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An Effective Implementation of Environmental Science Course at Undergraduate Level

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ABSTRACT-- *Environmental science connects with any issue that influence surrounding and living organism. Environmental sciences is a multidisciplinary subject. Obeying the supreme court of India orders in the year 1999 environmental science course has been made mandatory for all undergraduates including engineering students. The chief cause of implementing this course is to bring awareness on environment, to reduce environmental pollution and to save environment. Many researchers proved that environmental education will develop pro environmental behavior and environment friendly thinking. Multiple studies proved that persons with higher environment knowledge follow the principle Reduce, Reuse and Recycle. Even though Supreme Court ordered to implement this course more effectively, this course is not attaining much importance in engineering programme. There is a significant gap between Environmental science course and engineering core subjects. To find out the reasons for this gap a research was conducted and presented in this paper. In the present investigation a questionnaire was prepared and distributed to the students to take opinions from the students. Data collected from 600 students from different branches. Results of present investigation proved the importance of the environmental science course, modification of syllabus, necessity to give credits to Environmental science course. This research also proved the role of Environmental science course to make India "Clean India" (Swachh Bharat).*

Keywords-- *Environmental science, Engineering programme, Swachh Bharat, Questionnaire, pro environmental behavior.*

I. INTRODUCTION

Our planet earth is like mother to all of us, it is a valuable gift of the universe. Implementation of Environmental science course in academic syllabus will develop positive attitudes, sense of responsibility and environment friendly behavior to protect environment [1] UN Conference on Environment and Development (UNCED) was held in Rio de Janeiro, Brazil, in 1992. Agenda 21 of this conference identifies environmental education as one of the catalyst for sustainable development [2]. In chapter 36, it states that "Education is critical for promoting sustainable development and improving the capacity of people to address environment and development issues" [3]. Many researchers stated that environmentally literate society can solve the problem of human exploitation and stop natural resources exploitation [4-6]. Learning about the environment not only restricted to environmental courses, but it is important for the engineering students because according to the organization for American Engineering Education (ASEE, 1999), engineering students should learn about environment and sustainable development in the general education

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component of the curriculum as they are preparing for the major design experience [7]. The United Nations (UNESCO) launched the "Decade of Education for Sustainable Development, (DESD)" (2005-2014). Knowledge of environment has dual benefits. First it develops environmental awareness and inhibit environmental destruction behaviors. Second it develops conservation and enhancement of environment quality. This will improve quality of life and comfortable living.

II. METHODOLOGY

Environmental science subject deals with living and nonliving components of the environment [8]. Environmental sciences are a multidisciplinary subject. Chemistry, Biology, Sociology, Physics, Computers, Philosophy, Anthropology, Health, Economics, Statistics, Geology and Engineering. Engineering students require the knowledge of Environmental science course because engineers run the industries and develop technologies. So that engineers with environment knowledge can develop pro environment technologies and solve environmental problems due to industries. Educational institutions and students are neglecting this subject. From 2018-2019 academic year on wards AICTE (All India Council for Technical Education) declared this subject as a non- credits subject [8]. This decision will effect strict implementation of Environmental science course because when there are no credits, students will not study this subject seriously. There is misunderstanding between Environmental science course and engineering community. The chief objective of present research paper is to remove the misunderstanding regarding environmental science course, make this course more effective and interesting. For this purpose, a research survey was conducted in engineering colleges by distributing simple questionnaire. This questionnaire distributed to 600 under graduate students from different engineering braches and their opinions were collected.

Following questionnaire was distributed to the students. This questionnaire contains five questions. Each question contains three choices A, B, C.

1) To what extent the Environmental science Course will be beneficial to the Engineering students?

(A) To a great extent

(B) To some extent

(C) Cannot say

2) How far does the present Environmental science Course syllabus correlate with engineering core subjects?

(A) Very much

(B) Not much

(C) Cannot say

3) Does the present Environmental science syllabus require modifications?

(A) Yes

(B) No

(C) Cannot say

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4) Does the Environmental science course need credits?

(A) Agree

(B) Disagree

(C) Cannot say

5) Does the Environmental science course knowledge useful to make India "Clean India" (Swachh Bharat)?

(A) Yes

(B) No

(C) Cannot say

Six branches students participated in present investigation. Branches of Computer Science Engineering (CSE), Information Technology (IT), Electronics and Communication Engineering (ECE), Electrical & Electronics Engineering (EEE), Mechanical Engineering (ME) and Civil Engineering (CE) students participated in present investigation. From each engineering branch 100 students took part in present investigation. For each student one print copy of questionnaire was supplied and 30 minutes duration was given to answer questionnaire. To collect opinions from students, from each branch 100 students were invited to seminar hall separately. Like this 100*6=600 students took part in this investigation. This investigation was conducted in a free and fair environment.

III. RESULTS AND DISCUSSION

Question number 1: To what extent the Environmental Science Course will be beneficial to the Engineering students?

(A)To a great extent (B)To some extent (C)Cannot say

Response from undergraduates for question number 1 is shown in table I

More than 95% students of all branches agreed with choice A.

Data of table I represented in the form of a graph (Figure.1).

Figure.2 represents sum of undergraduates agreed with choice A.

Figure.3 represents sum of undergraduates agreed with choice B.

Figure.4 represents sum of undergraduates agreed with choice C.

Question number 2: How far does the present Environmental Science Course syllabus correlate with engineering core subjects?

(A)Very much (B)Not much (C)Cannot say

Response from undergraduates for question number 2 is shown in table II

Majority of CSE, IT and ECE undergraduates agreed with choice B. Because generally CSE, IT and ECE syllabus don't contain any environment related concepts. There are few topics like green computing, role of information technology in environment, remote sensing and GIS which require environmental science knowledge. So that CSE, IT and ECE undergraduates agreed with choice B. Majority of EEE, ME and CE undergraduates agreed with choice A. Because Environmental engineering subject is one of the major core subject to the civil engineering students. Environmental science topics like e-waste management, renewable resources etc.. related to EEE core

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subjects. Environmental science topics like water resources, thermal pollution etc., related to ME core subjects. Data of table II represented in the form of a graph (Figure 5).

Figure.6 represents sum of undergraduates agreed with choice A.

Figure.7 represents sum of undergraduates agreed with choice B.

Figure.8 represents sum of undergraduates agreed with choice C.

Resemblances between Environmental science topics with engineering core topics showed in table III

Question number 3: Does the present Environmental science syllabus require modifications?

(A)Yes (B)No (C)Cannot say

Response from undergraduates for question number 3 is shown in table IV

Majority of CSE, IT, EEE and ECE branches students expressed opinion that present environmental science subject syllabus should be modified. Because many software companies and electronic companies are thinking more environment friendly technologies. Example recently Microsoft initiated a new research project to find out the possibility of undersea data centers powered by offshore renewable energy like wind energy [9]. Undersea datacenters offers ready access to cooling and a controlled environment, and has the potential to be powered by locally available renewable power resources. One more example is research team at Italian institute of technology developing biodegradable smart materials and biodegradable robots which are more environment friendly[10]. Electronic waste disposal is a big challenge to scientific community. Electronic students with environmental science knowledge can find solutions for these type of problems. Due to these reasons young engineering students are thinking that there is a future for environment friendly technologies. Therefore students expressed opinion that Environmental science course syllabus should be modified which correlate with their core subjects. Majority of ME and CE students are in favor of B. Because few core subjects of their branch correlate with Environmental science. Data of table IV represented in the form of a graph (Figure 9).

Figure.10 represents sum of undergraduates agreed with choice A.

Figure.11 represents sum of undergraduates agreed with choice B.

Figure.12 represents sum of undergraduates agreed with choice C.

Question number 4: Does the environmental science course need credits?

(A)Agree (B)Disagree (C)Cannot say

Response from undergraduates for question number 4 is shown in table V

All engineering students are agreed with choice A. Because there are no credits to this subject so students may not take the particular subject seriously, in addition to that students realize that the subject has not importance. Therefore AICTE should give credits to this subject like other core subjects. Table V data represented in the form of a graph (Figure 13).

Figure.14 represents sum of undergraduates agreed with choice A.

Figure.15 represents sum of undergraduates agreed with choice B.

Figure.16 represents sum of undergraduates agreed with choice C.

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Question number 5: Does the environmental science course knowledge useful to make India "Clean India" (Swachh Bharat)?

(A) Yes (B) No (C) Cannot say

Response from undergraduates for question number 5 is shown in table VI

All undergraduates agreed with choice A . Because the main objective of environmental science is to save environment and make our surrounding clean & green. The Slogan of swachh Bharath is "One step towards cleanliness"[11]. Young engineering students apply the environmental science knowledge to their lives and motivate the society to make India "Clean India". Therefore Environmental science course knowledge useful to students to make India "Clean India". Table VI data represented in the form of a graph (Figure 17).

Figure.18 represents sum of undergraduates agreed with choice A.

Figure.19 represents sum of undergraduates agreed with choice B.

Figure.20 represents sum of undergraduates agreed with choice C.

Table1: Sum of undergraduates agreed with choice

A, B & C

S. no.	**Branch**	**Sum of undergraduates agreed with choice A**	**Sum of undergraduates agreed with choice B**	**Sum of undergraduates agreed with choice C**
1.	CSE	95	03	02
2.	IT	96	02	02
3.	EEE	98	02	00
4.	ECE	96	02	02
5.	ME	100	00	00
6.	CE	100	00	00

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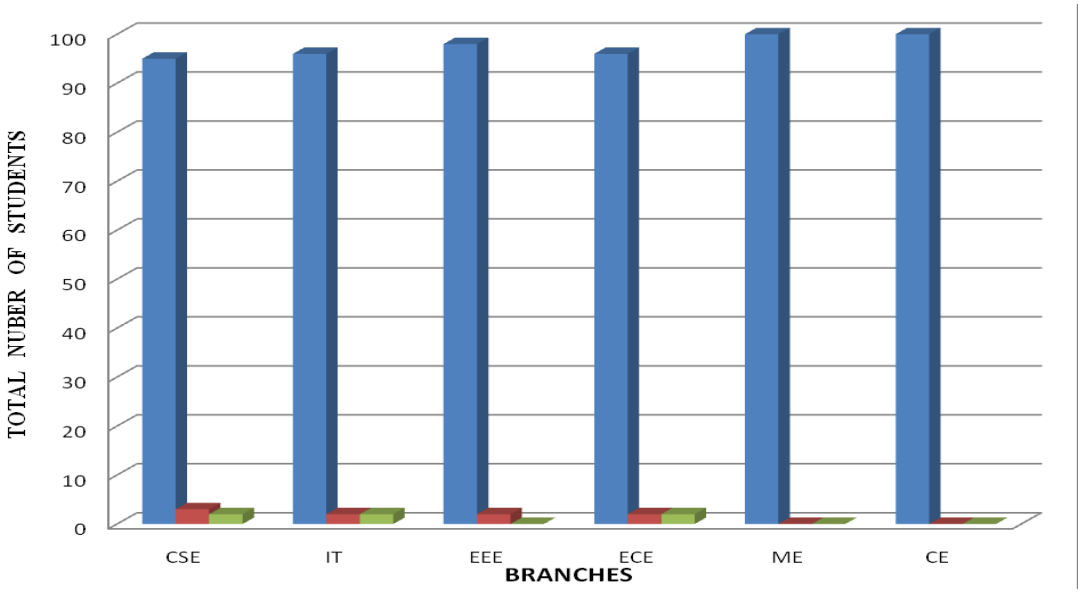

Figure1: Sum of undergraduates agreed with choice A, B & C.

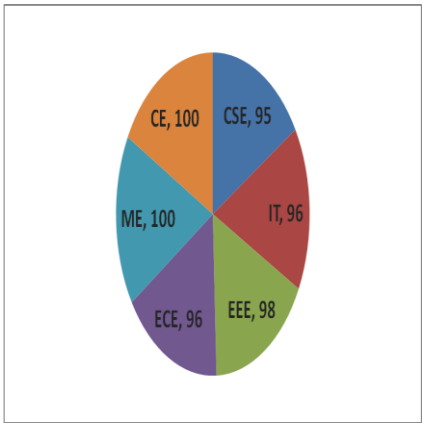

Figure2: Choice A

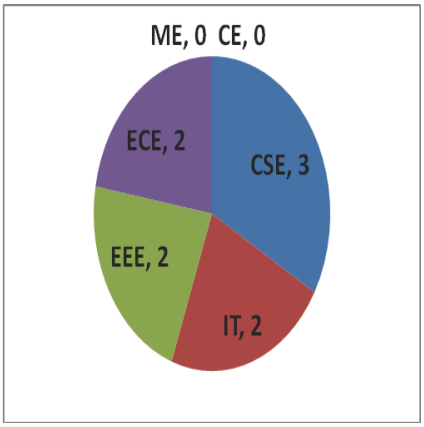

Figure3: Choice B

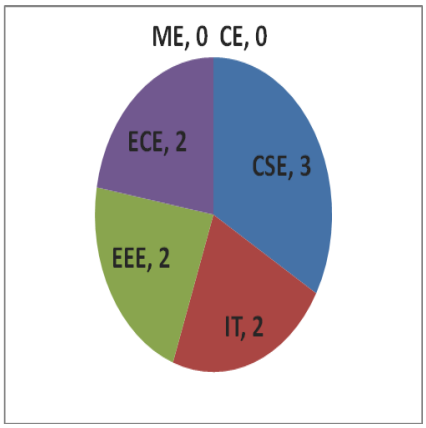

Figure 4: Choice C

Table 2: Sum of undergraduates agreed with choice A, B & C

S. no.	Branch	Sum of undergraduates	Sum of	Sum of

DOI: 10.37200/IJPR/V24I4/PR201363
Received: 22Sep 2019 | Revised: 13 Oct 2019 | Accepted: 15 Jan 2020

		agreed with choice A	undergraduates agreed with choice B	undergraduates agreed with choice C
1.	CSE	03	96	01
2.	IT	03	95	02
3.	EEE	80	17	03
4.	ECE	02	96	02
5.	ME	90	08	02
6.	CE	93	06	01

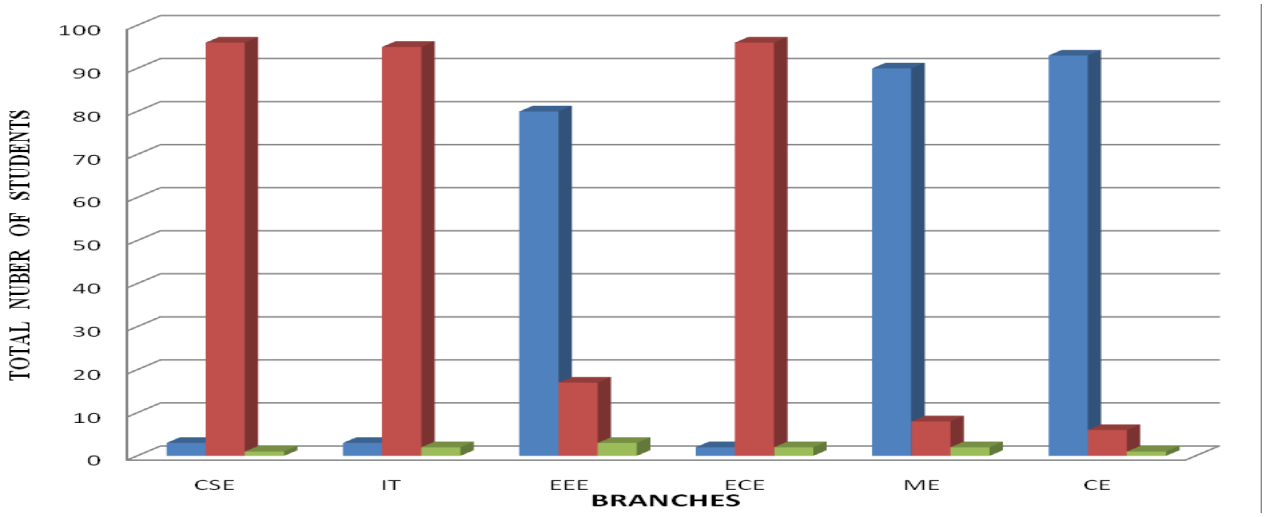

Figure 5: Sum of undergraduates agreed with choice A, B & C.

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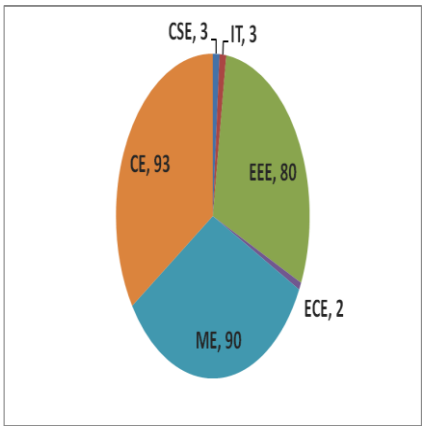

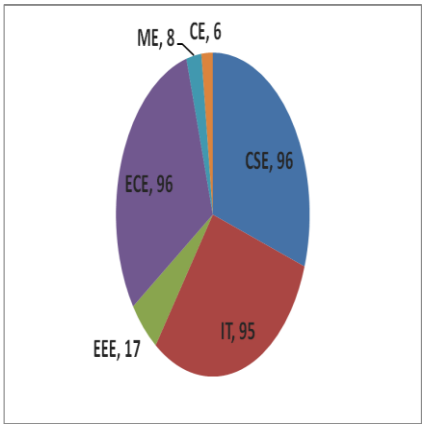

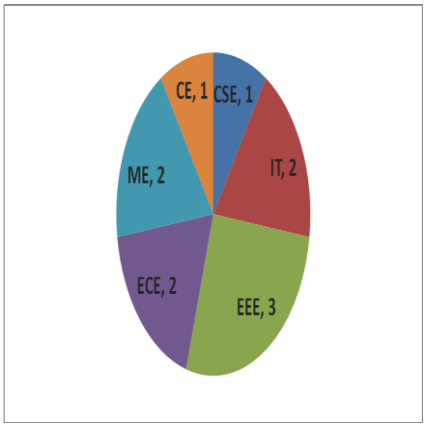

Figure 6: Choice **A**

Figure 7: Choice B

Figure 8: Choice C

Table 3 : Resemblances between Environmental science topics with engineering core topics

S. no.	Environmental science topics	Resemblance with engineering core topics	Courses
1.	Water resources	Water resources engineering	CE
2.	Advantages and disadvantages with dams	Dams construction engineering	CE
3.	Watershed management	Watershed management	CE
4.	Water treatment methods	Water treatment technologies	CE
5.	Solid waste management	Solid waste management	CE
6.	Thermal pollution	Thermal power stations	ME

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7.	Noise pollution	Automobiles engineering	ME
8.	Global warming	Fossil fuels	ME
9.	Ozone layer depletion	Air conditioners /Refrigerators	ME
10.	Air pollution	Automobiles engineering	ME
11.	Environmental effects of 2 stroke and 4 stroke engines	Automobile engineering	ME
12.	Renewable energy resources	Renewable/Non-conventional energy resources	EEE and ECE

Table 4: Sum of undergraduates agreed with choice A, B & C

S. no.	Branch	Sum of undergraduates agreed with choice A	Sum of undergraduates agreed with choice B	Sum of undergraduates agreed with choice C
1.	CSE	95	02	03
2.	IT	94	02	02
3.	EEE	55	30	15
4.	ECE	90	03	07
5.	ME	30	70	00
6.	CE	20	80	00

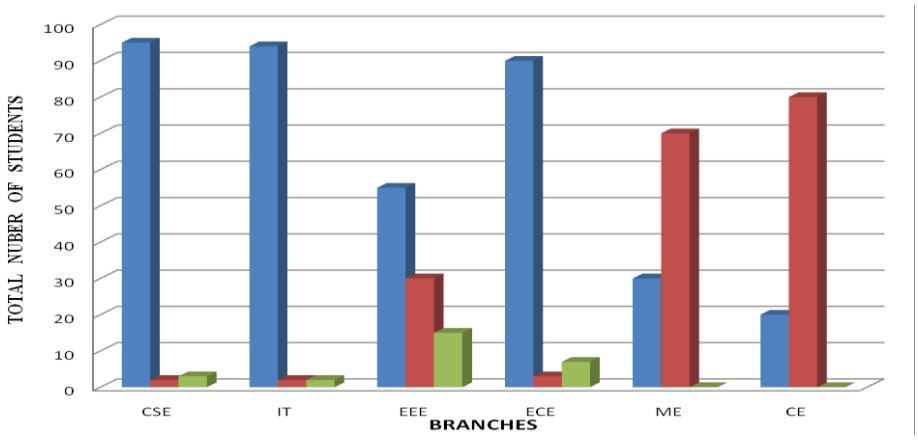

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Figure9: Sum of undergraduates agreed with choice A, B & C.

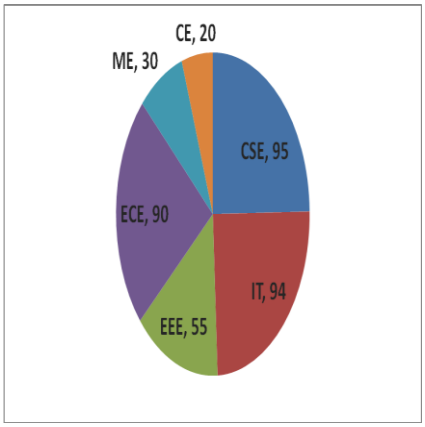

Figure 10: Choice A

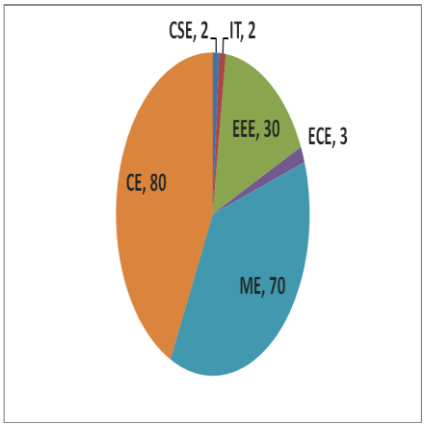

Figure 11: Choice B

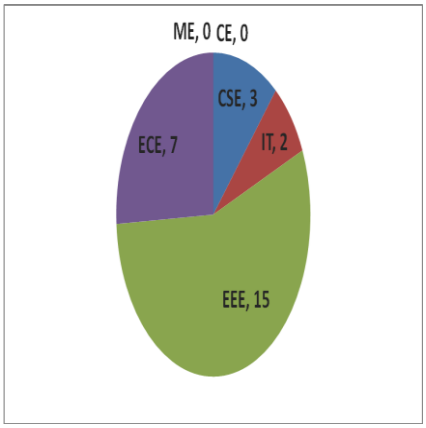

Figure 12: Choice C

Table 5: Sum of undergraduates agreed with choice A, B & C.

S. no.	Branch	Sum of undergraduates agreed with choice A	Sum of undergraduates agreed with choice B	Sum of undergraduates agreed with choice C
1.	CSE	96	03	01
2.	IT	97	02	01
3.	EEE	97	01	02
4.	ECE	96	02	02
5.	ME	98	01	01
6.	CE	100	00	00

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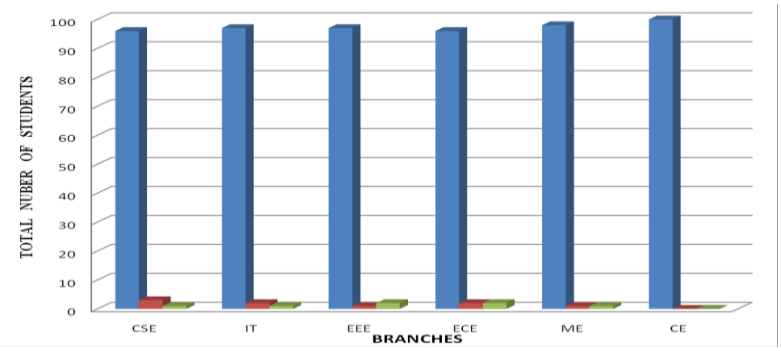

Figure 13: Sum of undergraduates agreed with choice A, B & C.

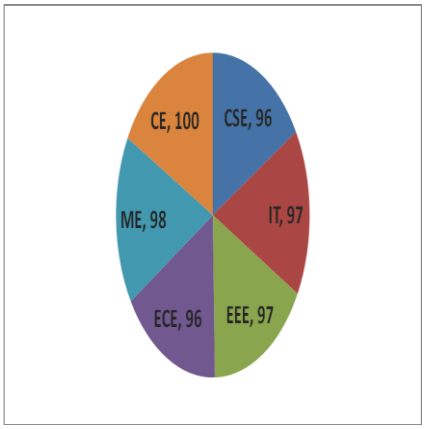

Figure 14: Choice A

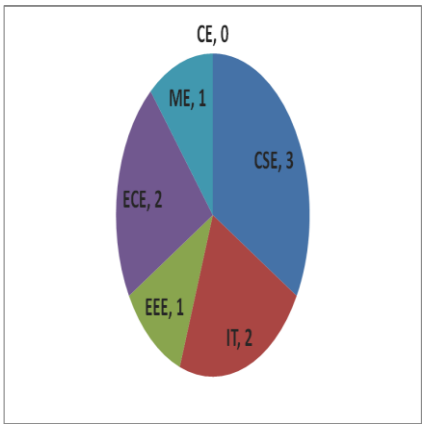

Figure 15: Choice B

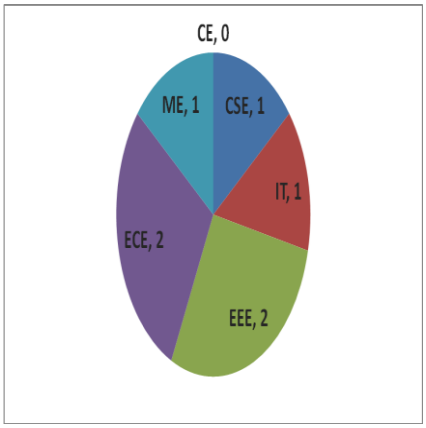

Figure 16: Choice C

Table 6: Sum of undergraduates agreed with choice A, B & C.

S. no.	Branch	Sum of undergraduates agreed with choice A	Sum of undergraduates agreed with choice B	Sum of undergraduates agreed with choice C
1.	CSE	97	01	02
2.	IT	96	01	03

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3.	EEE	99	01	00
4.	ECE	97	02	01
5.	ME	100	00	00
6.	CE	100	00	00

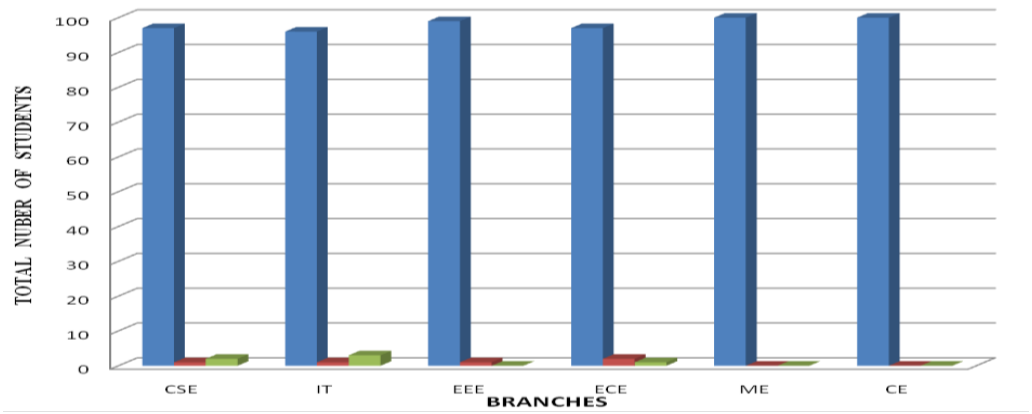

Figure 17: Sum of undergraduates agreed with choice A, B & C.

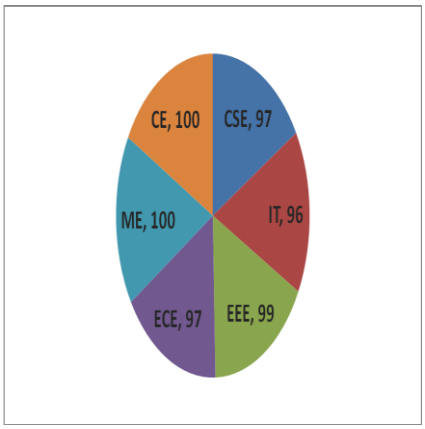

Figure 18: Choice A

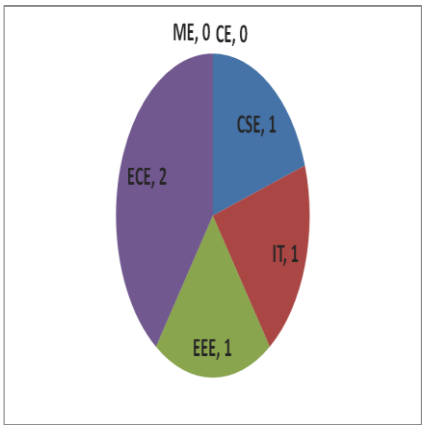

Figure 19 : Choice B

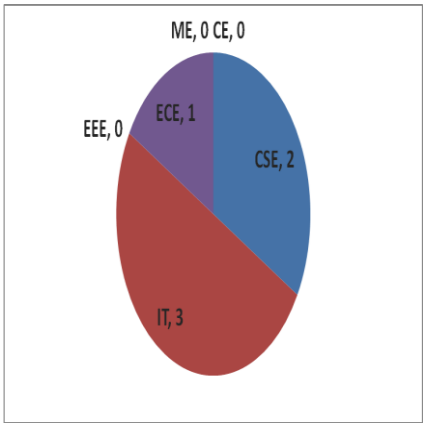

Figure 20 : Choice C

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IV. CONCUSION

The results of this research proved keen interest of engineering students to study Environmental science course. This research proved the importance of Environmental science course to engineering programme. Knowledge of this subject improves pro environmental behavior among students therefore students will able to think more environment friendly. The pro environmental behavior with in society will make India "Clean India". To implement this course more effectively AICTE should give credits to this subjects and AICTE should make mandatory to perform environment friendly projects in engineering programme. Opinions from Chemical and Biotechnology braches were not collected in present investigation. In future this research can be extended to Chemical and Biotechnology braches. Core subjects of these two branches largely correlated with syllabus of Environmental science, so we may get different type of results from these two branches for this questionnaire. This research was conducted in engineering colleges which are present in city. In future this research can be extended to engineering colleges which are present in rural areas.

REFERENCES

1. Palmer, J. and Neal, P. (1994). The handbook of environmental education, London: Routledge.
2. United Nations (1992) Agenda 21: Earth Summit -United Nations Conference on Environment and Development (UNCED), Rio de Janeiro, Brazil.
3. UN (1992) "The United Nations Programme of Action from Rio: Agenda 21", UN Department of Public Information.
4. UNESCO (1997) United Nations Educational, Scientific and Cultural Organization. A report from the International Conference on Environment and Society: Education and Public Awareness for Sustainability, 8-12 Dec.
5. Roth, C. E. (1996). Benchmarks on the way to environmental literacy K-12, Massachusetts S.
6. Wilke, R. (1995). Environmental literacy and the college curriculum, *EPA* Journal, *21*(2): 28-30.
7. American society for Engineering Education, ASEE (1999) ASEE Statement on Sustainable development Education..http://www.asee.org/about-us/theorganization/our-board-of-directors/asee-board-of-directors-statements.
8. https://www.aicte-india.org/sites/default/files/Vol.%20I_UG.pdf (page number:3)
9. https://natick.research.microsoft.com/
10. https://sputniknews.com/europe/201601201033397980-italian-scientists-decomposing-robots/
11. https://en.wikipedia.org/wiki/Swachh_Bharat_mission
12. Anvaripour, A., Ashkpour, H., Marashian, M., Mirzaei, K., Jahangirifard, A.The efficacy and side effects of dexmedetomidine and morphine in patient-controlled analgesia method after coronary artery bypass grafting surgery(2018) International Journal of Pharmaceutical Research, 10 (1), pp. 251-256.

DOI: 10.37200/IJPR/V24I4/PR201363
Received: 22Sep 2019 | Revised: 13 Oct 2019 | Accepted: 15 Jan 2020

13. Logarasu, R., &Andulgafoor, A. (2015). Bayesian Saliency Using the Spectral form of Relaxation Aid Cuts. International Journal of Communication and Computer Technologies, 3(1), 37-51.
14. Rezaei, A., & Noori, L. (2016). Novel Efficient Designs for QCA JK Flip flop Without Wire-crossing. International Academic Journal of Science and Engineering, 3(2), 93-101.
15. Khan, S.I., Sultan, A.A., Riyadh, H.A. Academic performance, social media effects, and leaning of college students: Evidence of positive influence in erbil city (2019) Journal of Research on the Lepidoptera, 50 (4), pp. 177-186.
16. Warren, A.D., Nakahara, S., Lukhtanov, V.A., Daly, K.M., Ferris, C.D., Grishin, N.V., Cesanek, M., Pelham, J.P. A new species of Oeneis from Alaska, United States, with notes on the Oeneis chryxus complex (Lepidoptera: Nymphalidae: Satyrinae) (2016) Journal of Research on the Lepidoptera, 49 (1), pp. 1-20.

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