



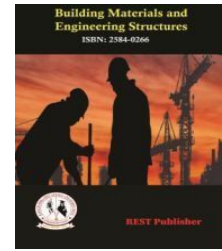
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Generalized Gravity And Fermat Principle Applications In Electrical Engineering Optimization Using The Wpm Method

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Abstract: The unexpected relevance of generalized gravity to electrical engineering may seem surprising, given that relativity was historically viewed as a complex rather than a straightforward element in engineering. However, when the Fermat Principle is taken into account, the connection between these two fields becomes less astonishing. This principle states that electromagnetic energy within a medium follows the shortest optical paths available, behaving like geodesics. Moreover, it provides mathematical frameworks for fields within curved geometries. Introducing problem-based learning, abbreviated as PBL, into Slovenian graduate programs focusing on electrical technology has yielded remarkable outcomes. Comparing to traditional methods, students demonstrated higher levels of understanding, as evidenced by improved exam scores. Both faculty and students, as indicated by survey responses, expressed high satisfaction with PBL. In particular, students highlighted that PBL enhanced their confidence and problem-solving skills.

Key word: Electrical engineering optimization using WPM for decision analysis.

1. INTRODUCTION

In another case, the study examined an electrical engineering course at a large university in the Southwest. The study comprised forty-six male and nine female participants, with the majority being juniors (N 32), seniors (N 16), and a small number of sophomores (N 7). Among the participants, nineteen percent (N 8) were majoring in chemical engineering, sixteen percent (N 9) in mechanical and aeronautical engineering, fifteen percent (N 8) in electrical engineering, while the remaining individuals (N 3) were pursuing majors in civil engineering, biosystems engineering, industrial engineering and management, and building design (N 1). Two participants did not disclose their majors. The course introduced students to electrical engineering fundamentals, covering topics such as mesh and AC/DC circuitry. Electrical engineering education developed alongside advancements in manufacturing, quickly becoming comparable to other prominent engineering disciplines within a decade. Electrical engineering programs incorporated telecommunications options in response to the growth of television and communication technologies. Concurrently, master's programs became increasingly common for students with a keen interest in research or teaching. Electrical engineering education developed alongside advancements in manufacturing, quickly becoming comparable to other prominent engineering disciplines within a decade. Electrical engineering programs incorporated telecommunications options in response to the growth of television and communication technologies. Concurrently, master's programs became increasingly common for students with a keen interest in research or teaching. However, only a small percentage pursued this option, and very few electrical engineers pursued doctoral degrees. In the decade following the war, the landscape of electrical engineering education underwent a significant overhaul. Pre-war courses underwent substantial revisions, with a heightened focus on fundamentals, especially the physical and mathematical principles underpinning electrical engineering. The evolution of electrical engineering education mirrors the growth of the electrical industry, particularly the electrical manufacturing sector. The early pioneers in electrical experimentation, invention, and entrepreneurship, such as Edison, Morse, Weston, Brush, Bell, Sprague, Westinghouse, Thomson, and others, who pioneered the practical applications of electrical phenomena, either received training in related fields like physics, chemistry, mechanics, or were self-taught individuals with a remarkable knack for innovation and tinkering. During the period from 1875 to 1885, the burgeoning electrical industry not only solidified electrical

engineering as a demanding profession but also generated a demand for educational programs to prepare individuals for careers in this emerging and dynamic field. The establishment of the first educational program in the United States, aimed at training individuals for careers in the burgeoning electrical industry, occurred at the Massachusetts Institute of Technology (MIT) in 1882. Thus, the initial electrical engineering programs were developed more in anticipation of future developments rather than to meet existing needs at the time. However, the unfolding events swiftly vindicated the proponents of these programs, and by the 1890s, enrollment in them equaled, if not surpassed, that of the more established fields of civil and mechanical engineering. For instance, at MIT, 27% of all graduates in 1892 were electrical engineers. The overall structure of electrical engineering curricula gradually evolved, placing greater emphasis on direct current (DC) and alternating current (AC) circuits, the characteristics of motors, generators, transformers, distribution systems, and the measurement of electrical quantities. A few courses were commonly available as professional electives, covering topics such as communication systems, batteries, electrical railways, and illumination. While some institutions offered courses in "wireless" telegraphy, this was more of an exception than the norm. Electrical engineering educators who were involved in wartime developments recognized this shift in demand. Upon their return to their respective institutions after the war, they advocated for enhancing the education of electrical engineers. The conditions were ripe for such developments. Veterans from the war sought structured training in the advancements made during wartime. Young individuals who had contributed to war projects were available as instructors, possessing both the qualifications and eagerness to teach the new subject matter. Consequently, the master's degree gradually became the desired academic goal for students aspiring to pursue careers in technical electrical engineering. They sought training that would equip them to engage with the continual influx of new ideas within the field. Regarding modeling in electrical engineering, the primary focus is on addressing mathematical and computational aspects without extensive prerequisites. It elucidates fundamental mathematical concepts, tools, and methodologies crucial to these problems, using illustrative examples to demonstrate these concepts effectively. While no single book can transform a reader into an expert with extensive experience in electrical engineering modeling, this particular book serves as an exceptional resource for grasping fundamental concepts and tools. Derived from the Greek "fysis," meaning nature, the term "physics" delves into the exploration of fundamental natural phenomena, thereby possessing a universal character. This universality explains why physics extends its influence into various domains, including electrical engineering. Physical phenomena stem from four primary interactions: gravity, weak, electromagnetic, and strong interactions. Each of these phenomena can be delineated using suitable mathematical frameworks, such as differential equations, group theory, probability theory, and others. Throughout this book, we will explore phenomena inherent to electrical engineering. Present deliberations in industrialized nations regarding the future of electrical engineering primarily focus on communication and information, largely driven by the advancements of microelectronics into molecular dimensions. Conversely, the energy sector is considered mature, offering limited prospects for future growth. In this paper, we showcase the practical utility of CLP(9~) through examples of programs designed to address electrical engineering challenges. This field is particularly fertile ground for complex and predominantly numerical problems, providing ample opportunities to demonstrate several unique features of CLP(9t). An in-depth examination of some key programming techniques underscores CLP(9t)'s capacity to support established, robust techniques from constraint programming. Our contention is that CLP(9t) embodies these techniques within a language that is more encompassing, refined, and adaptable than its predecessors, while remaining pragmatic. We have explored the application of CLP(9t) across various electrical engineering domains—including RLC circuit analysis, transistor circuit design, digital signal flow, and electromagnetic field analysis—that necessitate both symbolic reasoning and significant numerical computation. The majority of the programs discussed in this paper were initially crafted to explore the programming methodologies facilitated by the CLP(91) language and the viability of the CLP(9t) system. Our findings have revealed that CLP(91) inherently accommodates problem-solving techniques derived from the early stages of constraint programming languages. Furthermore, CLP(9t) emerges as a language that is more comprehensive, refined, and adaptable, while remaining pragmatic. Various models of PEMFCs are documented in the literature [6], a dynamic model for the PEMFC is introduced, albeit more suited for electrochemical applications rather than for electrical engineering purposes. For instance, when contemplating the integration of FC energy into the grid, the generation control system must determine the amount of power the FC will deliver to the grid based on the load demand. Hence, the dynamic response of the FC, from the perspective of energy systems, should align with the rapid fluctuations of a stochastic load curve. In numerous universities, majors are consolidated under a unified Electrical and Computer Engineering (ECE) department. Computer engineering originated from within electrical engineering, with the inaugural computer engineering program accredited by ABET in 1971. Computer engineering encompasses the principles and practices involved in designing, constructing, implementing, and maintaining both software and hardware components of modern computing systems and computer-controlled devices. Traditionally, computer engineering has been understood as a fusion of both computer science (CS) and electrical engineering (EE) [7]. Recent research has demonstrated the feasibility of integrating these elements into a cohesive framework, leveraging a game-based approach to teach

electronic and electrical engineering in a collaborative and competitive team setting. The utilization of a 3-D environment effectively replaced conventional 2-D remote laboratory interfaces, showcasing that in suitable contexts, immersive 3-D environments could provide a novel and captivating interactive method for teaching engineering-related concepts. In our exploration of entrepreneurship within premier departments of electrical engineering and computer science, we draw insights from contemporary sociological research emphasizing the significance of the social context in which economic actions unfold. The selection of the news-group was based on its widespread adoption in engineering, particularly in electrical engineering, as it offers a cost-effective communication platform compared to class email lists, albeit with less personal interaction. Primarily, the news-group served to inform students in advance about course-related matters such as outlines, access to new computer tutorials, and other pertinent information. Notably, it was instrumental in distributing problem assignments along with their solutions, allowing students additional time and a mechanism for self-assessment before tutorial sessions. We hypothesize that alternating between problems sharing structural similarities but differing in surface characteristics may have facilitated a deeper comprehension of electrical engineering principles covered in computer lessons. Consistent with prior research in diverse domains, contrasting problem solutions with those of new problems appears to enhance understanding of the underlying problem structure without imposing a substantial increase in cognitive load.

2. WPM METHOD

This article addresses the computational challenges of assessing bids with multiple features and measurements. Initially, the process involves standardizing each element of the bids and then employing a weighted product approach to create a unique scoring function for each bid. This scoring function assigns a score to every bid, facilitating evaluation. The article distinguishes between two types of multi-attribute auction models by employing grading methods and buying functions for objectives. The article is structured into several sections. Section 2 outlines the basic model, utilizing a weighted product approach to formulate a novel scoring function. Section 3 delves into the examination of bidders' equilibrium selling tactics, focusing on projected profits. To achieve equilibrium between the likelihood of winning and maximizing profit, Section 4 utilizes the Cobb-Douglas utility function in its computations. The most desirable bid, with subsequent discussion on equilibrium bidding strategies. Section 5 presents a comparison of the procurer's revenues [1]. This study adopts a quantitative approach utilizing descriptive methods, conducting a comparative analysis of observed phenomena [10]. Initially, the problems are identified and framed through a process involving interviews, observations, and literature review to gather relevant theories for this study. Among the methods used in Multiple Criteria Decision Making (MCDM), the Weighted Product Method (WPM) stands out as one of the most commonly employed techniques. Its efficiency in problem-solving is notable due to shorter calculation times compared to alternative methods [20]. Moreover, WPM is favored for its simplicity and ease of application, particularly in scenarios characterized by high subjectivity [21]. The method finds applications across various domains, including optimal route selection, evaluation of cyber operations, manufacturing processes, and project manager selection. [11]. Generalized product strategies are applied to analyze research data, employing division to link rating capabilities that are subsequently enhanced based on their values to foster success. In solving the FMADM (Fuzzy Multi-Attribute Decision Making) problem, the Weighted Product method is employed. This strategy enables the consideration of a wide range of options based on a set of independent criteria or attributes. According to Yoon, the Weighted Product technique connects attribute scores through multiplication, amplifying each feature's rating in accordance with its corresponding weight. [12]. A common method of assessing several possibilities when considering hiring new staff is to use the Balanced Product method. This method examines several options using a set of criteria or standards, whereby every attribute has to be taken seriously independently. Designing a website-based decision-support tool based on the Weighted Product approach for housing selection is the primary objective of this study. Eleven primary requirements were employed for this selection process, which were identified by surveying participants. [13]. The weighted product method (WPM) was initially introduced by Bridgeman in 1922 [15] [16]. It has since proven to be a highly reliable approach for addressing multi-criteria decision-making and has been successfully tested across a range of scenarios involving anywhere from three to one hundred criteria [15]. Several researchers have documented the effective application of WPM in various contexts, including selecting boarding houses [17], determining suitable food choices [18], choosing appropriate learning platforms [19], diagnosing diseases in ducks [20], among others. Building on the success of these previous studies, the present research endeavors to utilize WPM to address the challenges associated with house selection for individuals experiencing decision-making difficulties. The methodology was computed and integrated into a web-based system. The steps involved in the weighted product method are as follows: a. Multiply all attributes for each alternative by the weight, assigning a positive rank for the attribute of benefits and a negative rank for the attribute of costs. Sum the results of the multiplication to generate values for each alternative. Repeat the initial steps, but this time using the highest value for each benefit attribute and the lowest for each cost attribute. Divide the value of each

alternative (v) by the standard value to yield . Determine the optimal alternative order based on the resulting values [14]. This study aims to examine previous research regarding the application of the Weighted Products strategy in decision-making, such as the study titled "Implementation of Weighing Product Approach in Decision Support System Selection of Final Disposal Site (TPA)" conducted by Ari Wedhasmara and Rusdi Efendi (2016). The research aimed to identify the most suitable landfill location by utilizing the Weighted Product (WP) approach to input individual criteria values. The rank values generated by the WP method demonstrated a high degree of reliability. [15].]. The current research will incorporate findings from prior studies that utilized the Weighted Product method, such as the study titled "Implementation for Balanced Product Technique in Decision Support System Selection of Terminal Disposal Site (TPA)" authored by Ari Wedhasmara and Rusdi Efendi (2016). This study aimed to select the optimal landfill site by employing the Balanced Product (WP) approach to input sub-criteria values. In the Weighted Product (WP) approach, aspect evaluations are negatively ranked for the cost attribute, as multiplication is used to link attribute ratings, forming part of the decision-making framework. Attribute weights are assigned positively to facilitate the multiplication process. [In employing multiplication to connect feature ratings, the Generalized Product approach elevates each attribute rating according to its assigned weight, thereby equalizing the data at the outset. Conducted in 2019 at PT. XYZ, the research incorporated details on defective goods and manufacturing cycle times. In the current study, the Weighted Product method is integrated with a lean six sigma approach.

3. MATERIALS AND METHOD

Passion for Technology: Passion for technology refers to a deep and genuine interest, excitement, and dedication towards exploring, understanding, and innovating within the realm of technology. It involves an inherent curiosity about how technology works, its potential applications, and its impact on society. People with a passion for technology often immerse themselves in learning about new advancements, experimenting with different tools and technologies, and pushing the boundaries of what is possible. This passion drives them to pursue careers in technology-related fields, contribute to technological advancements, and use Advancements in technology aim to enhance the quality of life for individuals and tackle challenging issues. Ultimately, a passion for science fuels innovation, fosters creativity, and shapes the trajectory of scientific progress.

Math and Physics Skills: Math and physics skills encompass the ability to comprehend, analyze, and solve problems using mathematical and physical principles, theories, and concepts. These skills involve a combination of understanding abstract mathematical concepts and applying them to real-world phenomena. Math skills involve proficiency in arithmetic, algebra, geometry, calculus, statistics, and other branches of mathematics. Individuals with strong physics skills can analyze and predict the behavior of physical systems, conduct experiments, and apply theoretical frameworks to explain natural phenomena. Developing math and physics skills requires critical thinking, problem-solving abilities, logical reasoning, and attention to detail. These skills are essential in a wide range of fields, including engineering, computer science, finance, medicine, and research, where they are used to design systems, analyze data, model complex phenomena, and make informed decisions. Moreover, math and physics skills are foundational for understanding and contributing to advancements in science, technology, and innovation.

Critical Thinking Abilities: Critical thinking Analytical abilities encompass an individual's capability to methodically and carefully evaluate, analyze, and integrate data, concepts, and reasoning. Individuals with strong critical thinking abilities are able to: Understand, Analyze, Evaluate, Synthesize, Apply, Developing critical thinking abilities requires practice, open-mindedness, and intellectual humility. It involves asking probing questions, challenging assumptions, considering multiple viewpoints, and seeking evidence to support claims or conclusions. Critical thinking is essential for effective problem-solving, decision-making, communication, and lifelong learning. It enables individuals to navigate complex issues, think independently, and make informed choices in an increasingly diverse and interconnected world.

Curiosity about Emerging Technologies: Curiosity about emerging technologies refers to a strong desire to explore, learn, and understand the latest advancements, innovations, and trends in technology. Individuals exhibit curiosity about emerging technologies are driven by a sense of wonder and fascination with the possibilities that new technologies present. Here are some key aspects of curiosity about emerging Exploration, Learning, Innovation Critical Thinking, Adaptation, Impact Overall, curiosity about emerging technologies fuels innovation, drives progress, and shapes the future of technology and society. It encourages lifelong learning, fosters a spirit of exploration and experimentation, and empowers individuals to adapt and thrive in an ever-evolving technological landscape

Computer Engineering: Computer In the realm of engineering, commonly denoted as CPE or continuing engineering (COE), the field merges principles of electrical engineering and computer science with engineering practices., blending various aspects of both fields necessary for the creation of computer hardware and software.

Robotics Engineering: Robotics engineers play a crucial role in designing robotic systems that undertake a variety of tasks, both human and non-human. In this capacity, as a robotics engineer, your responsibilities encompass designing, constructing, maintaining, and repairing robots. Additionally, you will be engaged in research activities and the development of novel applications for existing robotic technologies.

Renewable Energy Engineering: Renewable Energy Engineering is centered on the creation and deployment of renewable energy systems aimed at delivering clean, efficient, and dependable power sources. Its primary goal is to diminish reliance on fossil fuels while mitigating environmental harm.

Biomedical Engineering: In response to healthcare needs, biomedical engineering, also known as medical engineering, integrates fundamental engineering principles and design concepts into the realms of biology and medicine. BME enhances medical practices by incorporating technological advancements into various areas such as treatment, monitoring, and diagnostics.

4. ANALYSIS AND DISCUSSION

TABLE 1. Electrical engineering

DATA SET				
	Passion for Technology	Math and Physics Skills	Critical Thinking Abilities	Curiosity about Emerging Technologies
Computer Engineering	36.26	152.32	35.62	89.35
Robotics Engineering	37.25	145.98	33.76	37.45
Renewable Energy Engineering	31.25	131.25	39.65	47.38
Biomedical Engineering	38.63	147.56	41.23	36.75
Telecommunications Engineering	37.42	188.91	47.65	32.49
	B	B	NB	NB

Table 1 shows the electrical engineering for weighted product model. Passion for Technology, Math and Physics Skills, Critical Thinking Abilities, Curiosity about Emerging Technologies..Figure 1 electrical engineering in Computer Engineering, Robotics Engineering, Renewable Energy Engineering, and Biomedical Engineering. From the figure 1 and table 1 it is seen that Biomedical Engineering is showing the Highest Value for Passion for Technology and Renewable Energy Engineering showing the lowest value. Telecommunications Engineering is showing the Highest Value for Math and Physics Skills and Renewable Energy Engineering is showing the Lower value. Telecommunications Engineering is showing the Highest Value for Critical Thinking Abilities and Solar Robotics Engineering is showing the lowest value Computer Engineering is showing the Highest Value for Curiosity about Emerging Technologies and Telecommunications Engineering is showing the lowest value.

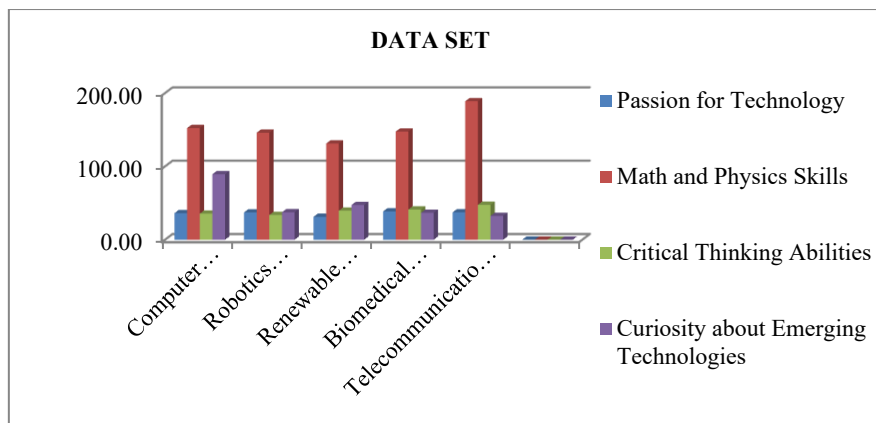


FIGURE 1. Electrical engineering

Figure 1 show the Provides a comparative analysis of student characteristics in five engineering disciplines: computing, robotics, renewable energy, biomedical, and telecommunications. Four assessment criteria are considered: interest in technology, mathematical and physical skills, critical thinking skills, and interest in

emerging technologies. Across all disciplines, mathematical and physical skills consistently show high values, especially in telecommunications and biomedical fields, indicating that strong analytical and quantitative skills are essential in these areas. Robotics and computing show high mathematical skills, although slightly lower than telecommunications. Interest in technology is moderately distributed across all disciplines, with relatively similar values, indicating a stable level of interest among students in different engineering specialties. Critical thinking skills show balanced scores, reflecting the importance of problem-solving skills in technical disciplines. Interest in emerging technologies is notably strong in robotics and computing, highlighting a high interest in innovation and technological advances in these areas. The renewable and biomedical sectors also show a steady but slightly lower level of interest.

TABLE 2. Performance value

Weight			
0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25

Table 2 shows the performance value for electrical engineering. Passion for Technology, Math and Physics Skills, Critical Thinking Abilities, Curiosity about Emerging Technologies and Computer Engineering, Robotics Engineering, Renewable Energy Engineering, Biomedical Engineering it is also Maximum and Minimum value.

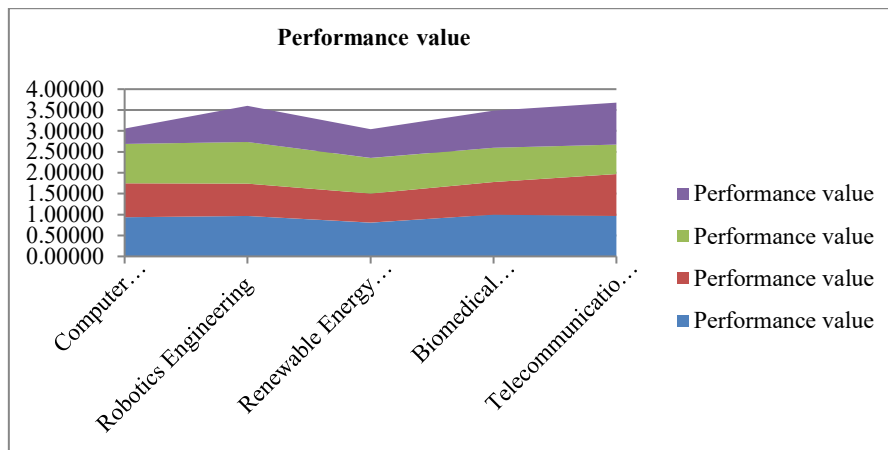


FIGURE 2. Performance value

Figure 1 show The stacked area representation shows the combined contribution of several performance components, resulting in an performance value for each sector. From the graph, Robotics shows one of the highest overall performance values, approaching 3.5. This indicates strong combined contributions from all measured parameters. Telecommunications shows a similarly high total value, indicating consistent strength across the evaluation criteria. Biomedical Engineering follows closely, maintaining a consistent and competitive performance level. In contrast, Renewable Engineering shows a significant decline in overall performance compared to the other domains. Although it still maintains moderate values, its combined score is relatively low. The Computers domain shows consistent performance with balanced contributions from all components, but does not reach the peak levels observed in Robotics or Telecommunications.

TABLE 3. Weightages

Weight			
0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25

Table 3 shows the This means that each criterion has the same level of importance in the evaluation process. Since the sum of the weights in each row is equal to 1.00 ($0.25 \times 4 = 1$), the weighting system is properly normalized and mathematically balanced. Such equal weighting implies that no single performance factor is given priority over another. All criteria related to technical performance, efficiency, cost, sustainability, or any other parameter are treated with equal importance in the decision-making model. This approach is typically used when the

evaluator wants to maintain neutrality and avoid bias towards any particular factor. In multi-criteria decision-making methods such as the Weighted Composite Model (WSM) or the Weighted Product Model (WPM), equal weights ensure that each parameter contributes proportionally to the final score. This is particularly useful in initial evaluations where there is no clear rationale to support a criterion,

TABLE 4. Weighted Normalized Decision Matrix

Weighted normalized decision matrix				
Computer Engineering	0.9843	0.9476	0.98668	0.77654
Robotics Engineering	0.99095	0.93758	1	0.9651
Renewable Energy Engineering	0.94838	0.91298	0.96059	0.90999
Biomedical Engineering	1	0.94011	0.95126	0.96967
Telecommunications Engineering	0.99208	1	0.91746	1

Table 4 shows the Weighted Normalized Decision Matrix. Passion for Technology, Math and Physics Skills, Critical Thinking Abilities, Curiosity about Emerging Technologies and Computer Engineering, Robotics Engineering, Renewable Energy Engineering, Biomedical Engineering it is also weighted Normalized Decision Matrix value.

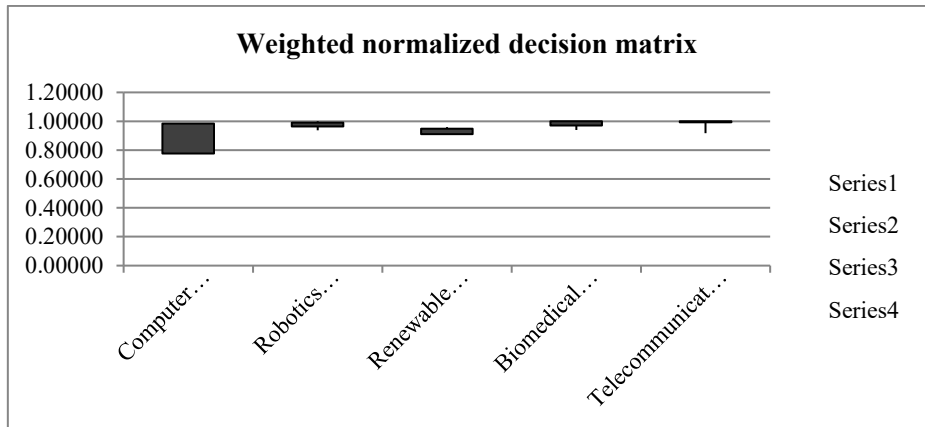


FIGURE 3. Weighted normalized decision matrix

Figure 3 shows the Weighted Normalized Decision Matrix. Passion for Technology, Math and Physics Skills, Critical Thinking Abilities, Curiosity about Emerging Technologies and Computer Engineering, Robotics Engineering, Renewable Energy Engineering, Biomedical Engineering it is also weighted Normalized Decision Matrix value.

TABLE 5. Result of Final Preference score and Rank

	Preference Score	Rank
Computer Engineering	0.71465	5
Robotics Engineering	0.89667	2
Renewable Energy Engineering	0.75687	4
Biomedical Engineering	0.86716	3
Telecommunications Engineering	0.91018	1

Table 5 shows the Result of Final Preference score and rank of WPM for electrical engineering. Preference score Telecommunications Engineering is showing the highest value for preference score and Solar Computer Engineering is showing the lowest value

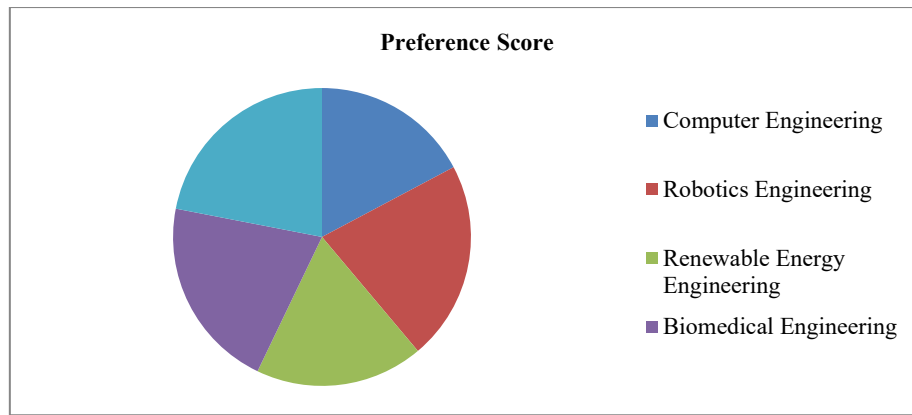


FIGURE 4. Preference Score

Figure 4 shows the The "Preference Score" reveals the relative preference levels among four engineering disciplines: Computer Engineering, Robotics Engineering, Renewable Energy Engineering, and Biomedical Engineering. Each segment of the chart represents the proportion of the overall preference assigned to each discipline based on the evaluation criteria. From the visual distribution, it appears that Robotics Engineering and Biomedical Engineering have slightly larger shares compared to the others, indicating stronger overall preference scores. This indicates that these disciplines perform better when multiple criteria such as technical skills, innovation skills, and analytical skills are considered together. Computer Engineering shows a moderate portion, reflecting consistent and competitive performance, but slightly lower preference compared to the top-performing disciplines. Renewable Energy Engineering also occupies a similar proportion, showing consistent but relatively moderate evaluation results. The differences between the segments are not very large, indicating that all four disciplines maintain relatively close performance levels. This indicates a competitive environment in which no single discipline dominates the preference rankings.

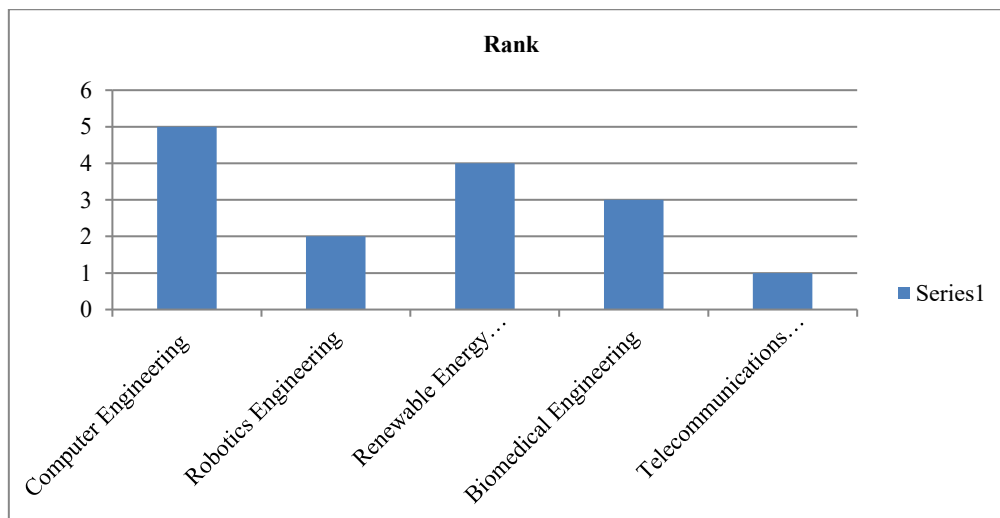


FIGURE 5. Rank

Figure 5 Shows the The "Rankings" provide the ranking positions of five engineering disciplines: Computer Engineering, Robotics Engineering, Renewable Energy Engineering, Biomedical Engineering, and Telecommunications Engineering. The vertical axis represents the ranking values, while the horizontal axis lists the respective disciplines. From the chart, Telecommunications Engineering is ranked 1st, indicating the highest overall performance or preference among the disciplines evaluated. Robotics Engineering is positioned at 2nd, reflecting a strong performance and competitive position. Biomedical Engineering is ranked 3rd, indicating moderate but commendable evaluation results. Renewable Energy Engineering is placed at 4th, showing relatively lower performance than the top three disciplines, but still maintaining relevance within the evaluation framework. Computer Engineering is ranked 5th, indicating the lowest evaluation score in this particular comparison. The ranking distribution shows a clear distinction between the best performing and the least performing disciplines. Telecommunications and robotics show strong combined performance across selected criteria, while computer engineering lags behind in this analysis.

4. CONCLUSION

The application of Weighted Product Model (WPM) in electrical engineering provides a systematic and reliable approach to evaluating multiple alternatives based on multiple performance criteria. By assigning appropriate weights to each criterion and using multiplicative aggregation, WPM ensures that the relative importance of factors such as performance, reliability, cost, safety, and environmental impact are accurately reflected in the final decision. Unlike simple additive methods, WPM minimizes the effect of size differences and maintains proportionality between criteria, leading to more accurate and consistent results. In electrical engineering problems such as selecting backup systems, replacing equipment, power generation technologies, or transmission solutions - the WPM method supports objective comparison and reduces subjective bias. It highlights the strengths and weaknesses of each alternative while creating a clear ranking based on overall performance.

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