold.

For instance, a student wanting to use a copyrighted computer graphics textbook chapter for a course pack must first obtain permission from the publisher.

4.4 Copyrights of the Author

The copyrights of the author are legally protected under Section 14 of the Copyright Act, 1957. This means the work created by the author cannot be published, copied, or used without their consent. Copyright gives the author exclusive control in the areas of publication, distribution, and usage.

The rights of an author are divided into two categories: Economic Rights and Moral Rights.

Economic Rights: Economic rights deal with financial benefits earned from copyright. An author can authorize or prohibit:

- Reproducing the work (like reprinting software documentation or copying a codebase).
- Distributing copies of the work (such as sharing paid software illegally).
- Public performance (like demonstrating copyrighted software at a tech event).
- Broadcasting or communicating the work (for example, uploading a copyrighted coding tutorial online without permission).
- Translating the work into other languages (for instance, translating a research paper on Machine Learning into another language without approval).
- Adapting the work (like turning a research project report into a published book or converting a mobile app into a web application).

Example: *If a student authors a plagiarism-detection tool, they can stop others from reproducing or selling it without permission.*

Moral Rights: Moral rights protect the personal bond between the author and their work. There are two types:

1. **Right of Paternity** – Even if copyright is sold or transferred, the original author's name must still appear.

   For example, if a CSE student publishes a book on "Data Structures" and sells the copyright to a publisher, their name will still remain on the book.

2. **Right of Integrity** – The author has the right to prevent their work from being misused or altered in a way that harms their reputation.

   For example, if a researcher's paper on Cybersecurity is edited in a misleading way that changes the meaning, the original researcher can stop it.

It is also important to note that a single work may have multiple copyright holders.

For example, a computer game might involve a programmer, a graphic designer, a sound engineer, and a story writer. Each one may hold a share of the copyright for their contribution.

In short, in Engineering, ownership of copyright ensures that authors of software, research, and creative projects retain control over their work, whether for economic gain or to protect their personal reputation.

4.5 Copyright Infringements

Copyright infringement happens when someone uses another person's copyrighted work without permission. According to the Copyright Act, 1957, certain actions are considered violations.

1. For example, making unauthorized copies of software and selling them for profit is an infringement.

2. If someone allows their classroom, auditorium, or online platform to be used for showing copyrighted software, movies, or coding tutorials without permission, that is also a violation.

3. Distributing pirated or unauthorized copies for trade that negatively affect the copyright owner's income is another infringement.

For example, distributing cracked versions of MATLAB or Photoshop to students harms the software company's rights.

4. Similarly, publicly displaying pirated copies for trade purposes, such as selling counterfeit engineering textbooks or pirated software at stalls, is illegal.

5. Importing pirated copies of software, games, or e-books into India without permission also counts as an infringement.

6. Even translating a copyrighted research paper, programming textbook, or AI project report without the author's consent is an infringement.

4.6 Copyright Infringement as a Criminal Offence

Under Section 63 of the Copyright Act, 1957, knowingly infringing a copyright is treated as a **criminal offence**. The punishment includes a minimum of six months imprisonment along with a fine of ₹50,000. For repeat offences, the punishment increases to at least one year in prison and a fine of ₹1,00,000.

For example, if a person continuously distributes pirated engineering software or computer science e-books, they can face strict legal action.

India has a dedicated Intellectual Property (IP) division and a Copyright Board (established in 1958) to handle such cases.

4.7 Copyright Infringement as a Cognizable Offence

Copyright infringement is also a cognizable offence, which means the police can act immediately. A police officer of the rank of sub-inspector or higher can confiscate pirated or infringing materials without needing a warrant. These materials are then produced before the court of law.

For instance, if a shop is caught selling pirated versions of programming software like AutoCAD, the police can directly seize the software CDs or laptops being used without waiting for court approval.

4.8 Fair Use Doctrine

Although copyright law is strict, there are exceptions under the Fair Use Doctrine. This allows limited use of copyrighted material without permission, especially for education and research. The rule depends on four tests:

1. *Character of Use* – If the use is purely educational, non-profit, or personal, it is more likely to be allowed.

   For example, a student using short sections of a copyrighted programming book in their project report.

2. *Nature of Work* – If the material is factual (like technical content) rather than imaginative, fair use is more likely to apply.

   For instance, using a factual definition of an algorithm in a research paper.

3. *Amount Used* – Using only a small portion of the copyrighted material may be permitted, although this is often debated.

   For example, quoting a few lines from a Data Science textbook in a seminar presentation is allowed, but copying entire chapters is not.

4. *Effect on Market Value* – If the copied portion does not reduce the author's income or harm their reputation, it may be excused.

   For example, using a small diagram from an AI textbook in classroom teaching without affecting book sales is acceptable.

Examples of Fair Use include quoting short passages in project reports, reporting current events in college magazines, reproducing work for classroom teaching or scientific research, and using work prepared by the Secretariat of a Legislature.

In simple terms, copyright infringement means misusing someone's copyrighted software, research, or creative work without permission, while fair use allows limited usage for education and research in Computer Science Engineering.

4.9 Copyrights and the Internet

The 21st century is the age of digitization, where most copyrighted material is easily shared and transmitted through the internet. Because of this, many changes have been made to existing copyright laws. Today, a huge concern is that copyrighted content—such as e-books, research papers, and software—can be downloaded or shared without the author's permission. Sometimes, material found online might have been uploaded illegally in the first place, without the consent of the original author.

For example, pirated versions of computer science textbooks or unauthorized uploads of software tools often circulate on websites.

When using the internet, one must be careful about copyright and fair use rules. Downloading or copying material for personal learning is generally acceptable, but using the same material for commercial purposes (such as selling pirated copies of an AI textbook or charging for access to coding tutorials created by someone else) is illegal. Posting material online by the copyright owner usually gives users the right to access it for personal use, but not for profit-making activities.

For example, if a professor uploads lecture slides on Data Structures, students can download them for study, but no one has the right to sell them.

To protect online content, electronic distribution of copyrighted material often comes with a disclaimer, such as: *"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."* This ensures that people are aware of their legal responsibilities when using such materials.

As per Section 2(o) of the Copyright Act, 1957, literary works also include computer programs, tables, compilations, and databases. This means software code and databases developed by computer science engineers are protected under copyright law. For copyright registration of such works, it is mandatory to submit both the Source Code and Object Code along with the application.

For example, if a CSE student develops a new face-recognition software, they must provide both the source code (human-readable code) and object code (machine-executable file) when applying for copyright registration.

In short, with the rise of the internet, Engineering students and professionals must follow copyright and fair use principles when using, sharing, or publishing digital content online.

4.10 Non-Copyright Work

Not all creations fall under copyright law. Copyright protects only the *expression* of an idea, not the idea itself.

For example, a Computer Science student may come up with the concept of a "face-recognition attendance system", but only their unique code, diagrams, or written documentation can be copyrighted—not the idea of face recognition itself.

Similarly, facts cannot be copyrighted. If a researcher finds a new algorithm property, anyone else can use the fact, but they must explain it in their own words.

For instance, if a PhD scholar publishes a book on Artificial Intelligence trends, others can reuse the facts but not directly copy the text.

Also, short titles, names, slogans, and methods are not protected.

For example, the name "CodeMate" for a programming tool cannot be copyrighted (it may be trademarked, but that is different).

Certificates are also not copyrightable, since they don't show creativity.

For example, an online course completion certificate cannot have copyright protection.

On the other hand, digitally created works, such as software, websites, or e-learning videos, are protected by copyright, while a website as a whole cannot be copyrighted, its parts like source code, graphics, UI designs, or written tutorials can be registered separately.

4.11 Copyright Registration

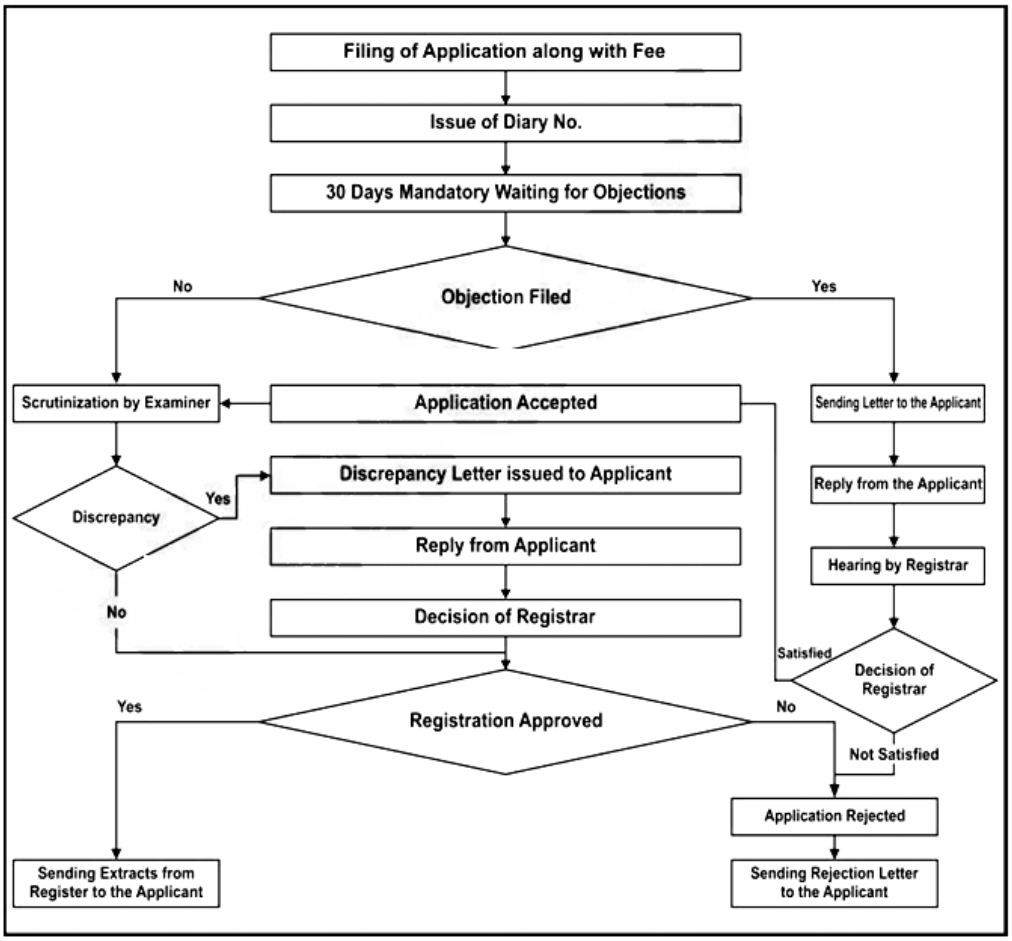
A common misconception is that you must register to get copyright. In reality, the moment a person writes code, publishes a research paper, or designs a digital project, it automatically receives copyright protection. Registration is not compulsory.

However, registration acts as legal proof in case of disputes.

For example, if two students claim authorship of the same machine learning project, a registered copyright certificate will serve as evidence in court.

In India, copyright is governed by the Copyright Act, 1957 and the Copyright Rules, 2013. Registration is done with the Registrar of Copyrights.

The process of copyright registration begins with the filing of an application along with the prescribed fee as shown in the following chart.



Once the application is filed, the Copyright Office issues a diary number to the applicant, which serves as a reference for the case. After this, there is a mandatory waiting period of thirty days during which any objections can be raised by other parties. If an objection is filed, the Registrar sends a notice to the applicant and collects a reply from them. The matter is then examined through a hearing by the Registrar. If the Registrar finds the objection unsatisfactory, the application is rejected and a rejection letter is sent to the applicant. However, if the Registrar is satisfied with the reply, the registration process continues.

In cases where no objections are filed during the thirty-day period, the application proceeds to scrutiny by an examiner. The examiner checks the application for any discrepancies. If discrepancies are found, a discrepancy letter is issued to the applicant, who must respond with clarifications or corrections. The Registrar then reviews the reply and makes a decision. If the response is satisfactory, the application is approved; if not, it is rejected.

Finally, when the Registrar approves the registration, the work is officially recorded in the Copyright Register. Extracts from this register are then sent to the applicant as proof of

registration. On the other hand, if the application is rejected, a rejection letter is issued. Thus, the process ensures that the copyright registration is properly verified, objections are fairly considered, and only eligible works are granted protection under copyright law.

4.12 Judicial Powers of the Registrar of Copyrights

The Registrar of Copyrights in India has powers similar to a civil court when handling disputes. They can:

- Summon people and record statements.
- Demand relevant documents like project reports or code files.
- Collect evidence such as GitHub commits or software logs.
- Examine witnesses or experts in Computer Science.
- Access public records to verify originality of the work.

The process of registration usually takes 2–3 months. After applying, there is a 30-day waiting period for objections. If someone objects—for example, another student claiming they developed the same plagiarism detection tool earlier—the Registrar will give both parties a fair hearing.
If examiners raise doubts (such as similarity with existing projects), the applicant gets around 45 days to clarify. Once objections are resolved, the work is officially registered.

4.13 Fee Structure:

When applying for a copyright, each work requires its own application form along with a fee. If the application is rejected, the fee will not be refunded. The fee amount depends on the type of work as shown in the following table.

Particulars	Fee (₹)	Example
Registration of Literary, Dramatic, Musical, or Artistic Work	500	A student writes a textbook on Data Structures and applies for copyright.
Registration of Cinematograph Film	5000	A student team produces a short educational film on Artificial Intelligence and registers it.
Registration of Sound Recording	2000	A student creates background music for a coding tutorial video and applies for copyright.
Literary/Artistic Work used commercially (branding, goods, services)	2000	A student designs a logo for a software startup and protects it under copyright.
Modification/Change in Literary, Dramatic, Musical, or Artistic Work	200	A student updates some chapters in their Data Structures book and files for modification.
Modification of Literary/Artistic Work used commercially	1000	A student modifies a previously registered startup logo and re-registers it.
Modification in Cinematograph Film details	2000	A team makes changes to the credits of their AI film and applies for an update.
Modification in Sound Recording details	1000	A student changes song credits in a tutorial soundtrack and applies for correction.
Application for prevention of import of infringing copies (per entry point)	1200	A professor prevents illegal imports of pirated copies of their Software Engineering book.

4.14 Copyright Symbol

It is not compulsory to display the copyright symbol © on your work, but if you do, it becomes easier to prove ownership in case of infringement. To properly mark your work, you can use:

- The © symbol (a "C" inside a circle),
- The year of first publication, and
- The owner's name or abbreviation.

For sound recordings, instead of ©, the ℗ symbol (P in a circle) is used.

For example, if a Computer Science student creates a programming tutorial video and uploads it on YouTube, adding "© 2025 John Doe" at the end makes it legally strong. If the student creates background music for that tutorial, the audio should be marked with "℗ 2025 John Doe." Similarly, if the student makes a software manual, they can add "© 2025 XYZ Institute" at the bottom of each page.

4.15 Validity of Copyright

In most cases, copyright remains valid for 60 years. For literary, dramatic, musical, and artistic works, the 60 years are counted from the year after the author's death. For cinematograph films, sound recordings, photographs, government publications, and international organization works, the 60 years are counted from the year of publication.

For example, if a professor in Computer Science writes a book on Artificial Intelligence and passes away in 2030, the copyright for that book will remain valid until 2090. Similarly, if a software company releases a machine learning tutorial video in 2025, its copyright protection will last until 2085.

4.16 Copyright Profile of India (2015–2020):

Year	Applications Filed	Applications Examined	Registrations Granted	Example
2015–16	Gradual increase begins	–	–	Some students started filing copyrights for small coding projects.
2016–17	Continued increase	–	–	Growing awareness led to copyrights for research papers and final year projects.
2017–18	High growth	34,388 (Peak)	19,997 (Peak)	Many students protected mobile apps, algorithms, and software tools.
2018–19	Increase continues	22,658	–	Copyright filing for IoT-based and AI-related projects became popular.
2019–20	21,905 (Highest applications filed)	19,460 (Lowest in study)	–	Large number of CS students registered machine learning models, software, and e-books.

4.17 Copyright and the Word "Publish":

In copyright law, a work is considered "published" only when it is freely available to the public without restrictions. If a work is shared privately with some restrictions (like "do not share"), it is not treated as published.

For example, if a student writes a research article on Cybersecurity and emails it only to their professor with a condition that it should not be shared, it is considered unpublished. However, if the same student uploads the article on a public website or shares it openly in a conference, it becomes published.

Importantly, both published and unpublished works can be registered under copyright.

For instance, a student can register their unpublished source code of a compiler project as well as their published technical blog on machine learning algorithms.

4.18 Transfer of Copyrights to a Publisher:

When authors create original work, like a textbook, software manual, or research paper, they often don't have the resources to publish and promote it widely. In such cases, they transfer their rights to a publisher in exchange for money. This money can be a one-time payment or royalties (percentage of profit from sales).

However, if the author gives away all rights, problems may arise.

For example, if a Computer Science professor publishes a Data Structures textbook through a publisher, the publisher may not allow the author to upload even a free copy of one chapter on the university website. The publisher may also block the author from revising the book for future editions.

To avoid such issues, authors should sign agreements carefully—like giving the publisher rights only to print hard copies, while the author keeps digital rights for e-books or online versions.

Fortunately, under the Copyright Act, authors can reclaim their rights after 35 years if they had transferred them completely. This ensures long-term control over their work.

4.19 Copyrights and the Word 'Adaptation':

In copyright law, *adaptation* means creating a new version of an existing work. For example:

- Turning a research paper into a video lecture,
- Converting a C programming textbook into a stage drama for teaching,
- Rearranging a software manual into an interactive online tutorial,
- Depicting algorithms visually in flowcharts or animations,
- Or making a film/documentary based on a technical book.

For instance, a Computer Science student who writes a project report on Machine Learning may later adapt it into a YouTube tutorial series. That adaptation is also protected under copyright.

4.20 Copyrights and the Word 'Indian Work':

A work is considered an *Indian Work* if:

- The author is an Indian citizen,
- The work is first published in India, or
- For unpublished work, the author was an Indian citizen when it was created.

For example, if a software engineer in Bangalore develops a mobile app and publishes it in India first, it is an Indian Work. Even if the same app later becomes famous globally, the first copyright protection lies under Indian law.

4.21 Joint Authorship:

Joint authorship happens when two or more people collaborate to create a single work where individual contributions cannot be separated.

For example, two Computer Science students working on a research paper on Artificial Intelligence may both contribute equally—one writes the algorithm while the other develops the code and explains the results. Since their work is merged and cannot be separated, the copyright belongs to them jointly.

4.22 Copyright Society:

Sometimes, authors or copyright owners cannot keep track of how their work is being used—like monitoring unauthorized copies of software, or e-books. To handle this, Copyright Societies exist.

A Copyright Society is a registered body (under Section 33 of the Copyright Act, 1957) that:

- Tracks rights and infringements,
- Issues licenses to users,
- Collects license fees,
- Distributes money among copyright owners after deducting expenses.

For example, if a group of software developers develops a popular game engine, they may join a copyright society to ensure that every company using their engine pays license fees.

Some Copyright Societies in India are:

- SCRIPT(Society for Copyright Regulation of Indian Producers for Film and Television) – for film and television works,

- IPRSL (Indian Performing Right Society Limited) – for musical works,
- PPL (Phonographic Performance Limited)– for sound recordings.

Though these are mainly for entertainment industries, similar societies can exist for software licensing, protecting Computer Science engineers' innovations.

4.23 Copyright Board

The Copyright Board is a special legal body created by the Government of India to handle copyright-related disputes and decisions. It works almost like a small court and is headed by a Chairman, who has the same authority as a High Court judge, along with 2–14 members. The Copyright Board has many powers.

For example, it can hear appeals if someone disagree with the decision of the Registrar of Copyrights.

- It can correct mistakes in the Register of Copyrights, solve disputes if two parties fight over copyright ownership.
- Issue compulsory licenses to allow someone to publish or republish a work if the original owner refuses unfairly.
- It can also grant permission to translate a book or software manual into another language after seven years of its first publication
- Fix royalty rates for songs or sound recordings, and even decide disputes about whether a work was published in India or abroad.

Example: Imagine two Computer Science students jointly developed a machine learning software tool. Later, one student claims full copyright ownership and refuses to share profits. In such a case, the Copyright Board can step in, hear both sides, and decide fairly who owns the rights.

Similarly, if a startup develops an AI-based textbook translation tool and wants to translate a programming book into Hindi after 7 years of its release, they can apply to the Copyright Board for a compulsory license.

4.24 Copyright Enforcement Advisory Council (CEAC)

The Copyright Enforcement Advisory Council (CEAC) was set up by the Government of India in 1991 to strengthen and monitor the enforcement of copyright laws. Its job is to regularly review how copyright rules are being followed in the country and suggest improvements. The council meets periodically and provides advice to the Government about making copyright protection stronger. The term of CEAC is three years, after which it is reconstituted with new members to continue its work.

Example: Suppose many cases of software piracy are reported, where cracked versions of expensive engineering software (like MATLAB, AutoCAD, or ANSYS) are being sold illegally in India. The CEAC can review such issues, study how piracy is harming students, researchers, and companies, and then advise the government to make stricter laws or launch awareness campaigns. This way, CEAC ensures that Computer Science engineers who develop software, apps, or games get fair protection from piracy.

4.25 International Copyright Agreements, Conventions, and Treaties:

Copyright protection is territorial, meaning that a work protected in India is not automatically protected worldwide. If an Indian author wants their work protected in another country, they must either apply in that specific country or depend on international copyright agreements and treaties — provided that the country is a member of those agreements.

India is a member of several important international conventions:

- Berne Convention (1886): Ensures protection of literary and artistic works across member countries.
- Universal Copyright Convention (1952): Provides a simpler alternative to Berne for countries that were not part of it.
- Rome Convention (1961): Protects the rights of performers, producers of sound recordings (phonograms), and broadcasters.

- Multilateral Convention (1979): Prevents double taxation of copyright royalties when works are used in multiple countries.
- TRIPS(Trade-Related Aspects of Intellectual Property Rights) Agreement (1995): Administered by the WTO, it sets global standards for protecting intellectual property rights, including copyright.

In India, the International Copyright Order ensures that works by foreign authors from countries that are members of Berne, Universal Copyright, or TRIPS are protected in India.

Example: Suppose a Computer Science student in India develops a mobile app and publishes it on the Google Play Store. If the student wants copyright protection in the USA and Europe, they don't need to file separately in each country because India is part of the Berne Convention and TRIPS Agreement. Their app is automatically protected in all member countries.

Similarly, if an American researcher publishes a paper on artificial intelligence algorithms, that work is protected in India because of the International Copyright Order.

4.26 Interesting Copyright Cases:

CASE 1: ORACLE versus GOOGLE (JAVA APIS IN ANDROID):

One of the most important copyright disputes in the software industry was the case of Oracle vs. Google. Oracle claimed that Google had infringed its copyright by using portions of the Java APIs in the development of the Android operating system. APIs are like building blocks in programming that allow communication between different software components. Google argued that it only reused a small portion of Java APIs to make Android more developer-friendly, and the rest of the work was original. The case went through several courts, with Oracle demanding billions in damages. Finally, in 2021, the U.S. Supreme Court ruled in favor of Google, stating that the use of APIs was considered fair use since it helped create something new and innovative. This case set a landmark decision for programmers and software developers because if Oracle had won, even using small portions of APIs might have required paying heavy license fees.

CASE 2: APPLE versus MICROSOFT (GRAPHICAL USER INTERFACE – GUI):

Another classic copyright battle was Apple vs. Microsoft, which took place during the late 1980s and 1990s. Apple claimed that Microsoft had copied the "look and feel" of the Macintosh graphical user interface (GUI) while developing its Windows operating system. The GUI included features like overlapping windows, icons, scroll bars, and drop-down menus, which made computers user-friendly. Apple argued that these design elements were their creative work and should be protected under copyright law. Microsoft, however, argued that these were basic ideas necessary for operating a computer and that Apple itself had borrowed the concept from Xerox PARC, where early GUI research was done. After years of legal battles, the court ruled in favor of Microsoft, saying that copyright does not protect general ideas, only their specific expression. This case was very important because if Apple had won, it would have severely restricted the growth of operating systems and software with GUIs.This ruling encouraged innovation in user interfaces, allowing many new software tools and platforms to evolve.

4.27 Trademarks

A Trademark is a unique symbol, word, design, or logo that helps identify and differentiate the products or services of one company from others. It can be anything that connects a product to its brand in the consumer's mind.

For example, the logo of Google or the bitten apple symbol of Apple Inc. immediately reminds us of the company's software, phones, and other electronic products. In computer science engineering, if a student team develops a new

coding platform or a mobile app, they can create a unique name and logo that becomes their trademark, making their project stand out from similar apps.

4.28 Eligibility Criteria for a Trademark

For something to be legally recognized as a trademark, it must follow certain rules.

1. ***Distinctiveness*** – The trademark must be unique so that customers can identify the source.

Example: Intel Inside is distinctive and immediately linked to Intel processors.

2. ***Descriptiveness*** – The trademark should not just describe the product or service.

For instance, naming a laptop brand simply "Fast Laptop" will not be approved. However, if a common word is given a new meaning (like "Apple" for electronics), it can qualify.

3. ***Similarity to prior marks*** – The trademark should not look or sound too similar to an existing one.

For example, if a student team creates a new operating system, calling it "MicroSoftt" would not be allowed because it is too close to Microsoft.

4.29 Who Can Apply for a Trademark?

Anyone who owns or creates a product or service can apply for a trademark. It can be:

- An individual – For example, a computer science student who develops a unique software library can trademark its name.
- Two or more people together – A group of students can jointly apply for their startup's logo.
- An organization or association – For example, the *IEEE logo* is a collective mark that represents the organization and is used across its publications, conferences, and journals in computer science.

A good Indian example is the Reliance logo, which represents all products and services of the Reliance group.

4.30 Trademark Acts and Laws

In India, trademarks are governed by the Trademarks Act, 1999 and the Trademarks Rules, 2002. These laws have been amended several times, including in 2010 and 2017, to keep up with modern practices. The administration is managed by the Controller General of Patents, Designs, and Trademarks (CGPDTM), Government of India. The following represent some of the acts and laws.

Act / Rules	Year	Purpose / Use	Example
The Trademarks Act	1999	Main law for registration, protection, and enforcement of trademarks.	A Bengaluru startup registering its cloud service logo.
The Trademarks Rules	2002 (Amended 2017)	Provides procedures for filing, renewal, and opposition.	A software company renewing its brand trademark online.
Indian Penal Code (IPC)	1860	Sections 482–489 deal with counterfeiting & falsification of marks.	Fake copies of a registered antivirus software logo.
Code of Criminal Procedure (CrPC)	1973	Legal process for criminal action against infringement.	Police action against counterfeit hardware brand marks.
Drugs and Cosmetics Act	1940	Prevents misleading/deceptive trademarks in medicines.	Health-tech app ensuring its name doesn't clash with a medicine brand.
Geographical Indications of Goods Act	1999	Protects region-based product names.	Preventing misuse of "Mysore Silk" in e-commerce platforms.
Information Technology Act	2000	Deals with online misuse, domain name disputes.	Protecting a domain name similar to a registered brand.

4.31 Designation of Trademark Symbols

Trademarks are often accompanied by symbols that indicate their status:

- **™ *(TM symbol)*** – Used when the trademark is unregistered but is still being promoted for products. *For example, if a student startup creates a hardware device and marks its brand as "TechSpark™", it shows they claim the name, even if it is not yet registered.*
- **℠ *(SM symbol)*** – Similar to ™ but used for *services* instead of goods. *For instance, if a group of computer engineers launch an IT consultancy service, they can use "SmartCloud℠".*
- **® *(Registered symbol)*** – Used once the trademark is officially registered. The registered owner gets legal protection. *For example, "Microsoft®" or "Java®" indicates the brand is legally owned and cannot be used without permission.*

4.32 Classification of Trademarks

Trademarks across the world are classified according to the Nice Agreement (1957), which is managed by WIPO (World Intellectual Property Organization). Around 149 countries follow this system, including India, and even international organizations like the European Union and African IP organizations. There are 45 classes in total – 34 for goods and 11 for services.
For example, Class 1 is for chemicals, plastics, and industrial materials, while Class 45 is for legal and security services.

In Computer Science, a software security firm like Quick Heal would fall under Class 45 because it provides digital security services. A company making silicon chips or 3D printing materials would fall under Class 1 since it deals with industrial chemicals and materials.

4.33 Registration of a Trademark is Not Compulsory

In India, registering a trademark is not compulsory, but it has several advantages:

- Legal Protection: A registered trademark prevents others from copying your brand. *For instance, if a startup builds an AI-based chatbot and trademarks its unique logo, no other company can legally copy it.*
- Exclusive Rights: Registration gives full rights to use the trademark in any lawful business. *For example, if an IT company trademarks its cloud storage brand name, only that company can officially use it.*
- Brand Recognition: A trademark helps customers quickly recognize products or services. *For example, the Infosys logo creates trust among clients globally.*
- Asset Creation: A registered trademark becomes an intangible asset that increases the company's value. *For instance, the TCS logo is not just a brand image but also a valuable property of the company.*

4.34 Validity of Trademarks

In India, a registered trademark is valid for 10 years. After that, it can be renewed indefinitely every 10 years by filing a TM-R form.

Example: If a cybersecurity company in Bangalore registers its logo in 2025, it must renew the registration in 2035, 2045, and so on, to keep ownership rights forever.

4.35 Types of Trademarks Registered in India

Trademarks in India can be of different types, but they must be distinctive and memorable. Some key rules include:

- Invented or Unique Words: Best trademarks are creative words that have no direct link to the product. *Example: Google is an invented word but is now the biggest tech brand.*
- Geographical or Unique Names: Uncommon place names can be trademarks. *Example: Silicon Valley Bank uses a regional name but in a unique way.*
- Avoid Common Names and Praise Words: Words like *"Best Software"* or *"Perfect Tech"* cannot be registered. They are too generic.

Examples:

- Personal or Surname-Based: *Bajaj* is a family name used as a brand. In IT, someone could trademark their surname for a software company, like *"Sharma Tech Solutions"*.
- Unrelated Word for a Product: *India Gate* is used for food grains. In IT, a company might use a name like *"Blue Ocean"* for a data analytics tool, even though it has nothing to do with oceans.

- Letters, Abbreviations, or Numerals: *YAHOO* started as an abbreviation (*Yet Another Hierarchical Officious Oracle*) but became a famous trademark. Similarly, IBM (International Business Machines) is a well-known registered trademark in computer science.

4.36 Trademark Registry in India

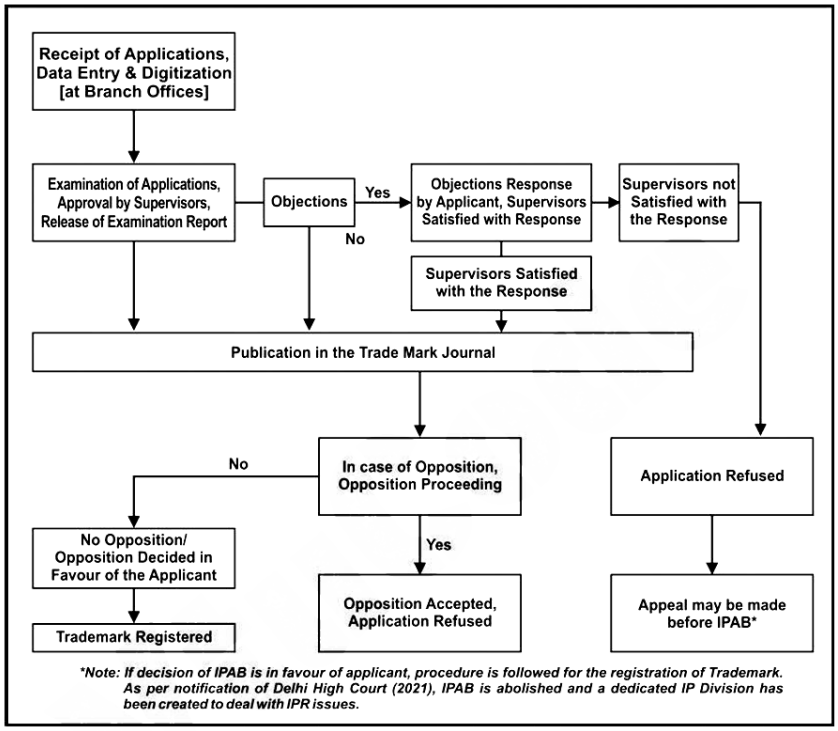
In India, the Trademark Registry is responsible for handling all operations related to trademark applications, registration, and protection. There are five main Trademark offices located in Delhi, Mumbai, Ahmedabad, Kolkata, and Chennai. Each office looks after specific states and union territories, which means that businesses can only apply for trademarks in the office assigned to their region. This system ensures smooth handling of applications across the country.

Example from Computer Science: If a software startup in Bangalore wants to register its logo or product name, it must approach the Chennai Trademark Office, because Karnataka comes under its jurisdiction.

Office Location	States & Union Territories Covered
Mumbai	Maharashtra, Madhya Pradesh, Chhattisgarh, Goa
Ahmedabad	Gujarat, Rajasthan, Daman, Diu, Dadra & Nagar Haveli
Kolkata	Arunachal Pradesh, Assam, Bihar, Odisha, West Bengal, Manipur, Mizoram, Meghalaya, Sikkim, Tripura, Jharkhand, Nagaland, Andaman & Nicobar Islands
New Delhi	Jammu & Kashmir, Punjab, Haryana, Uttar Pradesh, Himachal Pradesh, Uttarakhand, Delhi, Chandigarh (UT)
Chennai	Andhra Pradesh, Telangana, Kerala, Tamil Nadu, Karnataka, Pondicherry, Lakshadweep Islands

4.37 Process of Trademark Registration

To register a trademark in India, the first step is for the applicant (called the proprietor of the trademark) to file an application. This can be done directly by the applicant or through an authorized agent as shown in the following figure.



Before filing, it is very important to carry out a Prior Art Search. This means checking whether a similar trademark is already registered. Students can search using online platforms like the CGPDTM portal**,** Trademark Electronic Search System (TESS), or WIPO's Global Brand Database.

For example, if a startup plans to launch a product named "CodeSphere" *as a cloud storage platform, they must confirm that no one else already holds rights to the same or similar name.*

Once the search is done, the applicant submits the application. The system then generates an application number, which can be tracked online.

For example, a Bengaluru-based AI startup could track the progress of their trademark application for their chatbot logo on the IP India website.

After submission, the application is examined by an official examiner. If all details are correct, it proceeds to publication in the Trademark Journal. If there are mistakes or issues, the examiner raises objections and sends them back to the applicant. The applicant must reply with corrections or justifications.

For instance, if a student team's logo for their IoT-based drone software looks too similar to an existing drone company's logo, they need to explain the differences. If the examiner accepts the response, the application is moved forward; otherwise, it may be refused, and the applicant can appeal the decision before the Intellectual Property Division.

Once the application is published in the journal, the public gets 90 days to file objections.

For example, if a well-known company feels that a student's cloud service name is too similar to theirs, they can oppose it. In such cases, both sides present their arguments, and the authority decides. If the decision is unfavorable to the applicant, they can again appeal to the Intellectual Property Appellate Board (IPAB, now replaced by IP Division).

Finally, if no opposition is filed, or if the applicant wins the case, the trademark is officially registered. The applicant then receives a Trademark Registration Certificate, which legally protects their brand.

For example, once registered, the AI startup's chatbot logo and name cannot be copied by competitors without facing legal consequences.

4.38 Case Law: Coca-Cola Company vs. Bisleri International Pvt. Ltd.

One of the most well-known trademark cases in India involves the dispute over the mango drink brand "Maaza." The drink was originally developed and registered as a trademark by Bisleri International Pvt. Ltd., an Indian company.

Later, Bisleri sold the rights of Maaza to Coca-Cola Company. This included the drink's formulation, trademark, intellectual property rights (IPR), and goodwill — but only for the Indian market. Coca-Cola then began manufacturing and selling Maaza across India under its own control.

The conflict started in 2008, when Bisleri tried to register the Maaza trademark in Turkey and began exporting the drink under the same name. Coca-Cola objected to this, as it believed that Bisleri no longer had the rights to use the Maaza name, even outside India, because the rights had been assigned to Coca-Cola for the Indian territory.

Coca-Cola filed a petition in court, asking for a permanent injunction (a legal order to stop Bisleri from using the trademark) and also demanded damages for trademark infringement and passing off. Coca-Cola argued that since Maaza was already assigned to them in India, any use of the same brand name for production or export by Bisleri would amount to infringement of their trademark rights.

After reviewing arguments from both sides, the court granted an interim injunction in favor of Coca-Cola. This meant that Bisleri was barred from using the trademark "Maaza" not only in

India but also for exports. The court held that Bisleri's actions were indeed an infringement of Coca-Cola's trademark rights.

This case highlights how trademark rights are strictly enforced and how even exports under a disputed brand name can lead to legal infringement.

QUESTION BANK:

5 Marks Questions

1. Define Copyright. Give two examples related to Computer Science Engineering.
2. Who is considered the first owner of Copyright under the Copyright Act, 1957?
3. Differentiate between Economic Rights and Moral Rights with examples.
4. What is the "Fair Use Doctrine"? Give two situations where it applies.
5. List any four acts that constitute Copyright Infringement.
6. What is the validity period of Copyright in India?
7. Explain the significance of the Copyright Symbol © with an example.
8. Write a short note on Copyright in the Internet Era.
9. Mention works that cannot be protected under Copyright.
10. What is the role of the Registrar of Copyrights?
11. Explain the term "Adaptation" under Copyright law with one example.
12. Define "Indian Work" as per Copyright law.
13. What is Joint Authorship? Give an example.
14. Write a note on the Copyright Board and its functions.
15. What is the role of the Copyright Enforcement Advisory Council (CEAC)?
16. Mention any three International Copyright treaties to which India is a member.
17. Write a short note on the Coca-Cola vs. Bisleri case.
18. Define a Trademark. Give two examples.
19. What are the eligibility criteria for a valid Trademark?
20. What is the validity of a Trademark in India?

10 Marks Questions

1. Explain Ownership of Copyright with suitable examples.
2. Discuss in detail the Economic Rights and Moral Rights of an author with live examples from Computer Science Engineering.
3. What are the penalties for Copyright Infringement in India? Explain with examples.
4. Describe the process of Copyright registration with the help of a flow chart.
5. Explain in detail the concept of "Fair Use Doctrine" with suitable examples.
6. Write detailed notes on:
   a) Copyright in the Internet Era
   b) Non-Copyrightable Works
7. What is the procedure for transfer of Copyright to a publisher? What precautions should an author take?
8. Discuss the role and importance of Copyright Societies in India with examples.
9. Explain the international Copyright conventions and treaties India is part of.
10. Write short notes on:
    a) Judicial powers of the Registrar of Copyrights
    b) Copyright Profile of India (2015–2020)
11. Explain in detail the concept of Trademarks. How are they classified as per the Nice Agreement?
12. Describe the process of Trademark registration step by step with a neat diagram.

13. Write notes on:
    a) Trademark Registry in India
    b) Validity of Trademarks
14. What are the different types of Trademarks registered in India? Give suitable examples.
15. Explain the designation of Trademark symbols (™, ℠, ®) with examples.
16. Write a detailed note on Trademark Acts and Laws in India.
17. Describe the famous case of Coca-Cola Company vs. Bisleri International Pvt. Ltd. What lesson does it provide for IP protection?
18. Differentiate between Copyright and Trademark with suitable examples.

MODULE-05 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

5.0 INDUSTRIAL DESIGNS

The word *Design* refers to the features of shape, configuration, pattern, ornament, or composition of lines or colors applied to an article. It may be one-dimensional, two-dimensional, three-dimensional, or a combination of these. A design can be created manually, mechanically, or chemically, but in the end, it must appeal to the eye. It is important to note that design does not include the principles of construction or any purely mechanical device.

For example, the curved body of a laptop, the smooth edges of a smartphone, or the layout of a graphical user interface (GUI) are considered industrial designs. These elements are valued for their look and feel rather than their function.

The main objective of registering industrial designs is to protect and encourage original creativity. By giving recognition and exclusive rights to the originator, it motivates others to work towards artistic and innovative designs.

For instance, the unique body design of a gaming console or the icon arrangement on a mobile operating system are industrial designs that add appeal while being functional.

5.1 ELIGIBILITY CRITERIA

For a design to be eligible for registration, it must be novel or original and should not have been published, disclosed, or used before. It should also be different from already registered designs available in the public domain.

Examples include the RGB keyboard lighting pattern in gaming laptops, or the outer casing of a Virtual Reality (VR) headset.

If such designs are completely new and distinguishable, they qualify for registration.

5.2 ACTS AND LAWS TO GOVERN INDUSTRIAL DESIGNS

In India, industrial designs are governed by The Designs Act, 2000 and the Design Rules, 2001, with amendments made in 2008, 2013, 2014, and 2019. For a design to be registered under these laws, it must satisfy the following: it should be novel and original, applicable to a functional article, visible on the finished product, and free from prior publication or disclosure.

For example, the curved edge design of a smart watch screen or the custom outer shell of a portable hard drive can be protected, as they meet these legal requirements.

5.3 DESIGN RIGHTS

Once registered, the design confers exclusive rights to the proprietor. This means others cannot reproduce, manufacture, or sell the design without the owner's permission. Design rights are particularly useful when the shape or look of a product adds commercial value.

For example, the design of an ergonomic computer mouse or the sleek unibody frame of a laptop is protected so that competitors cannot copy them.

5.4 ENFORCEMENT OF DESIGN RIGHTS

A registered proprietor has the right to take legal action against infringement. If pirated products using the design are sold, the owner can file a case in a court not lower than a District Court. The court will first check if the design is registered under the Designs Act, 2000. If not registered, no legal action is possible. However, if the infringer is guilty, they may be ordered to pay damages of up to ₹50,000 for each infringement.

For example, if a company copies the design of a patented laptop cooling fan cover or the external casing of a unique headset, the original owner can sue them.

5.5 NON-PROTECTABLE INDUSTRIAL DESIGNS INDIA

Not every design can be protected. Industrial designs that are against public morals, involve flags, emblems, or official symbols of a country, or those related to integrated circuits are not eligible. Similarly, designs that describe the process of making an article cannot be registered. Items like books, calendars, certificates, forms, greeting cards, maps, postcards, and medals also do not qualify.

According to the Copyright Act, 1957, artistic works such as paintings, sculptures, photographs, architectural works, or artistic craftsmanship are not covered under industrial designs. Also, trademarks are excluded from the scope of industrial design protection under the Designs Act, 2000.

In Engineering, this means that software source code, programming algorithms, or database structures cannot be protected as industrial designs because they are functional, not aesthetic.

5.6 PROTECTION TERM

The outer shape or design of a product increases its appeal and adds value. Therefore, protecting designs prevents third parties from misusing them without consent. In India, registered designs are protected for 10 years and can be extended by another 5 years with a renewal application, giving a maximum of 15 years of protection.

For instance, if a company designs a new laptop body shape, a unique VR headset casing, or a stylish portable hard drive shell, it can secure rights over that design for up to 15 years.

5.7 PROCEDURE FOR REGISTRATION OF INDUSTRIAL DESIGNS

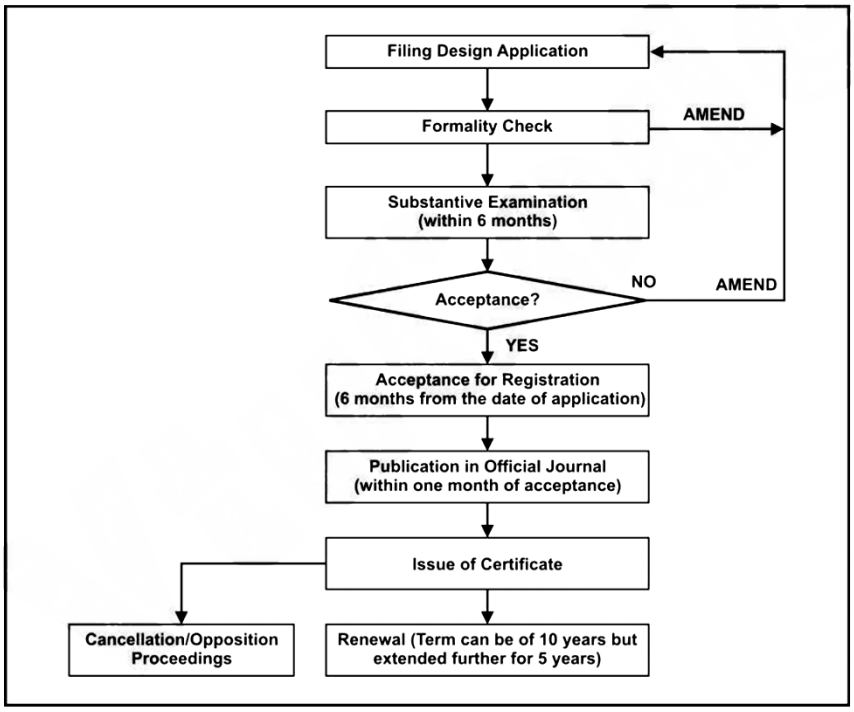
The process of registering an industrial design begins with a Prior Art Search. Before filing an application, the applicant must check whether a similar design has already been registered. This is done through databases like the Design Search Utility (CGPDTM, India) or the Global Design Database (WIPO). This step ensures that only novel and original designs move forward in the registration process.

For example, if a company wants to protect the unique outer casing of a portable SSD (Solid-State Drive), it must first verify that no identical or similar design already exists in the database.

Once the search confirms originality, the next step is the Application for Registration. The applicant, whether an individual, institution, organization, or industry, can file the application. This can be done personally or through a patent agent/legal practitioner. If the applicant is not a resident of India, they must appoint an Indian agent to represent them.

In practice, many tech companies—like those creating custom laptop shells, ergonomic keyboards, or VR headset designs—hire patent agents to manage this legal process.

The application is submitted to the Design Office, Deputy Controller of Patents & Designs, Patent Office, Intellectual Property Office Building, CP-2, Sector V, Salt Lake City, Kolkata.



As shown in the flowchart, the registration process begins with filing the application, which is then checked for basic formalities. After this, the design undergoes a substantive examination within six months. If any objections are raised during this stage, the applicant must make the necessary amendments and resubmit the application. Once the design is accepted, it moves to the stage of acceptance for registration, which remains valid for six months from the date of application.

After acceptance, the design is published in the Official Journal within one month, making it available to the public. The applicant is granted a Certificate of Registration, which gives legal recognition and protection to the design. The registered design is protected for 10 years and can be renewed for another 5 years. This allows a maximum protection of 15 years.

5.8 DURATION OF THE REGISTRATION OF A DESIGN

Initially, the registration of a design is valid for ten years from the date of registration. However, if the applicant has claimed a priority date (for example, by filing earlier in another country), then the registration period is calculated from that priority date. After the first ten years, the protection can be extended for another five years by filing an application in Form-3 with the prescribed fee before the expiry of the initial period.

For instance, if Computer Science engineers develop a unique laptop cooling system casing or a distinctive graphical user interface (GUI) for a software platform, they can keep their design protected for up to 15 years, ensuring no one can imitate it during that period.

5.9 IMPORTANCE OF DESIGN REGISTRATION

Design registration ensures that the exclusive rights of the applicant are legally protected. This means the owner can prevent others from pirating, copying, or imitating the registered design. Such protection is highly beneficial as it helps in boosting sales, increasing customer trust, and establishing goodwill in the market.

For example, if a group of computer engineers design a stylish desktop CPU cabinet or a unique laptop touchpad interface, registration gives them the right to stop competitors from duplicating the design. This exclusivity not only strengthens their brand identity but also provides a competitive edge in the technology industry.

5.10 CANCELLATION OF THE REGISTERED DESIGN

A registered design may be cancelled at any time if a petition is filed in Form-8 with the prescribed fee to the Controller of Designs. The cancellation can occur on several grounds: if the design has already been registered earlier, if it was published in India or abroad before the date of registration, if the design is not truly novel or original, or if it does not qualify as a "design" under Clause (d) of Section 2 of the Designs Act.

For instance, if computer engineers attempt to register a basic keyboard layout or a common mouse design that already exists in the public domain, their registration can be cancelled. Similarly, if a GUI design has already been showcased in research papers before filing, it cannot be protected through registration.

5.11 APPLICATION FORMS

The following table lists some of the important application forms related to Industrial Designs along with their form numbers and fees for different categories of applicants (Natural Person, Small Entity, Large Entity).

In the context of Design Registration, applicants are classified into three categories based on their nature and size. A Natural Person refers to an individual applying in a personal capacity, such as a student or independent designer, and pays the lowest fee. A Small Entity includes startups, small companies, or MSMEs that are officially recognized under Indian law, and they pay a moderate fee. A Large Entity refers to big organizations or corporations with significant resources, such as Infosys or Microsoft, and they are required to pay the highest fee. This classification ensures fairness in the fee structure depending on the applicant's capacity.

Sl. No.	Name of the Form	Form No.	Fee (in Rs.) – Natural Person	Fee (in Rs.) – Small Entity	Fee (in Rs.) – Large Entity
1	Application for registration of Design	Form – 1	1000	–	–
2	Application for renewal of Design	Form – 3	2000	4000	2000
3	Application for the restoration of Design	Form – 4	4000	8000	1000
4	Petition for cancellation of registration of a Design	Form – 8	2000	4000	1500 / 3000 / 6000
5	Notice of intended exhibition or publication of unregistered Design	Form – 9	500	–	–
6	Application for entry of name of proprietor or part proprietor in the Register	Form – 11	1000	2000	500
7	Request for correction of clerical error	Form – 14	1000	2000	500 / 1000 / 2000
8	Request for certified copy	Form – 15	500	–	–
9	Application for rectification of Register	Form – 17	1000	2000	500
10	Notice of opposition	Form – 19	1000	2000	100 / 200 / 400

5.12 CLASSIFICATION OF INDUSTRIAL DESIGNS

Industrial designs are classified according to the Locarno Agreement (1968), which provides a standardized system to organize and search designs across the world. This system consists of 32 main classes and 237 subclasses, each representing a different category of goods. By using this classification system, designers and companies can protect their innovations more effectively

while also making it easier for others to conduct design searches. Some of the important classes are listed below.

Class	General Example	Example
Class 1	Food products, diet food	Packaging design for computer-themed energy drinks (e.g., "Gamer Fuel" bottles)
Class 3	Travel goods, cases	Laptop bags, VR headset cases
Class 9	Bottles, flasks, containers	CPU cabinet casing or custom PC liquid cooling container
Class 14	Recording, communication equipment	Mobile phone design, laptop body structure
Class 18	Printing and office machinery	3D printer design, desktop printer casing
Class 32	Graphic symbols, logos, ornamentation	Software logos, mobile app icons, GUI themes

5.13 DESIGNS REGISTRATION TRENDS IN INDIA

In India, the registration of industrial designs has seen significant growth between 2010 and 2020. The trends in India show that tech-related design registrations (like smart devices, app icons, hardware designs) are rising sharply, proving that digital products need legal design protection as much as physical goods.

Year Range	Designs Filed	Designs Examined	Designs Registered	Example
2010–2011	Low baseline	Low baseline	Low baseline	Few companies filing for basic hardware designs like desktops or printers
2015–2016	Moderate growth	Higher examinations	Increasing registrations	More filings for smartphones, tablets, and wearables
2019–2020	12,268 filed	13,644 examined	14,272 registered	Surge in mobile apps (GUI designs), IoT devices, gaming laptops registrations

5.14 INTERNATIONAL TREATIES

To streamline and harmonize the registration of designs globally, the World Intellectual Property Organization (WIPO) has introduced two major treaties.

- Hague Agreement (1925) &
- Locarno Agreement (1968)

The Hague Agreement (1925), allows applicants to register their designs internationally through a single application. This saves time, cost, and effort, especially for multinational companies.

The Locarno Agreement (1968), standardizes the classification of industrial designs (as explained earlier). Both these treaties are highly useful for the computer science and electronics industry, where products are launched globally.

For instance, if a company like Apple wants to register the design of its MacBook worldwide, it can do so under the Hague system instead of filing separately in every country. Similarly, the unique design of a computer motherboard layout or a VR headset can be categorized and protected internationally using the Locarno system.

5.15 FAMOUS CASE LAW: APPLE INC. VS. SAMSUNG ELECTRONICS CO.

In 2011, Apple Inc. filed a lawsuit against Samsung Electronics Co. in the United States District Court for the Northern District of California. Apple accused Samsung of infringing its design and utility patents, particularly related to the user interface features such as the app grid layout on the screen and the "tap to zoom" function. To support its claim, Apple submitted side-by-side

image comparisons of its iPhone 3GS and Samsung's Galaxy S i9000 model, highlighting the alleged similarities.

However, it was later revealed that Apple had modified (or tampered with) the submitted images to make the designs appear more alike in dimensions and features. Samsung's legal counsel argued that Apple misled the court by providing false evidence. In response, Samsung countersued Apple in several international jurisdictions including Seoul (South Korea), Tokyo (Japan), Mannheim (Germany), the U.S. District Court for the District of Delaware, and the U.S. International Trade Commission (ITC) in Washington D.C.

The legal battle dragged on for almost seven years, with both companies fighting across multiple courts worldwide. Finally, in June 2018, the case came to a conclusion when both companies agreed to a settlement. As part of the settlement, Samsung was ordered to pay Apple $539 million for infringing its patents.

5.16 Geographical Indications (GI):

A Geographical Indication (GI) is a special sign or label used on products that originate from a specific region and have qualities, reputation, or uniqueness linked to that place.

For example, "Darjeeling Tea" is famous worldwide because of its unique flavor, which is tied to the geography of Darjeeling.

Similarly, in computer science terms, imagine if a certain city became famous for producing unique styles of computer processors or software frameworks.

For instance, "Silicon Valley Software" could act like a GI because the region is recognized globally for high-quality innovations in software and hardware.

Geographical Indications protect identity and originality linked to a region. While they traditionally apply to foods, handicrafts, or textiles, in computer science and engineering, this idea can extend to unique software frameworks, hardware designs, or digital innovations tied to a particular tech hub or city.

5.17 Acts, Laws, and Rules Pertaining to GI

In India, GIs are protected under the Geographical Indications of Goods (Registration & Protection) Act, 1999 and the related Rules of 2002. Although GI registration formally started in 2003, this law ensures that products tied to a location receive protection from misuse.

If we compare this to computer science, it would be like creating a legal framework to protect programming languages or design methods created in a particular region (for example, "Bangalore Cloud Computing Framework") so that outsiders cannot falsely use the name.

5.18 Ownership of GI

The ownership of a GI doesn't belong to a single person. Instead, it can be held collectively by producers, associations, cooperative societies, or sometimes even the government.

For example, "Kanchipuram Silk" is owned by weavers' associations.

Similarly, in computer engineering, if a city develops a unique design for eco-friendly data centers, the ownership of that GI-like recognition could belong to the engineering community or tech associations in that city rather than a single company.

5.18 Rights Granted to the Holders

The GI registration provides several rights to the holders:

1. ***Right to grant a license*** – The owner can license others to use the GI.

For example, weavers can allow traders to sell their GI-tagged silk. In computer science, if "Pune AI Framework" became a GI, the owners (developers' association) could grant licenses to companies to use it.

2. ***Right to sue*** – The holder can legally act against anyone who misuses the GI without consent.
   For example, just as "Darjeeling Tea" sellers can sue fake tea brands, computer scientists could sue if someone falsely marketed a random product as "Made with Bangalore Cloud AI."
3. ***Right to exploit*** – Holders have exclusive rights to use and commercially benefit from their GI.
   For example, only authorized users can sell "Mysore Sandal Soap."
   Similarly, if "Hyderabad Cybersecurity Tools" became a GI, only registered firms could market them with that label.
4. ***Right to reliefs*** – If the GI is violated, the owners can claim remedies such as compensation or injunctions.
   For example if outsiders misuse a GI-tagged "Kochi Blockchain Solution," the registered holders can demand compensation.

5.19 Registered Geographical Indications (GIs) in India

By May 2020, India had registered a total of 370 Geographical Indications (GIs). The very first GI was granted in 2004 to Darjeeling Tea, while the most recent ones include Kashmir Saffron and Manipur Black Rice (Chakhao), both registered in May 2020.

Among all categories, handicrafts account for the largest share with 58% of registrations, followed by agriculture at 30%, while the rest belong to foodstuffs, manufacturing, and natural goods. In the handicraft category, Tamil Nadu leads with 21 registered GIs, followed closely by Uttar Pradesh with 20 and Karnataka with 19. The following represent GI products registered as on May 2020

GI Product	Category/Type	State/Region
Darjeeling Tea	Agriculture	West Bengal
Mysore Silk	Handicraft	Karnataka
Kashmir Pashmina	Handicraft	Jammu & Kashmir
Banaras Brocades & Sarees	Handicraft	Uttar Pradesh
Naga Mircha (Chilli)	Agriculture	Nagaland
Tirupati Laddu	Foodstuff	Andhra Pradesh
Phulkari	Handicraft	Punjab
Basmati Rice	Agriculture	Punjab, Haryana, Rajasthan
Kashmir Saffron (latest, 2020)	Agriculture	Jammu & Kashmir
Manipur Black Rice (Chakhao) (latest, 2020)	Agriculture	Manipur

5.20 Identification of Registered GI

A Geographical Indication (GI) is a special tag given to products that come from a particular region and are made according to approved standards. When a product is registered, a GI tag is printed on it to confirm its authenticity.

For example, Darjeeling Tea and Mysore Silk carry GI tags that show they are original and tied to their place of origin. Non-registered products cannot use this tag.

In India, GI tags are issued by the Geographical Indication Registry, which is under the Ministry of Commerce and Industry, located in Chennai. A key point is that while the same product may be produced elsewhere using similar methods, it cannot be labeled as a GI unless it comes from its specific region.

For instance, tea plants from Darjeeling may be grown elsewhere, but they cannot be sold as "Darjeeling Tea" unless grown in Darjeeling's soil and climate.

A GI tag is only given to products that are uniquely linked to a geographical location due to natural factors (soil, climate) or traditional human skills (craftsmanship, culture).

Examples: Darjeeling Tea, Mysore Silk, Kashmir Saffron, Banarasi Saree.

In contrast, Computer Science & Engineering outputs (like software, algorithms, hardware designs, or programming methods) are not tied to a specific region's soil or tradition. They are results of human innovation and technical knowledge, which are better protected under:

- Patents → for new inventions (hardware, algorithms, devices).
- Copyrights → for software code and digital content.
- Trademarks → for branding of IT products/services.

5.21 Classes of GI

GI products are grouped into 34 different classes, each representing a type of goods. The following represent some of the important classes.

Class Number	Category	Example
Class 1	Chemicals, agriculture, food preservation	Covers fertilizers, industrial chemicals, adhesives – used in semiconductor and chip manufacturing.
Class 6	Furniture	Includes lab furniture, ergonomic computer chairs, and office setups in CS labs.
Class 9	Packaging and containers	Ensures safe transport of electronics, chips, laptops, and data storage devices.
Class 14	Recording, telecommunication, or data-processing equipment	Directly covers computers, servers, data storage, networking hardware, and AI machines.
Class 24	Medical and laboratory equipment	Includes AI-powered medical imaging systems, research equipment, and bioinformatics labs.
Class 33	Alcoholic beverages (except beers)	Not directly related to CS, but covered under GI for regional drinks like wine or whisky (e.g., Goa Feni).
Class 34	Tobacco, smoker's articles, matches	Also not linked to CS, but GI ensures protection of unique tobacco products like 'Kendu Leaves' from Odisha.

5.22 Non-Registerable GI

Not every product can get a GI tag. According to the GI Act, 1999, certain products are not eligible. These include:

- Products that cause confusion or deception.
- Products against the law.
- Items with obscene or scandalous matter.
- Products that may hurt religious or cultural sentiments.
- Items that have become generic names (e.g., using "Laptop" or "Smartphone" as a GI would not work since they are too generic).

5.23 Protection of GI

GI rights are protected through the legal system. Registration helps prevent misuse, identifies fake products, and increases the product's commercial value. If a violation occurs, the owner can go to court. Globally, there are two main systems of GI protection:

1. *Sui Generis System – a special law designed to protect GIs (India follows this).*
2. *Certification/Collective Mark System – where GIs are protected under broader trademark laws.*

This choice was influenced by the TRIPS Agreement (1995), which allowed countries to adopt a system suitable for their own needs.

The Sui Generis System is a special legal framework created exclusively to protect Geographical Indications. It ensures that unique products like Darjeeling Tea or Mysore Silk cannot be

misused, as the law directly recognizes their origin and qualities. This system provides strong and clear protection, making enforcement easier.

On the other hand, the Certification or Collective Mark System protects GIs under broader trademark laws. Here, a GI works more like a stamp of approval or association mark, such as "Certified Organic," to show authenticity. While this system is flexible and widely used in countries like the USA, it is less specific than the sui generis approach. India and many European countries prefer the sui generis system as it gives stronger and dedicated protection to GI products.

5.24 Collective or Certification Marks

Certification marks are special symbols or tags that show a product meets certain quality standards, no matter where it is made.

For example, in Computer Science, if a software tool has an ISO Certification mark, it proves that the tool meets global security and performance standards. This helps customers trust that the product is genuine and safe.

On the other hand, collective marks are owned by groups or associations that ensure their members follow agreed standards.

For instance, if an Association of Indian Software Companies used a collective mark, it would mean that only registered member companies (like Infosys, TCS, or Wipro) could use the mark.

This shows that the product or service comes from a recognized group and follows specific guidelines. In the context of engineering projects, collective marks work like a "seal of trust" that all members of a community (say, open-source contributors in Linux Foundation) follow common standards of quality.

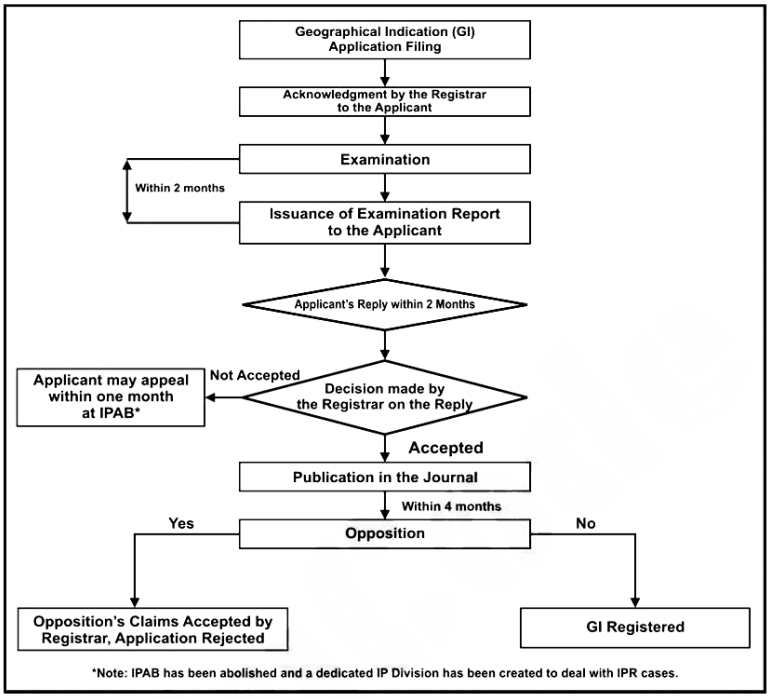
5.25 Enforcement of GI Rights

The protection of Geographical Indications (GI) is enforced through the courts. If someone uses a fake GI tag, legal actions can be taken. These actions may be civil (like stopping the misuse, asking for compensation), criminal (punishment for fraud), or administrative (warnings and fines).

For example, in Computer Science engineering, imagine if a company falsely claimed its software was "Made in Silicon Valley" (a geographical mark of innovation and technology). If proven false, legal action could be taken to stop the misuse, just like how Darjeeling Tea or Mysore Silk cannot be falsely labeled. Similarly, in hardware manufacturing, if a company outside Japan sold processors under the name "Japanese Semiconductor GI Certified" without origin proof, courts could stop them and penalize the misuse.

5.26 Procedure for GI Registration

The process of registering a Geographical Indication (GI) begins with a preliminary search to check whether the particular GI is already protected or not. This can be verified using specialized search tools such as those provided by WIPO or the official list of registered GIs published on the CGPDTM website. Once it is confirmed that the GI is not already registered, the applicant can proceed with the filing of an application as shown in the following figure.



The application may be submitted by an individual, an organization, or a legally established authority of producers. It must be filed in the prescribed format along with the applicable fee, and it should clearly mention the interest of the producers of the concerned product. The application also requires complete details about the GI, including the method of maintaining its standards, and must be duly signed either by the applicant or their authorized agent. Additionally, three certified copies of the map of the region to which the GI belongs must be submitted.

After submission, the application undergoes examination by the Registrar. During this stage, the examiner reviews the application to identify any deficiencies or similarities with existing GIs. If any discrepancy is found, it is communicated to the applicant, who must provide a reply within one month. Once the examiner is satisfied with the response, an examination report is prepared and submitted to the Registrar for further scrutiny. At this stage, if any objections or doubts remain, the applicant is given up to two months to clarify them. Failure to resolve these issues may lead to rejection of the application.

If the application is found satisfactory, the Registrar accepts it and publishes it in the official Geographical Indication Journal. This publication invites opposition from the public or other stakeholders. Any opposition must be filed within four months of the publication. If opposition is raised, the case is examined, and the Registrar decides whether the opposition should be upheld or rejected. If the opposition is accepted, the application is refused.

However, if no opposition is received within the specified time, or if the opposition is dismissed, the GI is formally registered. The date of filing of the application is considered as the date of registration.

Once registered, the GI is valid for ten years. It can be renewed indefinitely for further periods of ten years each, provided the prescribed renewal fee is paid.

5.27 Documents Required for GI Registration

For GI registration, the applicant must submit details such as name, address, GI-1A form, affidavit, characteristics of the product, and class of goods. Different prescribed forms (GI-1, GI-2, GI-3, etc.) are used for applications, oppositions, renewals, and authorized user registration. Each form has a specific purpose with fixed fees ranging from ₹100 to ₹5000 (plus renewal charges).The following represent details about the documents required as well types of forms along with the prescribed fee.

Document	Description
Applicant's Details	Complete information about the applicant such as name, address, and identification particulars.
Application Form GI-1A	Official form that needs to be filled for initiating the GI registration process.
Statement of Goods	A written statement describing the goods that are to be protected under GI.
Class of Goods	Mention the correct class number under which the goods fall, as per GI classification.
Affidavit	A sworn statement proving that the applicant genuinely represents the interest of the producers.
Characteristics of GI	Description of the unique features, qualities, or characteristics of the product that justify GI protection.
Special Human Skill (if applicable)	Mention if the production requires any unique traditional skill or specialized human involvement.

Form No.	Purpose of the Form	Applicable Fee (₹)
GI-1A	Application for registering a GI for goods included in one class.	5000
GI-1	Application for registering a GI for goods in one class from a Convention country.	5000
GI-1 (Multi-class)	Application for registering a GI for goods in multiple classes (Indian applicant).	5000 per class
GI-1 (Multi-class – Convention country)	Application for registering a GI in multiple classes from a Convention country.	5000 per class
GI-2	Notice of opposition to the registration of a GI or opposition by/against an authorized user.	1000 per class
	Form of counter-statement against opposition.	1000
	Application for extension of time to file opposition.	300
GI-3	Application for registering an authorized user of a registered GI.	500
	Request for issuance of registration certificate for authorized user.	100
	Renewal of authorized user registration.	1000
GI-4	Renewal of GI registration after expiration of validity.	3000
	Application for restoration of a removed GI or authorized user (with renewal fee).	1000 + renewal fee
	Application for renewal within 6 months of expiration.	3500
GI-8	Application for registration of a Geographical Indications agent.	1000
GI-10	Application for cancellation of an entry in the Register or to strike out goods.	300

5.28 GI Ecosystem in India

India has a rich tradition of unique products with huge potential for GI registration, but only 370 were registered till June 2021, far below the scope. Between 2010–20, GI filings peaked in 2011–12 and dropped in 2015–16, showing fluctuating trends.

Registrations mostly remained steady around the twenties each year, with the highest (34) in 2016–17. The following table represent GI trends in our country.

Point	Explanation
India's Rich Heritage	India has a wide variety of traditional and regional products due to its diverse geography and culture.
Scope of GI	There is huge potential for developing GI products, which can boost regional economy and recognition.
Current Status (as of June 2021)	Only 370 GI products were registered, which is very low compared to the actual potential of India.
Filing Trends (2010–20)	The highest GI filings (148) happened in 2011–12, while the lowest (17) were in 2015–16.
Registration Trends (2010–20)	GI registrations were mostly around the twenties each year, with the highest being 34 in 2016–17.

5.29 Case Study of Curcuma (Turmeric) Patent

Turmeric, also known as *haldi* in India, has been a part of Indian tradition for thousands of years. It is used in cooking, cosmetics, and especially in traditional medicine systems like Ayurveda. One of its most popular uses has been for healing wounds and reducing inflammation. In the mid-1990s, two researchers from the United States were granted a patent on turmeric's wound-healing properties.

This came as a shock to India, because turmeric was already widely known and used for this purpose in Indian households. The Indian Council of Scientific and Industrial Research (CSIR) challenged this patent in the U.S. Patent Office. CSIR provided documentary evidence from ancient Sanskrit texts and research papers showing that turmeric had been used in India for wound healing long before.

The U.S. Patent Office reviewed this evidence and agreed that the claim was not an invention but a traditional use. As a result, the turmeric patent was revoked.

This case was very important because it showed how traditional knowledge can be misused if not properly documented or protected. It also highlighted the need for India to set up systems like the Traditional Knowledge Digital Library (TKDL) to safeguard ancient wisdom. The turmeric case became a global example of how developing countries can fight back against biopiracy and protect their cultural heritage.

5.30 Case Study of Neem Patent

The neem tree, often called the "village pharmacy," has been deeply connected with Indian culture and agriculture for centuries. Its leaves, bark, and oil have been used in medicines, soaps, and pesticides. Farmers in India traditionally used neem oil as a natural pesticide for protecting crops.

In the 1990s, the U.S. Department of Agriculture and a European company received a patent in Europe for using neem oil as a pesticide.

This alarmed Indian farmers and scientists, because neem's pesticidal use was not new but part of common practice in India. Several NGOs, along with the Indian government, opposed the patent at the European Patent Office (EPO).

They argued that neem's pesticidal properties were traditional knowledge and not an invention by the foreign company. Evidence from Indian agriculture and Ayurveda was submitted to prove that neem had been used for this purpose for generations. After a long legal battle, the EPO revoked the patent in 2000.

This decision was a victory for India, as it protected neem as part of the country's heritage and stopped unfair commercial exploitation. The neem case is remembered as a milestone in the fight against biopiracy and also demonstrated the importance of documenting traditional agricultural practices. It helped India push for stronger global rules to protect biodiversity and indigenous knowledge under agreements like the Convention on Biological Diversity (CBD).

5.31 Case Study of Basmati Patent

Basmati rice is famous worldwide for its long grain, aroma, and delicate flavor. It has been grown for centuries in specific regions of India and Pakistan, and its quality is closely linked to the soil, climate, and traditional farming of the area.

In the late 1990s, an American company called RiceTec Inc. was granted a patent in the U.S. for growing and marketing a variety of rice that they called "Basmati." The patent included certain varieties and methods of growing rice that resembled Indian Basmati. This caused serious concerns in India, because the patent could damage the identity and global market of genuine Basmati rice.

The Indian government, along with farmer organizations, strongly opposed the patent. They argued that Basmati is not just any rice but a Geographical Indication (GI) product that belongs to the Indian subcontinent. Evidence was presented to prove that Basmati had been cultivated in India for hundreds of years and cannot be claimed by a foreign company. After international pressure and opposition, several claims in RiceTec's patent were withdrawn or canceled.

This allowed India to protect the unique identity of Basmati rice. The case highlighted the importance of GIs in safeguarding region-specific products. It also warned India to strengthen its legal framework so that products like Basmati, Darjeeling tea, or Alphonso mangoes are not misused in global markets. The Basmati case remains one of the most important examples of protecting agricultural heritage through intellectual property rights.

5.32 IP Organizations in India.

IP organizations in India are government bodies that handle the registration and protection of patents, trademarks, copyrights, and geographical indications. The following represent IP organizations in INDIA and their role.

Organization	Description	Example
CGPDTM (Controller General of Patents, Designs & Trademarks)	Registers and manages patents, trademarks, designs, and geographical indications in India.	A startup can file a software patent for an AI-based algorithm.
Copyright Office	Protects creative works like books, films, music, paintings, and computer software.	Copyright can protect source code, mobile apps, or websites.
Intellectual Property Appellate Board (IPAB) (now merged with High Courts)	Resolved disputes related to patents, trademarks, and copyrights.	If two companies fight over a software patent, IPAB (earlier) handled it.
Patent Facilitation Centre (PFC) under TIFAC	Helps scientists, researchers, and innovators in filing patents.	A researcher can approach PFC for filing a patent on a blockchain security model.
IPR Chairs in Universities	Promote research, training, and awareness about Intellectual Property in academic institutions.	Engineering colleges guide students on protecting final year projects like IoT systems or AI tools.

5.33 Schemes and Programmes:

The government runs various IP schemes to promote awareness, protect traditional knowledge, and support startups in filing patents and trademarks. These initiatives help boost innovation and strengthen India's IP ecosystem. The following represent major IP Schemes and Programmes with their scope.

Scheme / Programme	Description	Example
National IPR Policy (2016)	A framework to promote innovation, strengthen IPR laws, and spread awareness.	Encourages IT companies to protect innovative software solutions.
SIPP (Startup Intellectual Property Protection)	Provides startups with help and financial support for filing patents, trademarks, and designs.	A startup developing a cybersecurity app can get financial support to file a patent.
NIPAM (National Intellectual Property Awareness Mission)	Educates students, youth, and entrepreneurs about IPR.	Organizes workshops in engineering colleges about software copyright & patenting.
TKDL (Traditional Knowledge Digital Library)	Documents India's traditional knowledge to stop foreign misuse.	Helps prevent misuse of IT-based Ayurvedic apps or databases of Indian knowledge.
Workshops, Training & E-filing Tools	Online platforms and training sessions to make IPR filing simple and affordable.	Engineers can use e-filing portals to register their coding projects or software patents.

QUESTION BANK

5 Marks Questions

1. Define Industrial Design and explain its eligibility criteria for registration.
2. What are the main objectives of registering Industrial Designs?
3. Mention the rights granted to the proprietor of a registered Industrial Design.
4. List the types of Industrial Designs that are not protectable in India.
5. Explain the duration of protection for Industrial Designs in India.
6. What is a Geographical Indication (GI) and what makes it different from a Trademark?
7. State the ownership criteria of GI in India.
8. What rights are granted to the holders of GI?
9. Write a short note on Collective Marks and Certification Marks.
10. What are the documents required for GI registration?

10 Marks Questions

1. Explain the procedure for registration of Industrial Designs with the help of a flowchart.
2. Discuss the importance of Design registration and grounds for cancellation of registered Designs.
3. Explain Classification of Industrial Designs as per the Locarno Agreement with examples.
4. Discuss the enforcement of Design rights and the penalties for infringement.
5. Explain the case study of Apple Inc. vs. Samsung Electronics Co. in detail.
6. Discuss the procedure for GI registration along with the role of the Examiner and Registrar.
7. Write a detailed note on non-registerable GIs and explain why they are restricted.
8. Explain the protection of GI rights and methods adopted internationally.
9. Discuss the case studies of Turmeric, Neem, and Basmati patents and their significance.
10. Explain the role of IP Organizations in India and describe the major schemes and programmes supporting IP.

Model Question Paper-1 with effect from 2022-23 (CBCS Scheme)

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Fifth Semester B.E. Degree Examination

Research Methodology & Intellectual Property Rights (IPR)

TIME: 03 Hours **Max. Marks: 100**

Note: 01. Answer any **FIVE** full questions, choosing at least **ONE** question from each **MODULE**.

		Module -1	*Bloom's Taxonomy Level	Marks
Q.01	a	Define the term research and explain the research flow cycle with a relevant diagram.	L1	7
	b	What are the three broad categories of developing and accessing knowledge in research? Explain with a diagram.	L1	7
	c	What are the key ethical issues related to authorship? Explain each one.	L1	6
		OR		
Q.02	a	Discuss the different types of engineering research. Clearly point out the differences between all of them with examples.	L2	10
	b	List the different types of research misconduct and provide a brief explanation for each one.	L3	10
		Module-2		
Q. 03	a	What are the primary goals of conducting a literature review in academic research?	L1	7
	b	How does the new and existing knowledge can contribute to the research process? Explain with relevant points.	L2	8
	c	What are datasheets and write their contents?	L2	5
		OR		
Q.04	a	Explain the various steps involved in the critical and creative reading process.	L1	8
	b	Define the term Citation. Describe the three functions of Citation.	L1	5
	c	Explain how knowledge flows through a citation network using a flow diagram.	L1	7
		Module-3		
Q. 05	a	What types of inventions are eligible for patenting, and which matters are considered non-patentable?	L2	10
	b	Explain the major steps involved in the process of filling patent applications using a flow chart.	L1	10
		OR		
Q. 06	a	Explain the different types of patent applications.	L1	8
	b	What strategies are involved in the commercialization of a patent?	L2	7
	c	What are utility models, and how do they differ from patents?	L1	5

		Module-4		
Q. 07	a	Define the term Copyright and write its classes.	L1	5
	b	What are the two exclusive rights owned by the copyright owner? Explain briefly.	L2	5
	c	What are the roles and functions of the copyright board and the copyright society in administering copyright laws and regulations?	L2	10
		OR		
Q. 08	a	What are the key eligibility criteria that a mark must meet to qualify for trademark protection? List advantages that a proprietor gains through trademark registration	L2	10
	b	Using a flowchart, explain the steps involved in the process of Trademarks Registration.	L3	10
		Module-5		
Q. 09	a	Briefly explain the overview of Industrial Design (ID). Summarize the Non-Protectable Industrial Designs in India.	L1	10
	b	Discuss the Design registration procedure by using a flowchart.	L2	10
		OR		
Q. 10	a	Define Geographical Indications (GI) with an example. What are the rights granted to GI holders?	L1	10
	b	Summarize the IPR-related activities the Department for Promotion of Industry and Internal Trade (DPIIT) undertakes.	L3	10

*Bloom's Taxonomy Level: Indicate as L1, L2, L3, L4, etc. It is also desirable to indicate the COs and POs to be attained by every bit of question.

Model Question Paper-2 with effect from 2022-23 (CBCS Scheme)

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Fifth Semester B.E. Degree Examination

Research Methodology & Intellectual Property Rights (IPR)

TIME: 03 Hours **Max. Marks: 100**

Note: 01. Answer any **FIVE** full questions, choosing at least **ONE** question from each **MODULE**.

		Module -1	*Bloom's Taxonomy Level	Marks
Q.01	a	Define engineering research and list its aims and objectives.	L1	7
	b	What are the factors that motivate you to do engineering research? Briefly explain	L2	7
	c	Compare descriptive research versus analytical research with examples.	L2	6
		OR		
Q.02	a	What is the meaning of ethics and why is it important in the practice of engineering research?	L1	7
	b	Write a note on the following research misconduct (i) Falsification (ii) plagiarism.	L2	8
	c	What are three ways to credit the research contributions? Explain	L2	5
		Module-2		
Q. 03	a	How does the existing knowledge can contribute to the research process? Explain with relevant points.	L2	5
	b	What are the key features of the bibliographic database of the Web of Science (WoS), and how is it commonly used in research?	L1	7
	c	List and explain the Importance of Note-taking while reading research papers.	L1	8
		OR		
Q.04	a	What types of citations fail to achieve their goal and do not benefit the reader? Explain.	L2	8
	b	Illustrate using a flowchart, how collaboration in a Co-authorship network can improve the flow of knowledge in the research.	L3	6
	c	Explain the most common styles for citation used by engineers during research, and provide an example.	L1	6
		Module-3		
Q. 05	a	Describe Intellectual Property Rights (IPR) and list its types.	L1	6
	b	Define the term patent and what are the conditions that must be met for obtaining patent protection?	L2	8
	c	What are Patent Infringements? Explain its two categories of Infringements.	L1	6
		OR		

Q. 06	a	Explain the following major steps involved in the process of patent registration. *(i)* Prior Art Search (ii) Choice of Application to be Filed (ii) Pre-grant Opposition	L2	10
	b	In which circumstances Indian residents are not required to file a patent application first in India to get patent protection in another country? Explain.	L3	6
	c	Name the four national bodies dealing with patent affairs	L2	4
Module-4				
Q. 07	a	What are the key considerations and tests for determining fair use doctrine under copyright law? Explain with examples.	L2	5
	b	Using a Flow chart, explain the important steps involved in the process of Copyright Registration.	L2	9
	c	What were the key events and circumstances surrounding the copyright dispute between photographer David Slater and the macaques in Indonesia in 2011? Explain.	L2	6
OR				
Q. 08	a	What are the different categories of trademarks recognized under Indian law, and tabulate the famous trademark types with examples	L2	10
	b	Explain by using a process flowchart, the steps involved in trademark registration.	L2	10
Module-5				
Q. 09	a	Describe the enforcement of Industrial Design Rights.	L1	5
	b	Explain the classification of Industrial Designs and design registration trends in India.	L1	7
	c	Explain registered Geographical Indications (GI) in India with the tabulate of examples.	L2	8
OR				
Q. 10	a	Explain the Identification of Registered Geographical Indications (GI) items. What are the common methods used to project GI in India.	L1	10
	b	Using a flowchart, explain the process of GI registration.	L2	10

*Bloom's Taxonomy Level: Indicate as L1, L2, L3, L4, etc. It is also desirable to indicate the COs and POs to be attained by every bit of questions.

CBCS SCHEME

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Fifth Semester B.E. Degree Examination, Dec.2023/Jan.2024
Research Methodology & Intellectual Property Rights

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. What is Engineering Research? What are the primary objectives of conducting research in engineering? **(10 Marks)**

b. What are the various types of engineering research? Explain. **(10 Marks)**

OR

2 a. Explain Fabrication, Falsification and Plagiarism related to Engineering research. **(10 Marks)**

b. What ethical considerations and responsibilities should be taken into account when determining authorship in Engineering research? **(10 Marks)**

Module-2

3 a. How do researchers distinguish between new and existing knowledge during a literature review? **(10 Marks)**

b. How can researchers effectively use search engines to find relevant literature in their fields? **(10 Marks)**

OR

4 a. What challenges do researchers commonly face when reading mathematical content or algorithm? **(10 Marks)**

b. What is impact of Title and Keywords on Citations? Explain Citation based knowledge flow. **(10 Marks)**

Module-3

5 a. What is definition of Intellectual Property (IP)? In what way does Intellectual Property contribute to economic growth and cultural development in a society? **(10 Marks)**

b. Discuss the history of Intellectual property in India. **(10 Marks)**

OR

6 a. Explain the step by step process of obtaining a patent. From the initial idea to the grant of the patent. **(10 Marks)**

b. What are the commonly used terms in the field of patenting and how do they contribute to effective communication in this domain. **(10 Marks)**

Module-4

7 a. Explain the criteria that an original work must meet to quality for copyright protection. **(10 Marks)**

b. Explain the process of copyright registration? What are the benefits for the copy right holders? **(10 Marks)**

OR

8 a. Explain the process of Trademark registration. (10 Marks)

b. Explain the classification system for trademarks and its role in categorizing different types of marks. (10 Marks)

Module-5

9 a. Explain the process of Industrial design registration. (10 Marks)

b. Explain the famous case law between Apple Inc Vs Samsung Electronics Co. related with Industrial Design rights. (10 Marks)

OR

10 a. Which specific acts, laws and rules govern geographical indications in India? Give some examples of well known geographical indications registered in India. (10 Marks)

b. How would you describe the overall ecosystem and significance of geographical indications in India? (10 Marks)

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Model Question Paper-1 with effect from 2022-23 (CBCS Scheme)

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Fifth Semester B.E. Degree Examination

Subject Title: Research Methodology and Intellectual Property Rights

TIME: 03 Hours **Max. Marks: 100**

Note: 01. Answer any **FIVE** full questions, choosing at least **ONE** question from each **MODULE**.

		Module -1	*Bloom's Taxonomy Level	COs	Marks
Q.01	a	Explain Research Flow cycle with a Neat Diagram	L2	1	7
	b	What are three broad categories of developing and accessing Research	L1	1	6
	c	Explain the three different types of Research? Give distinct examples of each.	L2	1	7
		OR			
Q.02	a	List the different types of Research misconduct ?Provide examples for each	L2	1	7
	b	What are the objectives of Engineering Research and its motivation?	L1	1	6
	c	Give a detailed description of Ethics and Ethical practices in Research	L2	1	7
		Module-2			
Q. 03	a	What are the primary goals of Literature Review?	L1	2	7
	b	How does new and existing Knowledge contribute to Research	L3	2	7
	c	What are datasheets enumerate their comtemts?	L2	2	6
		OR			
Q.04	a	Explain the terms critical reading and creative reading?	L1	2	7
	b	Explain the term citation? Describe the functions of citation?	L1	2	6
	c	Explain the knowledge flow process through a citation network?	L1	2	7
		Module-3			
Q. 05	a	Define the term patent?	L1	3	5
	b	Write a brief history of Patents	L2	3	8
	c	What are different patent applications and how are they commercialized	L2	3	7
		OR			
Q. 06	a	What are the inventions eligible for patenting and which are the matters considered as non patentable?	L2	3	10
	b	Explain through a flow chart the major steps involved in patenting	L1	3	10
		Module-4			
Q. 07	a	What is a copyright and write its classes	L2	4	5
	b	Explain what are the two exclusive rights owned by copyright owners ?	L1	4	5
	c	What is the role of Register of copyrights and the powers given to the Board of Copyrights?	L2	4	10
		OR			
Q. 08	a	What is a trademark? List the advantages a owner of the trademark gain through its registration	L2	4	10
	b	Explain the steps involved in Trademark Registrations using a flowchart	L1	4	10
		Module-5			
Q. 09	a	Explain in detail what is Industrial Design (ID)	L1	5	6
	b	Summarize the Non Protectable Industrial Designs in India	L2	5	4
	c	Describe the Registration process for Industrial Design with a flow chart	L2	5	10
		OR			

Q. 10	a	Define the term Geographical Indicators (GI)?What are the rights given ti GI holders	L1	5	10
	b	Discuss the case study of Apple Vs Samsung	L2	5	5
	c	Discus the case study of Basmati Patent	L2	5	5

*Bloom's Taxonomy Level: Indicate as L1, L2, L3, L4, etc. It is also desirable to indicate the COs and POs to be attained by every bit of questions.