K.L.N. College of Engineering

Pottapalayam – 630612.(11 km From Madurai City)
Tamil Nadu, India.

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DEPARTMENT OF MECHANICAL ENGINEERING

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VISION

To become a Centre of excellence for Education and Research in Mechanical Engineering.

MISSION

- Attaining academic excellence through effective teaching learning process and state of the art infrastructure.
- Providing research culture through academic and applied research.
- Inculcating social consciousness and ethical values through co-curricular and extra-curricular activities.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO I	Graduates will have successful career in Mechanical Engineering and service industries.
PEO II	Graduates will contribute towards technological development through academic research and industrial practices.
PEO III	Graduates will practice their profession with good communication, leadership, ethics and social responsibility.
PEO IV	Graduates will adapt to evolving technologies through lifelong learning.

PROGRAM SPECIFIC OUTCOMES (PSOs)

Mechanical Engineering Graduates will be able to:

PSO 1	Derive technical knowledge and skills in the design, develop, analyze and manufacture of mechanical systems with sustainable energy, by the use of modern tools and techniques and applying research based knowledge.
PSO 2	Acquire technical competency to face continuous technological changes in the field of mechanical engineering and provide creative, innovative and sustainable solutions to complex engineering problems.
PSO 3	Attain academic and professional skills for successful career and to serve the society needs in local and global environment.

MECASO

MECHANICAL ENGINEERING NEWSLETTER

Principal Message

KLN College of Engineering is fortunate because it had the opportunity to be fortuned by the hands of the people who were sure of their aims and aspirations. .And this is the apt time to plan for the next ten years activities. Even while enjoying the sweet fruits of previous successes we should constantly sense the need to innovate and act before it becomes too late. Many of us get blinded by our own success and fail to heed the winds of change. Rather than be blinded by success we should leave success behind to succeed again. We should develop a framework that helps to foster a culture of innovation. It is the need of the hour. We should not hesitate to offer fresh ideas to our society. We all should constantly seek to upgrade knowledge and skills so as to stay ahead of the curve. At this juncture, I feel proud to congratulate all those who shaped the institution to its present status with their untiring dedication and self service for bringing the best results inpast years. May God shower his abundant blessings on each one of you and I wish a happy and prosperous New Year ahead. I hope MECASO will uncover the milestones of KLN College of Engineering in its fruitful journey towards excellence.

Principal

Dr. A.V. RAMPRASAD

Message from the Head of the Department

I am extremely happy to bring out this message for our college magazine released for the academic year 2014 – 2015. This magazine provides a platform for students to share information, spread the latest technical knowledge and cultivate right ways that will equip all of us to stay competent in our respective fields of study and research. I congratulate and thank all the students and staff coordinators who have made untiring efforts to bring out this magazine. I wish them all success

HOD/MECH

Dr. P.Udayakumar

News Letter Editorial Board

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Types of 3D Printing:

FDM – Fused Deposition Modeling

Fused Deposition Modeling is an additive manufacturing technology commonly used for modeling, prototyping, and production applications. FDM works on an "additive" principle by laying down material in layers. A plastic filament or metal wire is unwound from a coil and supplies material to an extrusion nozzle which can turn the flow on and off. The nozzle is heated to melt the material and can be moved in both horizontal and vertical directions by a numerically controlled mechanism, directly controlled by a computer-aided manufacturing (CAM) software package. The model or part is produced by extruding small beads of thermoplastic material to form layers as the material hardens immediately after extrusion from the nozzle. Stepper motors or servo motors are typically employed to move the extrusion head.

FDM, a prominent form of rapid prototyping, is used for prototyping and rapid manufacturing. Rapid prototyping facilitates iterative testing, and for very short runs, rapid manufacturing can be a relatively inexpensive alternative.

Advantages: Cheaper since uses plastic, more expensive models use a different (water soluble) material to remove supports completely. Even cheap 3D printers have enough resolution for many applications.

Disadvantages: Supports leave marks that require removing and sanding. Warping, limited testing allowed due to Thermo plastic material. Stereo lithography is an additive manufacturing process which employs a vat of liquid ultraviolet curable photopolymer "resin" and an ultraviolet laser to build parts' layers one at a time. For each layer, the laser beam traces a cross-section of the part pattern on the surface of the liquid resin. Exposure to the ultraviolet laser light cures and solidifies the pattern traced on the resin and joins it to the layer below.

After the pattern has been traced, the SLA's elevator platform descends by a distance equal to the thickness of a single layer, typically 0.05 mm to 0.15 mm (0.002" to 0.006"). Then, a resin-filled blade sweeps across the cross section of the part, re-coating it with fresh material. On this new liquid surface, the subsequent layer pattern is traced, joining the previous layer. A complete 3-D part is formed by this process. After being built, parts are immersed in a chemical bath in order to be cleaned of excess resin and are subsequently cured in an ultraviolet oven.

Stereolithography requires the use of supporting structures which serve to attach the part to the elevator platform, prevent deflection due to gravity and hold the cross sections in place so that they resist lateral pressure from the re-coater blade. Supports are generated automatically during the preparation of 3D Computer Aided Design models for use on the stereolithography machine, although they may be manipulated manually. Supports must be removed from the finished product manually, unlike in other, less costly, rapid prototyping technologies.

SLS has many benefits over traditional manufacturing techniques. Speed is the most obvious because no special tooling is required and parts can be built in a matter of hours. Additionally, SLS allows for more rigorous testing of prototypes. Since SLS can use most alloys, prototypes can now be functional hardware made out of the same material as production components.

SLS is also one of the few additive manufacturing technologies being used in production. Since the components are built layer by layer, it is possible to design internal features and passages that could not be cast or otherwise machined. Complex geometries and assemblies with multiple components can be simplified to fewer parts with a more cost effective assembly. SLS does not require special tooling like castings, so it is convenient for short production runs.

Applications

This technology is used to manufacture direct parts for a variety of industries including aerospace, dental, medical and other industries that have small to medium size, highly complex parts and the tooling industry to make direct tooling inserts. With a build envelop of 250 x 250 x 185 mm, and the ability to ‘grow’ multiple parts at one time, SLS is a very cost and time effective technology. The technology is used both for rapid prototyping, as it decreases development time for new products, and production manufacturing as a cost saving method to simplify assemblies and complex geometries.

Constraints

The aspects of size, feature details and surface finish, as well as print through error in the Z axis may be factors that should be considered prior to the use of the technology. However, by planning the build in the machine where most features are built in the x and y axis as the material is laid down, the feature tolerances can be managed well. Surfaces usually have to be polished to achieve mirror or extremely smooth finishes.

For production tooling, material density of a finished part or insert should be addressed prior to use. For example, in injection molding inserts, any surface imperfections will cause imperfections in the plastic part, and the inserts will have to mate with the base of the mold with temperature and surfaces to prevent problems.

In this process metallic support structure removal and post processing of the part generated is a time consuming process and requires use of EDM and/or grinding machines having the same level of accuracy provided by the RP machine.

Lean Manufacturing

By Vignesh N (131327) III year A section

A Brief History of Lean Manufacturing

U.S. manufacturers have always searched for efficiency strategies that help reduce costs, improve output, establish competitive position, and increase market share. Early process oriented, mass production manufacturing methods common before World War II shifted afterwards to the results-oriented, output-focused, production systems that control most of today's manufacturing businesses.

Japanese manufacturers re-building after the Second World War were facing declining human, material, and financial resources. The problems they faced in manufacturing were vastly different from their Western counterparts. These circumstances led to the development of new, lower cost, manufacturing practices. Early Japanese leaders such as the Toyota Motor Company's Eiji Toyoda, TaiichiOhno, and Shingeo Shingo developed a disciplined, process-focused production system now known as the "Toyota Production System", or "lean production." The objective of this system was to minimize the consumption of resources that added no value to a product.

The "lean manufacturing" concept was popularized in American factories in large part by the Massachusetts Institute of Technology study of the movement from mass production toward production as described in The Machine That Changed the World, (Womack, Jones &Roos, 1990), which discussed the significant performance gap between Western and Japanese automotive industries. This book described the important elements accounting for superior performance as lean production. The term "lean" was used because Japanese business methods used less human effort, capital investment, floor space, materials, and time in all aspects of operations. The resulting competition among U.S. and Japanese automakers over the last 25 years has lead to the adoption of these principles within all U.S. manufacturing businesses.

What is Lean Manufacturing?

Lean Manufacturing can be defined as:

"A systematic approach to identifying and eliminating waste (non-value-added activities) through continuous improvement by flowing the product at the pull of the customer in pursuit of perfection."

Value

In lean production, the value of a product is defined solely by the customer. The product must meet the customer's needs at both a specific time and price. The thousands of mundane and sophisticated things that manufacturers do to deliver a product are generally of little interest to customers. To view value from the eyes of the customer requires most companies to undergo comprehensive analysis of all their business processes. Identifying the value in lean production means to understand all the activities required to produce a specific product, and then to optimize the whole process from the view of the customer. This viewpoint is critically important because it helps identify activities that clearly add value, activities that add no value but cannot be avoided, and activities that add no value and can be avoided.

Continuous Improvement

The transition to a lean environment does not occur overnight. A continuous improvement mentality is necessary to reach your company's goals. The term "continuous improvement" means incremental improvement of products, processes, or services over time, with the goal of reducing waste to improve workplace functionality, customer service, or product performance (Suzaki, 1987). Continuous improvement principles, as practiced by the most devoted manufacturers, result in astonishing improvements in performance that competitors find nearly impossible to achieve.

Lean production, applied correctly, results in the ability of an organization to learn. As in any organization, mistakes will always be made. However, mistakes are not usually repeated because this is a form of waste that the lean production philosophy and its methods seek to eliminate.

Customer Focus

A lean manufacturing enterprise thinks more about its customers than it does about running machines fast to absorb labor and overhead. Ensuring customer input and feedback assures quality and customer satisfaction, all of which support sales.

Perfection

The concept of perfection in lean production means that there are endless opportunities for improving the utilization of all types of assets. The systematic elimination of waste will reduce the costs of operating the extended enterprise and fulfills customer's desire for maximum value at the lowest price. While perfection may never be achieved, its pursuit is a goal worth striving for because it helps maintain constant vigilance against wasteful practices.

Focus on Waste

The aim of Lean Manufacturing is the elimination of waste in every area of production including customer relations, product design, supplier networks, and factory management. Its goal is to incorporate less human effort, less inventory, less time to develop products, and less space to become highly responsive to customer demand while producing top quality products in the most efficient and economical manner possible.

Essentially, a "waste" is anything that the customer is not willing to pay for. Typically the types of waste considered in a lean manufacturing system include:

Overproduction: to produce more than demanded or produce it before it is needed. It is visible as storage of material. It is the result of producing to speculative demand. Overproduction means making more than is required by the next process, making earlier than is required by the next process, or making faster than is required by the next process. Causes for overproduction waste include:

- Just-in-case logic
- Misuse of automation
- Long process setup
- Unlevel scheduling
- Unbalanced work load
- Over engineered
- Redundant inspections

Waiting: for a machine to process should be eliminated. The principle is to maximize the utilization/efficiency of the worker instead of maximizing the utilization of the machines. Causes of waiting waste include:

1. Unbalanced work load
2. Unplanned maintenance
3. Long process set-up times
4. Misuses of automation
5. Upstream quality problems
6. Unlevel scheduling

Inventory or Work in Process (WIP): is material between operations due to large lot production or processes with long cycle times. Causes of excess inventory include:

I. Protecting the company from inefficiencies and unexpected problems
II. Product complexity
III. Unleveled scheduling

IV. Poor market forecast
V. Unbalanced workload
VI. Unreliable shipments by suppliers
VII. Misunderstood communications
VIII. Reward systems

Processing waste: should be minimized by asking why a specific processing step is needed and why a specific product is produced. All unnecessary processing steps should be eliminated. Causes for processing waste include:

I. Product changes without process changes
II. Just-in-case logic
III. True customer requirements undefined
IV. Over processing to accommodate downtime
V. Lack of communications
VI. Redundant approvals
VII. Extra copies/excessive information

Transportation: does not add any value to the product. Instead of improving the transportation, it should be minimized or eliminated (e.g. forming cells). Causes of transportation waste includes:

a) Poor plant layout
b) Poor understanding of the process flow for production
c) Large batch sizes, long lead times, and large storage areas

Motion: of the workers, machines, and transport (e.g. due to the inappropriate location of tools and parts) is waste. Instead of automating wasted motion, the operation itself should be improved. Causes of motion waste include:

a) Poor people/machine effectiveness
b) Inconsistent work methods
c) Unfavorable facility or cell layout
d) Poor workplace organization and housekeeping
e) Extra "busy" movements while waiting

Making defective products: is pure waste. Prevent the occurrence of defects instead of finding and repairing defects. Causes of processing waste include:

- Weak process control
- Poor quality
- Unbalanced inventory level

- Deficient planned maintenance
- Inadequate education/training/work instructions
- Product design
- Customer needs not understood

Underutilizing people: not taking advantage of people's abilities. Causes of people waste include:

1. Old guard thinking, politics, the business culture
2. Poor hiring practices
3. Low or no investment in training
4. Low pay, high turnover strategy

Nearly every waste in the production process can fit into at least one of these categories. Those understand the concept deeply view waste as the singular enemy that greatly limits business performance and threatens prosperity unless it is relentlessly eliminated over time. Lean manufacturing is an approach that eliminates waste by reducing costs in the overall production process, in operations within that process, and in the utilization of production labor. The focus is on making the entire process flow, not the improvement of one or more individual operations.

Some Basic Elements of Lean Manufacturing

1. Elimination of waste
2. Equipment reliability
3. Process capability
4. Continuous flow
5. Material flows one part at a time
6. Less inventory required throughout the production process, raw material, WIP, and finished goods
7. Defect reduction
8. Lead time reduction
9. Error proofing
10. Stop the Line quality system
11. Kanban systems
12. Standard work
13. Visual management
14. In station process control
15. Level production
16. Takt Time
17. Quick Changeover
18. Teamwork
19. Point of use storage

The Implementation of Sixth "S" in 5S System Concerned with Safety:

by N.Pranav (131318) III Year A Section

An organization can comply with safety regulations and yet not perform as well as another organization that also complies with regulations. The difference lies in management support and a culture that integrates safety into all aspects of its continuous improvement programs such as Lean. In high-performing organizations, safety becomes part of the same continuous improvement programs that drive productivity, efficiency, and business results.

An Aberdeen Study identified four key performance indicators (KPIs) to distinguish Best-in-Class from Industry Average and Laggard organizations relative to plant safety. The KPIs included overall equipment efficiency (defined as Availability X Performance X Quality), repeat accident rate, injury frequency rate, and unscheduled asset downtime.

Manufacturers in the Best-in-Class category, or top 20%, had the highest OEE (90%) and the lowest accident and injury rates (0.2% and 0.05%, respectively). In contrast, the Laggard category, or those in the bottom 30%, had the lowest OEE (76%) and the highest accident and injury rates (10% and 3.0%, respectively).

Safety is inherent to Lean principles:

Two key pillars of Lean are standardization and employee empowerment. Though often considered paradoxical, the pillars represent basic tenets of a safety culture. Plant safety is ensured, in part, by establishing standard operating procedures (SOPs) and work instructions (WIs). However, as operations change, employees at the source are often more aware of potentially unsafe conditions. Empowerment gives these employees an opportunity to challenge a standard and provide a corrective action before an incident occurs.

Applying 5S methodology

The following example illustrates how fall protection, the leading cause of workplace injuries, can leverage 5S methodology to reduce incidents while improving efficiency and effectiveness.

Workers require access to an elevated work area to conduct routine maintenance. For some, the first response is a ladder. While a ladder may make sense for its practicality, it comes with its own set of safety issues and may not be efficient if workers must first locate a ladder and bring it to the work area. Keeping a ladder in the area may seem like a good solution to the efficiency issue. However, considering the "Straighten" tenet, efficiency gains may be offset by the safety risk of added workspace clutter.

Biggs conducts ABC analysis to sift items. For example, "A" items are those used every day. They should be readily accessible. "B" items, used weekly, for example, should be somewhat accessible, but out of the way. "C" items that are used infrequently can be tucked away. Taking a holistic look at the previous example from a 5S perspective, what's needed is safe access that's efficient, compliant, and unobtrusive—a solution that keeps the work area uncluttered (Straighten / Sift), meets safety regulations (Standardize) and does so consistently over time (Sustain). Can a plant meet these criteria and maintain efficiency? Modular workspaces may be the answer.

One safety module at a time

For many plants modularity strongly influences the choice in systems implemented throughout the plant. Modular systems offer a lower total cost of ownership and greater flexibility to accommodate the accelerated pace of change in business that ultimately impacts the manufacturing footprint. Changes in automation systems, packaging systems, or relocation of production from one plant to another require footprint changes that often result in less-than-efficient access.

More plants are considering modular access solutions that not only emphasize safety, but also provide flexibility to reconfigure pre-engineered and compliant modules in other difficult-to-reach areas of the plant. Modularity supports 5S tenets of Sort, Standardize, and Sustain. In our previous example of access to an elevated work area, modular stairs, rails, and a work platform are erected to enable safe efficient access. It's safer than a ladder, particularly when workers must also bring tools to conduct maintenance activities. And the secure platform provides needed space for tools, preventing workspace clutter.

De-Inking Process:

By V.Muthappan, (131010) III Year C Section

Before printed paper, such as office waste and newspapers, can be recycled the ink needs to be removed, otherwise it will be dispersed into the pulp and a dull grey paper will result. There are two main processes for de-inking waste paper known as washing and flotation.

Washing:

The waste paper is put into a pulper with a large quantity of water and broken down into a slurry. Contaminates or ‘contraries’ such as staples and plastic are removed by wire mesh machines and a mechanical action. Most of the water containing dispersed ink is drained off from the pulp through slots or screens that allow small particles through, but not the pulp. Water can be added to rinse the fibres and drained to remove huge amount of ink. Adhesive particles known as ‘stickies’ are removed by fine screening. About 80% of the original fibre is recovered by this process (though it will depend on the type of washing equipment being used) with the remaining 20% of ink, clay, filler, plastics etc left behind. De-inking by washing has been used with great success on old newspapers to produce stock for newsprint manufacture. It is more effective than the flotation process at removing smaller ink particles.

Flotation:

Again, the waste paper is made into a slurry and the contaminates are removed. Then special surfactant chemicals are added which makes a sticky froth on the top of the pulp. Air bubbles are blown through the pulp and these carry the ink to the surface. As the bubbles reach the top a foam layer is formed that traps the ink. The foam must be removed before the bubbles break or the ink will go back into the pulp. Because the ink is removed from the flotation machine in a concentrated from, the flotation system does not require a larger water treatment plant. When the flotation method is used to de-ink old newspapers, around 30% used magazines are usually added for strength. The clay present in coated papers can improve de-inking efficiency as the ink attaches itself to the clay particles before floating to the surface. The flotation method is more able, than the washing method, to remove large ink particles. Yields from flotation de-inking are quoted as 90-95% but filler is not removed to the same extent as in the washing process.

Composite Materials

By SumanBabu G (121039) IV Year B Section

Introduction

A Composite material is a material system composed of two or more macro constituents that differ in shape and chemical composition and which are insoluble in each other. The history of composite materials dates back to early 20th century. In 1940, fiber glass was first used to reinforce epoxy.

Applications:

- Aerospace industry
- Sporting Goods Industry
- Automotive Industry
- Home Appliance Industry

Terminology/Classification

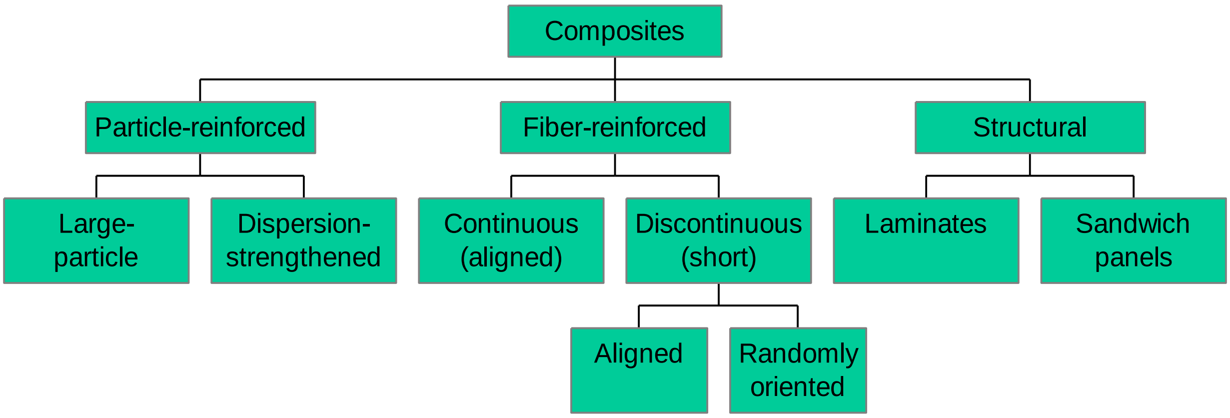
- Composites:

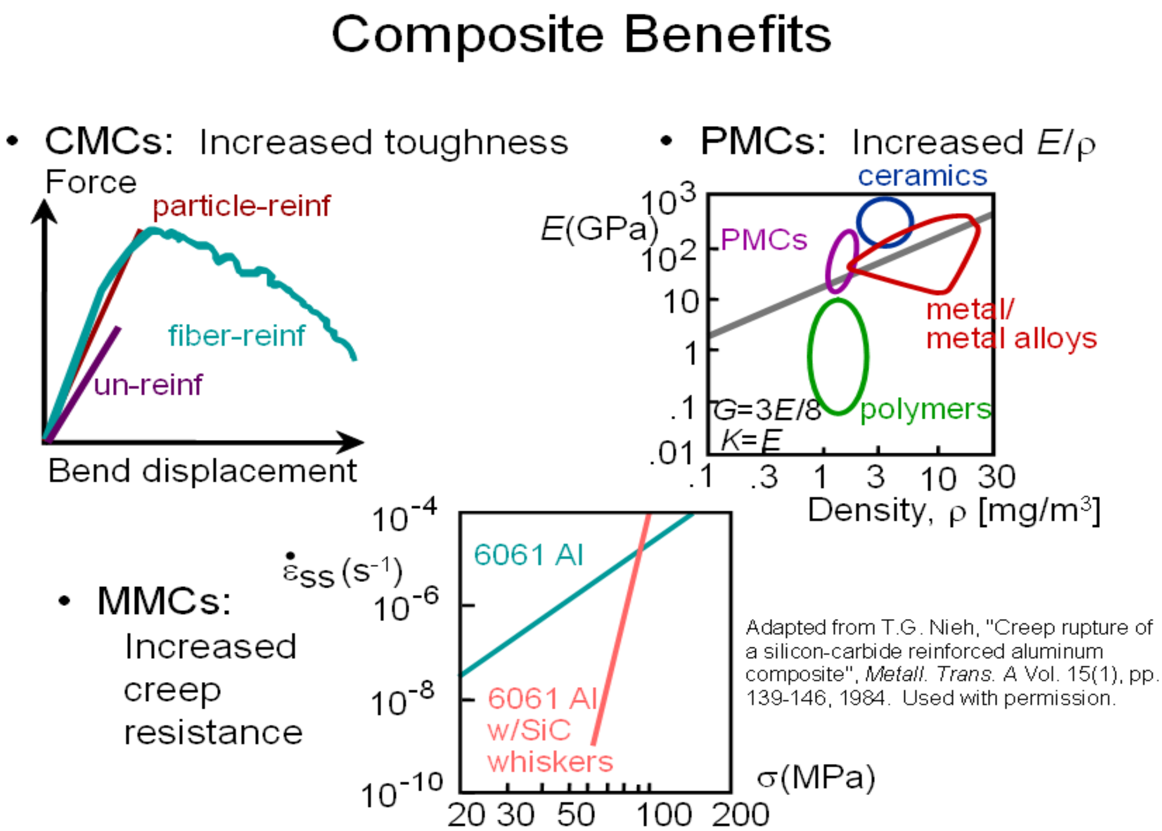
  Multiphase material w/significant proportions of each phase.

- Matrix:
  - The continuous phase
  - Purpose is to:
  - transfer stress to other phases
  - protect phases from environment

Classification: MMC, CMC, PMC

Composite Survey





PROGRAM OUTCOMES (POs)

Mechanical Engineering Graduates will be able to

1.	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to solution of complex engineering problems.
2.	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3.	Design / development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4.	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5.	Modern tool usage: Create, select and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6.	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7.	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8.	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9.	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10.	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11.	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects in multidisciplinary environments.
12.	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

K.L.N. COLLEGE OF ENGINEERING

VISION

To become a Premier Institute of National Repute by Providing Quality Education, Successful Graduation, Potential Employability and Advanced Research & Development through Academic Excellence.

MISSION

To Develop and Make Students Competent Professional in the Dynamic Environment in the field of Engineering, Technology and Management by emphasizing Research, Social Concern and Ethical Values through Quality Education System.

Principal | President | Secretary & Correspondent