

**K.L.N. COLLEGE OF ENGINEERING**  
**DEPARTMENT OF INFORMATION TECHNOLOGY**

**VISION OF THE INSTITUTION:**

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

**MISSION OF THE INSTITUTION:**

**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.**

**VISION OF THE DEPARTMENT:**

**To Emerge as a Center of Excellence through Innovative Technical Education and Research in Information Technology.**

**MISSION OF THE DEPARTMENT:**

**To Produce Competent Information Technology Professionals to Face the Industrial and Societal Challenges by Imparting Quality Education with Ethical Values**

## **PROGRAM OUTCOMES (POs) OF IT DEPARTMENT**

**PO1: Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

**PO2: Problem analysis:** Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

**PO3: 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.

**PO4: 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.

**PO5: 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.

**PO6: 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.

**PO7: 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.

**PO8: Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

**PO9: Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

**PO10: 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.

**PO11: 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 and in multidisciplinary environments.

**PO12: 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.

## **PROGRAM SPECIFIC OUTCOMES OF IT DEPARTMENT**

**PSO 1:** Ability to apply the fundamentals of mathematics, science, engineering, information and computing technologies to identify, analyze, design, develop, test, debug and obtain solutions for complex engineering problems.

**PSO 2:** Ability to select and apply appropriate modern tools and cutting edge technologies in the field of Information and communication to meet the industrial and societal requirements with public health and safety considerations.

**PSO 3:** Ability to analyze the multidisciplinary problems and function effectively in various teams for developing innovative solutions with environmental concerns and apply ethical principles in their career.

**PSO 4:** Ability to acquire leadership and communication skills to manage projects and engage in lifelong technical learning to keep in pace with the changes in technologies.

## **PROGRAM EDUCATIONAL OBJECTIVES OF IT DEPARTMENT**

**PEO 1:** To excel in industrial or graduate work in information technology and allied fields.

**PEO 2:** To practice their professions conforming to ethical values and environmental friendly policies.

**PEO 3:** To be able to have an exposure in emerging cutting edge technologies and adapt to ever changing technologies.

**PEO 4:** To work in international and multi–disciplinary environments.

### **OUTCOME BASED EDUCATION (OBE)**

In a traditional education system, students are given grades and rankings compared to each other. Content and performance expectations are based primarily on what was taught in the past to students of a given age. The goal of traditional education was to present the knowledge and skills of an older generation to the new generation of students, and to provide students with an environment in which to learn. The process paid little attention (beyond the classroom teacher) to whether or not students learn any of the material.

An outcome is a culminating demonstration of learning; it is what the student should be able to do, at the end of a course/program, in-terms of the knowledge, skill and behavior.

Outcome-based education is an approach to education in which decisions about the curriculum are driven by the exit learning outcomes that the students should display at the end of the course. In outcome-based education, product defines process. Outcome-based education can be summed up as results-oriented thinking and is the opposite of input-based education where the emphasis is on the educational process. Outcome-based education promotes fitness for practice and education for capability.

### **BENEFITS AND SIGNIFICANCE OF ACCREDITATION**

The process of accreditation helps in realizing a number of benefits, such as:

- Helps the Institution to know its strengths, weaknesses and opportunities

- Initiates Institutions into innovative and modern methods of pedagogy
- Gives Institutions a new sense of direction and identity
- Provides society with reliable information on quality of education offered
- Promotes intra and inter-Institutional interactions Accreditation signifies different things to different stakeholders. These are:

### **Benefits to Institutions:**

Accreditation is market-driven and has an international focus. It assesses the characteristics of an Institution and its programs against a set of criteria established by National Board of Accreditation. NBA's key objective is to contribute to the significant improvement of the Institutions involved in the accreditation process. Accreditation process quantifies the strengths, weaknesses in the processes adopted by the Institution and provides directions and opportunities for future growth. NBA provides a quality seal or label that differentiates the Institutions from its peers at the national level. This leads to a widespread recognition and greater appreciation of the brand name of Institutions and motivates the Institutions to strive for more.

### **Benefits to Students:**

Students studying in NBA accredited Institutions can be assured that they will receive education which is a balance between high academic quality and professional relevance and that the needs of the corporate world are well integrated into programmes, activities and processes. It signifies that he has entered the portals of an Institution, which has the essential and desirable features of quality professional education.

**Benefits to Employers:**

Accreditation assures prospective employers that students come from a program where the content and quality have been evaluated, satisfying established standards. It also signifies that the students passing out have acquired competence based on well established technical inputs.

**Benefits to the Public:**

Accredited status represents the commitment of the programme and the Institution to quality and continuous improvement.

**Catalyst for International Accreditations:**

Due to accreditation from NBA, the Institution's systems and procedures get aligned with the Institution's Mission and Vision. All essential prerequisites for international accreditation are included in the accreditation process of NBA. Therefore, NBA acts as a catalyst for the Institutions planning to acquire International Accreditation.

**Benefits to Industry and Infrastructure Providers:**

It signifies identification of quality of Institutional capabilities, skills and knowledge.

**Benefits to Parents:**

It signifies that their ward goes through a teaching-learning environment as per accepted good practices.

**Benefits to Alumni:**

It reassures alumni that alumni are products of an institute with a higher standing in terms of learning.

### **Benefits to Country:**

Accreditation helps in gaining confidence of stakeholders and in giving a strong message that as a country, our technical manpower is of international standards and can be very useful in enhancing the global mobility for our technical manpower.

### **ENGINEERING ETHICS**

Engineering Ethics is the set of rules and guidelines that engineers adhere to as a moral obligation to their profession and to the world. Engineering is a professional career that impact lives. When ethics is not followed, disaster often occurs; these disasters not only include huge monetary costs and environmental impacts, but also often result in the loss of human life. Engineering Ethics applies to every engineer and is very important.

The National Society of Professional Engineers (NSPE) decides the overall standards and codes of ethics for all the engineering professions. The Preamble of the NSPE Code of Conduct for Engineers (2007) states: *“Engineers shall at all times recognize that their primary obligation is to protect the safety, health, property, and welfare of the public. If their professional judgment is overruled under circumstances where the safety, health, property, or welfare of the public are endangered, they shall notify their employer or client and such other authority as may be appropriate.”*

**Software Engineering Code of Ethics and Professional Practice (Version 5.2)  
as recommended by the ACM/IEEE-CS.**

Software engineers shall commit themselves to making the analysis, specification, design, development, testing and maintenance of software a beneficial and respected profession. In accordance with their commitment to the health, safety and welfare of the public, software engineers shall adhere to the following Eight Principles:

- 1. PUBLIC** - Software engineers shall act consistently with the public interest.
- 2. CLIENT AND EMPLOYER** - Software engineers shall act in a manner that is in the best interests of their client and employer consistent with the public interest.
- 3. PRODUCT** - Software engineers shall ensure that their products and related modifications meet the highest professional standards possible.
- 4. JUDGMENT** - Software engineers shall maintain integrity and independence in their professional judgment.
- 5. MANAGEMENT** - Software engineering managers and leaders shall subscribe to and promote an ethical approach to the management of software development and maintenance.
- 6. PROFESSION** - Software engineers shall advance the integrity and reputation of the profession consistent with the public interest.
- 7. COLLEAGUES** - Software engineers shall be fair to and supportive of their colleagues.

**8. SELF** - Software engineers shall participate in lifelong learning regarding the practice of their profession and shall promote an ethical approach to the practice of the profession

## **PRINCIPLES**

### **Principle 1: PUBLIC**

Software engineers shall act consistently with the public interest. In particular, software engineers shall, as appropriate:

1.01. Accept full responsibility for their own work.

1.02. Moderate the interests of the software engineer, the employer, the client and the users with the public good.

1.03. Approve software only if they have a well-founded belief that it is safe, meets specifications, passes appropriate tests, and does not diminish quality of life, diminish privacy or harm the environment. The ultimate effect of the work should be to the public good.

1.04. Disclose to appropriate persons or authorities any actual or potential danger to the user, the public, or the environment, that they reasonably believe to be associated with software or related documents.

1.05. Cooperate in efforts to address matters of grave public concern caused by software, its installation, maintenance, support or documentation.

1.06. Be fair and avoid deception in all statements, particularly public ones, concerning software or related documents, methods and tools.

1.07. Consider issues of physical disabilities, allocation of resources, economic disadvantage and other factors that can diminish access to the benefits of software.

1.08. Be encouraged to volunteer professional skills to good causes and contribute to public education concerning the discipline.

## **Principle 2: CLIENT AND EMPLOYER**

Software engineers shall act in a manner that is in the best interests of their client and employer, consistent with the public interest. In particular, software engineers shall, as appropriate:

2.01. Provide service in their areas of competence, being honest and forthright about any limitations of their experience and education.

2.02. Not knowingly use software that is obtained or retained either illegally or unethically.

2.03. Use the property of a client or employer only in ways properly authorized, and with the client's or employer's knowledge and consent.

2.04. Ensure that any document upon which they rely has been approved, when required, by someone authorized to approve it.

2.05. Keep private any confidential information gained in their professional work, where such confidentiality is consistent with the public interest and consistent with the law.

2.06. Identify, document, collect evidence and report to the client or the employer promptly if, in their opinion, a project is likely to fail, to prove too expensive, to violate intellectual property law, or otherwise to be problematic.

2.07. Identify, document, and report significant issues of social concern, of which they are aware, in software or related documents, to the employer or the client.

2.08. Accept no outside work detrimental to the work they perform for their primary employer.

2.09. Promote no interest adverse to their employer or client, unless a higher ethical concern is being compromised; in that case, inform the employer or another appropriate authority of the ethical concern.

### **Principle 3: PRODUCT**

Software engineers shall ensure that their products and related modifications meet the highest professional standards possible. In particular, software engineers shall, as appropriate:

3.01. Strive for high quality, acceptable cost and a reasonable schedule, ensuring significant tradeoffs are clear to and accepted by the employer and the client, and are available for consideration by the user and the public.

3.02. Ensure proper and achievable goals and objectives for any project on which they work or propose.

3.03. Identify, define and address ethical, economic, cultural, legal and environmental issues related to work projects.

3.04. Ensure that they are qualified for any project on which they work or propose to work by an appropriate combination of education and training, and experience.

3.05. Ensure an appropriate method is used for any project on which they work or propose to work.

- 3.06. Work to follow professional standards, when available, that are most appropriate for the task at hand, departing from these only when ethically or technically justified.
- 3.07. Strive to fully understand the specifications for software on which they work.
- 3.08. Ensure that specifications for software on which they work have been well documented, satisfy the users' requirements and have the appropriate approvals.
- 3.09. Ensure realistic quantitative estimates of cost, scheduling, personnel, quality and outcomes on any project on which they work or propose to work and provide an uncertainty assessment of these estimates.
- 3.10. Ensure adequate testing, debugging, and review of software and related documents on which they work.
- 3.11. Ensure adequate documentation, including significant problems discovered and solutions adopted, for any project on which they work.
- 3.12. Work to develop software and related documents that respect the privacy of those who will be affected by that software.
- 3.13. Be careful to use only accurate data derived by ethical and lawful means, and use it only in ways properly authorized.
- 3.14. Maintain the integrity of data, being sensitive to outdated or flawed occurrences.
- 3.15. Treat all forms of software maintenance with the same professionalism as new development.

#### **Principle 4: JUDGMENT**

Software engineers shall maintain integrity and independence in their professional judgment. In particular, software engineers shall, as appropriate:

4.01. Temper all technical judgments by the need to support and maintain human values.

4.02 Only endorse documents either prepared under their supervision or within their areas of competence and with which they are in agreement.

4.03. Maintain professional objectivity with respect to any software or related documents they are asked to evaluate.

4.04. Not engage in deceptive financial practices such as bribery, double billing, or other improper financial practices.

4.05. Disclose to all concerned parties those conflicts of interest that cannot reasonably be avoided or escaped.

4.06. Refuse to participate, as members or advisors, in a private, governmental or professional body concerned with software related issues, in which they, their employers or their clients have undisclosed potential conflicts of interest.

#### **Principle 5: MANAGEMENT**

Software engineering managers and leaders shall subscribe to and promote an ethical approach to the management of software development and maintenance . In particular, those managing or leading software engineers shall, as appropriate:

5.01 Ensure good management for any project on which they work, including effective procedures for promotion of quality and reduction of risk.

5.02. Ensure that software engineers are informed of standards before being held to them.

5.03. Ensure that software engineers know the employer's policies and procedures for protecting passwords, files and information that is confidential to the employer or confidential to others.

5.04. Assign work only after taking into account appropriate contributions of education and experience tempered with a desire to further that education and experience.

5.05. Ensure realistic quantitative estimates of cost, scheduling, personnel, quality and outcomes on any project on which they work or propose to work, and provide an uncertainty assessment of these estimates.

5.06. Attract potential software engineers only by full and accurate description of the conditions of employment.

5.07. Offer fair and just remuneration.

5.08. Not unjustly prevent someone from taking a position for which that person is suitably qualified.

5.09. Ensure that there is a fair agreement concerning ownership of any software, processes, research, writing, or other intellectual property to which a software engineer has contributed.

5.10. Provide for due process in hearing charges of violation of an employer's policy or of this Code.

5.11. Not ask a software engineer to do anything inconsistent with this Code.

5.12. Not punish anyone for expressing ethical concerns about a project.

## **Principle 6: PROFESSION**

Software engineers shall advance the integrity and reputation of the profession consistent with the public interest. In particular, software engineers shall, as appropriate:

6.01. Help develop an organizational environment favorable to acting ethically.

6.02. Promote public knowledge of software engineering.

6.03. Extend software engineering knowledge by appropriate participation in professional organizations, meetings and publications.

6.04. Support, as members of a profession, other software engineers striving to follow this Code.

6.05. Not promote their own interest at the expense of the profession, client or employer.

6.06. Obey all laws governing their work, unless, in exceptional circumstances, such compliance is inconsistent with the public interest.

6.07. Be accurate in stating the characteristics of software on which they work, avoiding not only false claims but also claims that might reasonably be supposed to be speculative, vacuous, deceptive, misleading, or doubtful.

6.08. Take responsibility for detecting, correcting, and reporting errors in software and associated documents on which they work.

6.09. Ensure that clients, employers, and supervisors know of the software engineer's commitment to this Code of ethics, and the subsequent ramifications of such commitment.

6.10. Avoid associations with businesses and organizations which are in conflict with this code.

6.11. Recognize that violations of this Code are inconsistent with being a professional software engineer.

6.12. Express concerns to the people involved when significant violations of this Code are detected unless this is impossible, counter-productive, or dangerous.

6.13. Report significant violations of this Code to appropriate authorities when it is clear that consultation with people involved in these significant violations is impossible, counter-productive or dangerous.

### **Principle 7: COLLEAGUES**

Software engineers shall be fair to and supportive of their colleagues. In particular, software engineers shall, as appropriate:

7.01. Encourage colleagues to adhere to this Code.

7.02. Assist colleagues in professional development.

7.03. Credit fully the work of others and refrain from taking undue credit.

7.04. Review the work of others in an objective, candid, and properly-documented way.

7.05. Give a fair hearing to the opinions, concerns, or complaints of a colleague.

7.06. Assist colleagues in being fully aware of current standard work practices including policies and procedures for protecting passwords, files and other confidential information, and security measures in general.

7.07. Not unfairly intervene in the career of any colleague; however, concern for the employer, the client or public interest may compel software engineers, in good faith, to question the competence of a colleague.

7.08. In situations outside of their own areas of competence, call upon the opinions of other professionals who have competence in that area.

### **Principle 8: SELF**

Software engineers shall participate in lifelong learning regarding the practice of their profession and shall promote an ethical approach to the practice of the profession. In particular, software engineers shall continually endeavor to:

8.01. Further their knowledge of developments in the analysis, specification, design, development, maintenance and testing of software and related documents, together with the management of the development process.

8.02. Improve their ability to create safe, reliable, and useful quality software at reasonable cost and within a reasonable time.

8.03. Improve their ability to produce accurate, informative, and well-written documentation.

8.04. Improve their understanding of the software and related documents on which they work and of the environment in which they will be used.

8.05. Improve their knowledge of relevant standards and the law governing the software and related documents on which they work.

8.06 Improve their knowledge of this Code, its interpretation, and its application to their work.

8.07 Not give unfair treatment to anyone because of any irrelevant prejudices.

8.08. Not influence others to undertake any action that involves a breach of this Code.

8.09. Recognize that personal violations of this Code are inconsistent with being a professional software engineer.

### **Engineering Ethics in College/Education:**

The main engineering ethics problem that college students are face with is academic integrity. Academic integrity can show itself in the form of cheating by copying someone's work, intentional cheating, plagiarism, and/or self plagiarism. However, professional ethics is something that can be learned even when it conflicts with personal ethics, as for example, a situation where you are personally okay with building a product that can harm the environment, yet save lives. You can learn professional ethics and realize that something that is harmful to the environment is not okay. Ethics codes can even help you see the bigger picture. For example, in the previous scenario, these codes can help you re-evaluate your ethics and realize that something that is harmful to the environment will eventually be harmful to the people around you and yourself.

### **Engineering Ethics in the Professional World:**

In the professional world, ethical engineering problems come up in many cases. One of these includes the case of a professional using someone else's work that is published in the widespread market of publication. Another is the case of a professional using someone else's work that is not published yet and stealing their idea. Engineers who have good engineering ethics often have a good sense of the value of life. They don't hesitate to admit that they made a mistake because they know that the cost of not owning up to your mistakes can have disastrous consequences. It might even cost a human life.

## **Engineering Ethics in Companies:**

Not only do individual engineers have to be conscious of engineering ethics, but also companies. Companies have to be aware of their Corporate Social Responsibility and Environmental Responsibility. Corporate Social Responsibility is a company's responsibility to give back to the community that they profit from and to behave ethically so that both they and their community can benefit. Environmental Responsibility is a business's initiative to leave the environment (where it is taking its resources from) the same, if not better, that it is found it.

## **BLOOM'S TAXONOMY**

Definitions of the different levels of thinking skills in Bloom's taxonomy

1. **Remember** – recalling relevant terminology, specific facts, or different procedures related to information and/or course topics. At this level, a student can remember something, but may not really understand it.
2. **Understand** – the ability to grasp the meaning of information (facts, definitions, concepts, etc.) that has been presented.
3. **Apply** – being able to use previously learned information in different situations or in problem solving.
4. **Analyze** – the ability to break information down into its component parts. Analysis also refers to the process of examining information in order to make conclusions regarding cause and effect, interpreting motives, making inferences, or finding evidence to support statements/arguments.
5. **Evaluate** – being able to judge the value of information and/or sources of information based on personal values or opinions.

6. **Create** – the ability to creatively or uniquely apply prior knowledge and/or skills to produce new and original thoughts, ideas, processes, etc. At this level, students are involved in creating their own thoughts and ideas.

### List of Action Words Related to Critical Thinking Skills

REMEMBER	UNDERSTAND	APPLY	ANALYZE	EVALUATE	CREATE
Count	Associate	Add	Analyze	Appraise	Categorize
Define	Compute	Apply	Arrange	Assess	Combine
Describe	Convert	Calculate	Breakdown	Compare	Compile
Draw	Defend	Change	Combine	Conclude	Compose
Identify	Discuss	Classify	Design	Contrast	Create
Label	Distinguish	Complete	Detect	Criticize	Drive
List	Estimate	Compute	Develop	Critique	Design
Match	Explain	Demonstrate	Diagram	Determine	Devise
Name	Extend	Discover	Differentiate	Grade	Explain
Outline	Extrapolate	Divide	Discriminate	Interpret	Generate
Point	Generalize	Examine	Illustrate	Judge	Group
Quote	Give	Graph	Infer	Justify	Integrate
Read	examples	Interpolate	Outline	Measure	Modify
Recall	Infer	Manipulate	Point out	Rank	Order
Recite	Paraphrase	Modify	Relate	Rate	Organize
Recognize	Predict	Operate	Select	Support	Plan
Record	Rewrite	Prepare	Separate	Test	Prescribe
Repeat	Summarize	Produce	Subdivide		Propose
Reproduce		Show	Utilize		Rearrange
Select		Solve			Reconstruct
State Write		Subtract			Related
		Translate			Reorganize
		Use			Revise
					Rewrite
					Summarize
					Transform
					Specify