

## Comparative Evaluation of Citation Analysis of Mechanical Engineering Theses: A Study to the Energy, Industrial and Production Engineering to Students in 2011-2020 GNDEC

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**Abstract:** *The present study is based on 11502 citations are appended to the theses of 5 energy engineering, 343 production engineering, and 169 industrial engineering submitted to Engineering GNDEC for the award of thesis during the period of 2011-2020. According to the study, Journals 5069 other sources, 4349 others citation, conference document 938 were the most preferred sources of mechanical engineering researchers, accounting for 11502 of total citations, followed by books with 588 citations. Citation analysis is carried out on all journal articles published in the journal of energy, production engineering and Industrial (ME) 2011-2020. The study concludes that, together with other approaches, citation analysis remains one of the most important tools to assess the usefulness of library holdings for M. Tech students in the activities of mechanical.*

**Keywords:** Citation analysis, Production engineering, Industrial engineering, Energy engineering, Theses students, GNDEC

### Introduction

Citation analysis is an interesting area of study. Citation analysis is the study of the references or citations that is included in the research communication. Citation analysis examines the use of references or literature in journals, theses, and other materials. The frequency of the journal title, type and age of the resources used, place of publication, language, and frequency of the author are all studied when analyzing citations to suggest ways to improve the library. Citation analysis involves looking at the pattern and frequency of citations in books and articles.

### Citation analysis

Citation analysis and application of citation-based techniques such as direct citation, co-citation, and bibliographic coupling to understand the structure of science have a long history. An area of bibliometrics that studies the citations to and from documents. Citation analysis applies various techniques such as citation counts that can help establish scholarship influence and patterns. Unlike traditional database searching by author or subject, citation searching tracks where works such as journals, books, conference proceedings, symposiums, transactions, and theses have been cited by other authors.

### **Definitions of citation analysis**

Martin defined citation analysis, “as an activity involving analysis of citation and references which forms a part of primary scientific communication.”

Ravichandra Rao “by citation analysis one can evaluate and interpret citations received by articles, authors, institutions and another aggregate of scientific activity.

### **Literature Review**

In the library literature, a vast majority of citation studies have explored M. Tech students characteristics and information needs, using theses and dissertations as data sources.

**Definition of a journal:** A Journal is a scholarly publication containing articles written by researchers, professors and other experts. Journals focus on a specific discipline or field of study. Manpreet Singh M.Tech student’s use of library resources, the age resources is an essential factor in citation analysis. In postgraduate students' use of library resources, the age of resources is also an important factor in citation analysis. Environment is the subject of the study. Environment 50 (13.66%) geotechnical 113 (30.87) 53 (14.84%)-soil mechanics structural engineering 147 (40.16%) and structural engineering 147 (40.16%). K. P. Singh and Bebi study about citation analysis of PhD thesis in Sociology Submitted to University of Delhi during 1995-2010.

The study presents analysis of several parameters like authorship pattern, forms of literature, country wise scattering of citations, distribution of Indian and foreign citations and a ranked list of top 30 cited sociology journals. The study finds that highest number of citations was single authored (83.94 %), and 67.23 % citations were from books and only 22.20 % citations were from journals [1].

K. Kumar and Reddy, T. R. explain the study on citations in master's degree thesis submitted to the department of library and information science, Sri Venkateswara university, Tirupathi between 2000 and 2007, were analyzed for possible relationships between citing, citing articles, and bibliographic forms. Data was analyzed using frequency and percentage distributions (presented in charts, tables, and graphs), as well as measures of central tendency. According to the findings, journals were the most frequently used reference materials in the thesis. Anaehobi, E. S. and Muokebe Bibiana document analysis was employed to extract data from all the Masters theses submitted to Festus Aghagbo Nwako Library. A total of 87 documents were studied and 2949 citations were recorded. The analysis and organization of data were done through the use of frequency tables and percentages. The result indicated that Internet resources had the least citation with (12.14%), books (54.09%).

### **Guru Nanak Dev engineering college**

Guru Nanak Dev engineering college was established in 1956. The Nanakana Sahib education trust resisted the trust deed on February 24, 1953, with a commitment to uplift the vast weaker section of Indian polity comprising rural India by admitting 70% of students from rural areas every year. The college is affiliated with Punjab technical university, Jalandhar, and offers B. Tech., M. Tech., MBA and MCA programmers. The faculty of engineering is one of six faculties at GNDEC and offers applied science, civil engineering, computer engineering, electrical engineering, electronics and Com. Engineering, information engineering, mechanical engineering, production engineering, BCA, BBA, MCA and MBA.

The institution has a well-established air conditioned central library having a rich collection of books, online books, print journals, online journals, back volume journals. The books are classified according to DDC 23<sup>rd</sup> latest edition through web Dewey service [2]. Library is fully computerized with e-Granthalaya software package which is an integrated multi-user library management system that supports all in-house operations of the Library. Library collection can also be accessed through Web OPAC at any terminal on the campus network. Library is also connected with DELNET for inter library loan and document delivery services. Library resources which include some of the leading IEEE, ASCE, ASME, J-Gate engineering, Wiley eBook, Pearson education book, McGraw hill book and EBSCO. The library shall be managed and administered by a library committee under the supervision and control of the board of management. The library has created an institutional repository on open source software "D Space" which serves as a platform for accessing the scholarly contents generated by the GNDEC community [3].

### **Department of mechanical engineering**

The department of mechanical engineering, production engineering, and industrial engineering is revitalized into cutting-edge research and provides cutting edge education. We attract some of the brightest students and faculty and we invite you to join us in the excitement.

#### **Objectives:**

- To determine the yearly distribution of these, submit industrial and production.
- To study if different sources of information were used by mechanical M.Tech in conducting research.
- To know the nature of authorship patterns.
- To study bibliometrics, citation analysis and the significance of citations.
- To identify the most important journals in the field.

#### **Methodology**

Form 1 shows the year wise distribution of thesis submitted by the department of energy, industrial and production engineering.

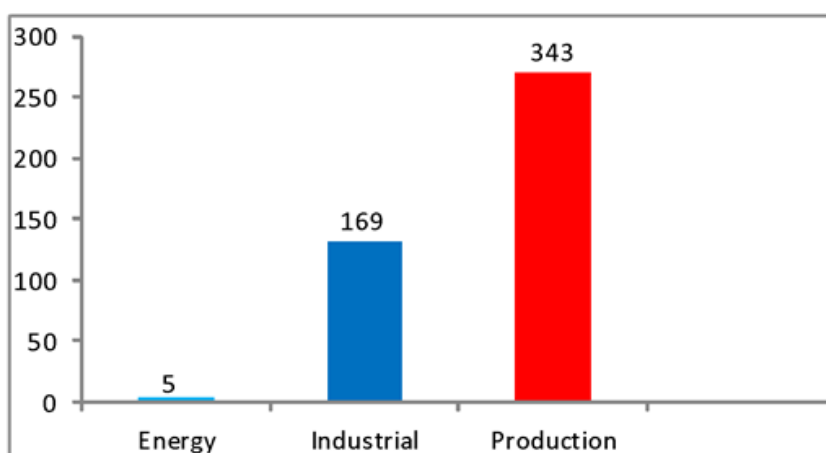
Every article published during the study period was examined. Title pages and reference sections were photocopied from each of the 11502 journals published by the journal the study. The is journal of data on the total number of articles, citations, and different sources cited, as well as dates of publication of such references, with an authorship pattern for each article.

#### **M. Tech Theses**

From Table 1 shows production 343 (2.98%) industrial 169 (1.46%) and energy 5 (0.04%) thesis with a total of 11502 citations representing three engineering disciplines: Energy engineering, production engineering, industrial engineering. According to the table, research have used a maximum of 5069 journals (44.07%) 4349 other sources (37.81%) 938 conferences (8.15%), 588 books (5.11%) 183 theses (1.59%) 25 (0.22) Ph.d (Figure 1).

**Table 1: Form wise distribution.**

S. No	No. of citation	Mechanical	Age%	Citation	Age%
1	Book	588	5.11	588	5.2
2	Conference	938	8.15	1526	13.43
3	Journal	5069	44.07	6595	57.85
4	Link	140	1.21	6735	59.05
5	Magazines	37	0.32	6772	59.38
6	Symposium	45	0.39	6817	59.76
7	Transactions	128	1.11	6945	60.85
8	Thesis	183	1.59	7128	62.43
9	Ph.d	25	0.21	7153	62.65
10	others	4349	37.81	11502	99.97
	Total	11502	99.97%		99.97%



*Figure-1: Distribution of energy, industrial and production M. Tech theses.*

Table 2 the distribution of departmental theses from the GNDEC energy, industrial and production engineering submitted from 2011 to 2020. During the year 2011-20, the journal received 5069 (44.07%), others received 4329 (37.81%), conference received 938 (8.15%), and book received 588 (5.11%), Thesis (1.59%), links received 183 (1.21%), symposiums received 45 (0.39%), magazines received 37 (0.32%), and Ph.D. received 25 (0.21%) (Figures 2 and 3) [4].

**Table 2: Form wise distribution.**

Year	Book	Confer	Journal	Link	Maga	Sympo	Trans	Thesis	Ph.d	Others	Citation
2010-11	89	66	382	5	11	5	1	7	3	172	741
2012-12	46	--	312	10	--	3	2	13	1	308	695
2013-13	53	51	458	10	--	3	29	9	2	245	860
2014-14	68	9	308	--	6	4	2	12	2	265	676
2015-15	45	62	335	12	--	4	11	11	2	243	726
2016-16	28	85	400	20	1	--	7	12	2	393	948
2017-17	49	78	610	6	--	3	8	9	4	463	1230
2018-18	--	37	90	--	--	1	2	3	1	77	211
2019-19	33	53	237	3	11	--	7	3	--	366	713
2020-20	15	8	63	--	--	--	3	--	--	92	181
Total	426	449	3195	66	29	23	72	79	17	2624	6981
	-6.11	-6.44	-45.83	-0.94	-0.41	-0.32	-1.03	-1.13	-0.24	-37.58	-100

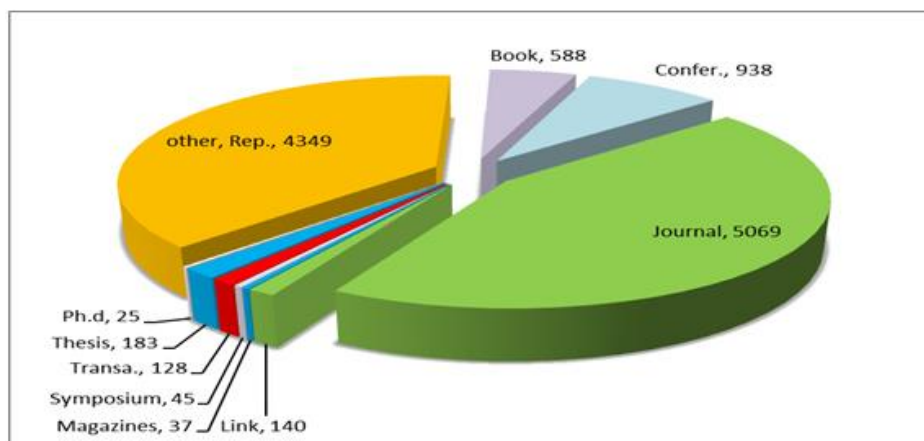


Figure-2: Form wise distribution.

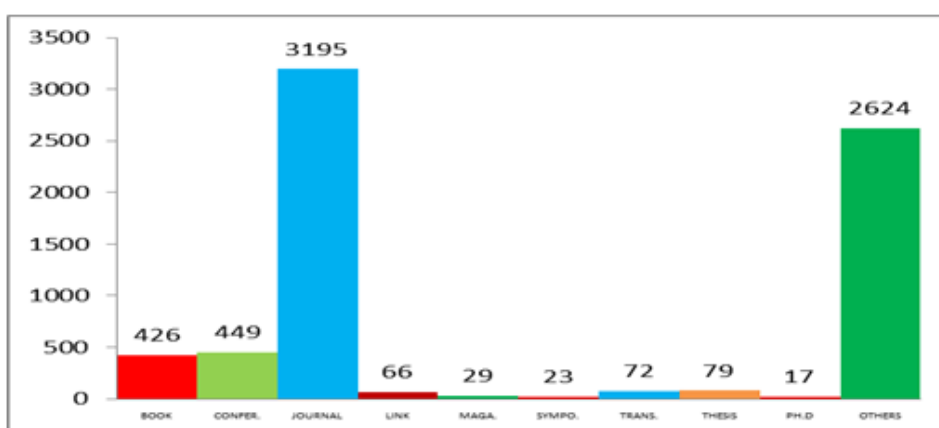


Figure-3: Form wise distribution.

## Discussion

The Table 3 shows the total number of citations for the 6981 to 463 (17.61%) of citations occurring in the year 2017-17 and 92 (1.31%) in the year 2020. The Table 3 shows other sources account for 3195 of the citations in their theses (45.83%). According to the findings for cited sources in a mechanical engineering thesis, production provides access to 45.83% of the others (37.58%) of the cited journal titles and conferences (6.44%) (Figure 4). Journals get the highest number of citations used by researchers in industrial engineering accounting for 2624 (37.58%), followed by conferences with (6.44%) 479, books with (6.11%) 426, thesis 99, and theses with the least number of citations used by researchers (1.61%) 70 [5].

Table 3: Industrial engineering.

Year	Book	Confer	Journal	Link	Maga	Sympo	Trans	Thesis	Ph.d	Others	Citation
2010-11	14	45	154	--	--	1	6	8	--	62	290
2012-12	26	72	147	--	--	--	10	16	3	170	444
2013-13	42	71	384	21	--	3	9	19	1	471	1021
2014-14	6	104	294	15	--	7	10	21	--	193	650
2015-15	21	38	298	7	--	3	10	1	3	290	671

15											
2016-16	26	54	206	19	7	3	--	26	1	111	449
2017-17	5	19	127	3	--	1	3	1	--	122	281
2018-18	10	48	133	--	--	2	3	3	--	74	273
2019-19	1	17	40	4	1	--	--	2	--	61	131
2020-20	11	6	35	--	--	--	--	--	--	34	86
Total	162	479	1818 (41.88)	70	08 (0.18)	20	51 (1.17)	99 (2.28)	08 (0.18)	1619	4340
	- 3.73	-11.03		- 1.61		-0.46				- 36.86	99.38

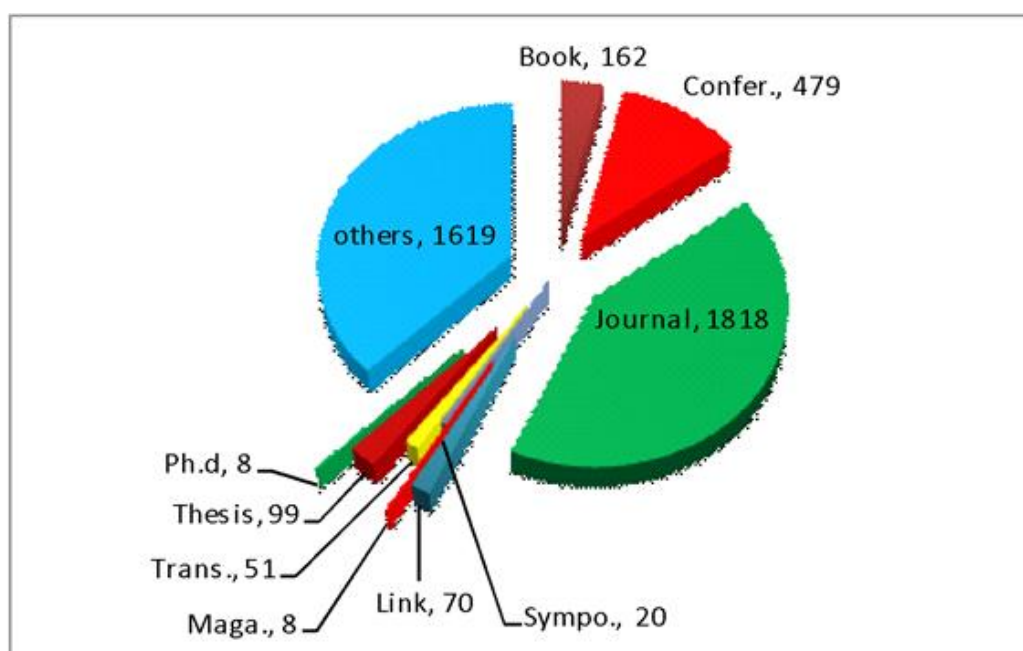


Figure-4: Form wise distribution.

The Table 4 shows the total number of citations for the 4340 to 471 (23.52%) of citations occurring in the year 2013-13 and 86 (1.98%) in the year 2020. The shows 4 other sources account for 1619 of the citations in their theses (36.86%). Journals get the highest number of citations used by researchers in industrial engineering accounting (41.88%) 1818, followed by conferences with (11.03%) 479, books with (3.73%) 162, theses (2.2860%) 99, and theses with the least number of citations used by researchers (1.61%) 70 (Figure 5) [6].

Table 4: Energy engineering.

	Book	Confer	Journal	Link	Maga	Symp	Trans	Thesis	others	Citation
2014-14	--	6	21	--	--	1	1	1	30	60
2015-15	1	3	15	--	--	--	6	1	26	52
2016-16	--	3	11	4	--	--	--	3	21	42
2017-17	2	8	12	--	--	1	6	--	29	58
Total	3	20	59	4	0	2	13	5	106	212

Figure 5 shows the total number of citations for the 212 to 30 (28.30%) of citations occurring in the year 2014-14 and 21 (19.81%) in the year 2016 to 16. Journals get the highest citations by authors in energy engineering accounting (27.83%). 59, then others (50%) 106 conference with (9.43%) 20, transaction (6.13%) 13 and thesis (2.35%) 05 link (1.88%) 4 books with (1.41%) 3 symposium (0.94%) with the fewest number of citations made by researchers 02 [7].

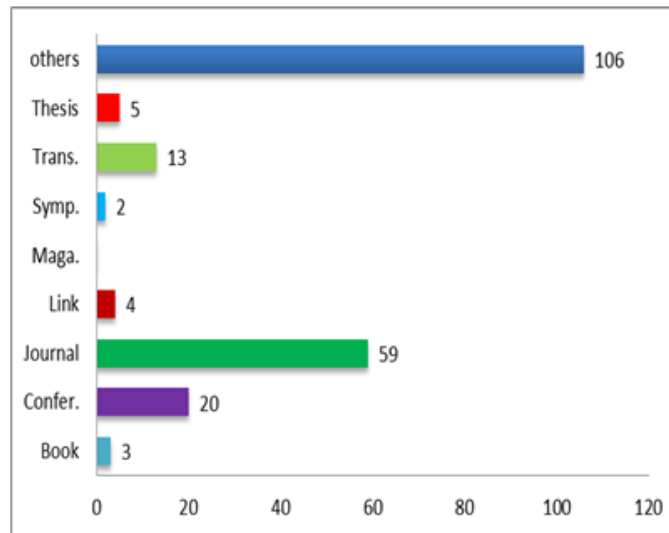


Figure-5: Energy engineering.

### Pattern of authorship

It helps to know the most productive contribution to the subject. For this purpose, the information about all the authors was retrieved, arranged, and tabulated in order to find the type of authorship. Any subject characteristics include not only the basic publishing pattern but also the authors themselves (Table 5).

Table 5: Year wise distribution of authors.

Year	Authors	Two author	Three author	More than three	Cum. citation	Age%	Citation	Age%
2011-11	14	41	23	11	89	20.89	89	20.89
2012-12	4	38	4	--	46	10.79	135	31.68
2013-13	3	44	4	2	53	12.44	188	44.12
2014-14	10	48	7	3	68	15.96	256	60.08
2015-15	4	31	6	4	45	10.56	301	70.64
2016-16	2	20	2	4	28	6.57	329	77.21
2017-17	4	38	5	2	49	11.5	378	88.71
2018-18	--	--	--	--	--	--	--	--
2019-19	4	20	3	6	33	7.74	411	96.45
2020-20	1	10	--	4	15	3.52%	426	99.97
Total	46	297	84	41	426	99.97%		99.97%



As shown in Table 6, books (89%) are the most often cited type of reference material in production engineering. This finding is in line with past citation analysis studies in engineering in general and its sub-disciplines. The other sources account for 68 (15.96%) of the thesis' citations (Figure 6).

**Table 6: Guide of faculty.**

S. No	Faculty guide	Energy	Age %	Cumulative	Age %	Production	Age%	Cumulative	Age %
1	Rupinder Singh	--	--	--	--	81	23.61	81	23.61
2	Jasmaninder S. Grewal	--	--	--	--	70	20.4	151	44.01
3	Sehijpal Singh	--	--	--	--	65	18.95	216	62.96
4	J. Kapoor	--	--	--	--	30	8.74	246	71.7
5	Gurinder S. Brar	--	--	--	--	20	5.83	266	77.53
6	Gurmeet Kaur	--	--	--	--	15	4.37	281	81.9
7	Harwinder Singh	--	--	--	--	12	3.49	293	85.39
8	P. S. Bigla	1	20	1	20	8	2.33	301	87.72
9	Aprinder S. Sandhu	--	--	--	--	5	1.45	306	89.17
10	Harpuneet Singh	--	--	--	--	4	1.16	310	90.33
11	Chandandeep S. Grewal	--	--	--	--	4	1.16	314	91.49
12	Balraj S. Gill	--	--	--	--	3	0.87	317	92.36
13	Sudhir Gbai	--	--	--	--	3	0.87	320	93.23
14	Parminder Singh	--	--	--	--	3	0.87	323	94.1
15	Harnam S. Faraha	--	--	--	--	2	0.58	325	94.68
16	Jagdeep Singh	--	--	--	--	2	0.58	327	95.26
17	Prem Singh	3	60	4	60	2	0.58	329	95.84
18	K. K. Sareen	--	--	--	--	2	0.58	331	96.42
19	Amrinder S. Pannu	--	--	--	--	2	0.58	333	97
20	Harmeet Singh	1	20	5	20	1	0.29	334	97.29
21	Buta S. Sindh	--	--	--	--	1	0.29	335	97.58
22	Chantwant S. Panther	--	--	--	--	1	0.29	336	97.87
23	Gulvir Singh	--	--	--	--	1	0.29	337	98.16
24	Iqbal Sharma	--	--	--	--	1	0.29	338	98.45
25	Harpreet Kaur	--	--	--	--	1	0.29	339	98.74
26	Simranjit Singh	--	--	--	--	1	0.29	340	99.03
27	Suhkinderper Singh	--	--	--	--	1	0.29	341	99.32
28	Gaurav Goel	--	--	--	--	1	0.29	342	99.61
29	Jarwinder Singh	--	--	--	--	1	0.29	342	99.9
31	Total	5	100			343	99.57 %		



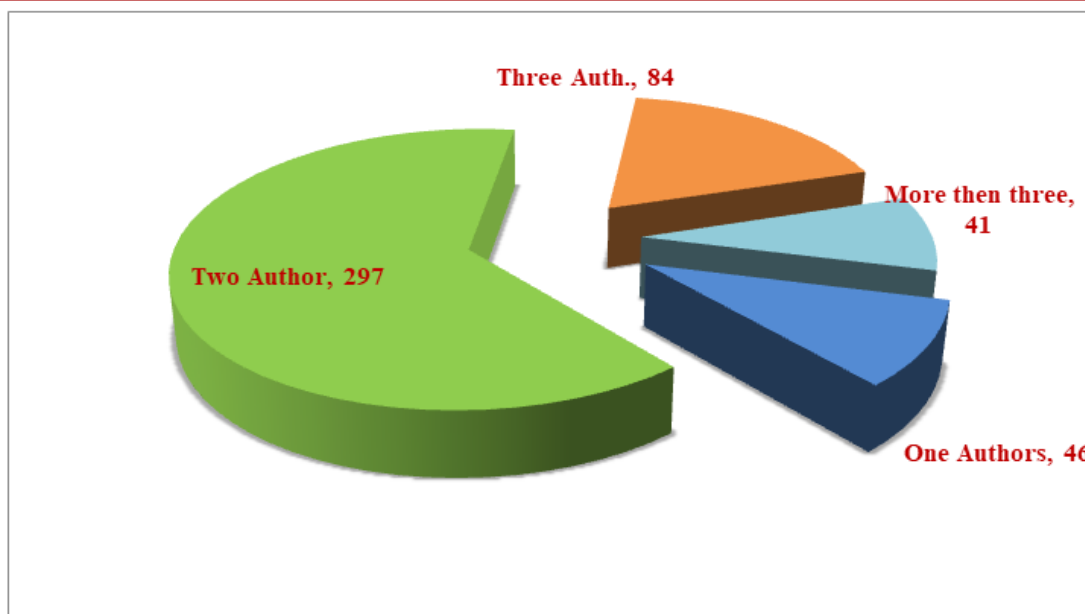


Figure-6: Year wise distribution of authors.

According to the above table, 297 out of 426 (6.11%) used single author books, while 41 out of 426 (6.11%) used citations from fourth author books. In this study, only book authorship patterns were used. The authorship pattern in this study indicates that mechanical engineering favoured single authors work (Table 7) [8].

**Table 7: Production first.**

S. No	Faculty guide	Production	Age%
1	Rupinder Singh	81	23.61
2	Jasmaninder S. Grewal	70	20.4
3	Sehijpal Singh	65	18.95
4	J. Kapoor	30	8.74

Rupinder Singh got top place in the above table with 81 successful candidates, followed by Jasmaninder S. Grewal with 70, Sehijpal Singh with 65, and J. Kapoor with 30. Rupinder Singh, who in top spot in GNDEC, is also vying for third spot in the nation wide ranking. In table 6 above, Rupinder Singh generated the most successful research, with 81 (23.68%), followed by Jasmaninder S. Grewal with 70 (20.46%), Sehijpal Singh with 65 (19%), J. Kapoor with 30 (8.77%), Gurinder S. Brar with 20 (5.84%), and Gurmeet Kaur with 15 (4.38%). During 2020, 271 research subjects successfully completed in 62 research guides. Prem Singh got the first 03 (60.00) in the table above. The by P.S. Bigla and Harmeet Singh with 01 (20.00) (Figure 7 and Tables 8 and 9).

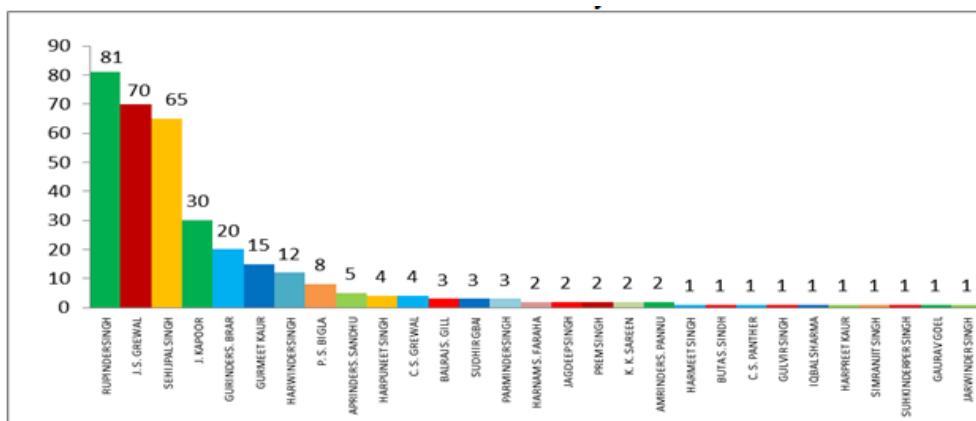


Figure 7-Guide of faculty.

Table 8: Guide of Faculty.

S.No	Faculty	Industrial	Age%	Citation	Age%
1	Harwinder Singh	37	21.89	169	21.89
2	Deepinder Singh	34	20.11	203	42
3	Gurinder S. Brar	26	15.38	229	57.38
4	Jagdeep Singh	15	8.87	244	66.25
5	Aprinder S. Sandhu	13	7.69	257	73.94
6	Harmeet Singh	10	5.91	267	79.85
7	P. S. Bigla	10	5.91	277	85.76
8	Harpuneet Singh	7	4.14	284	89.9
9	Sehijpal Singh	5	2.95	289	92.85
10	Prem Singh	3	1.77	292	94.62
11	J. Kapoor	2	1.18	294	95.8
12	Ravi I. Singh	2	1.18	296	96.98
13	Jasmaninder S. Grewal	1	0.59	297	97.57
14	Rupinder Singh	1	0.59	298	98.16
15	Chandandeep S. Grewal	1	0.59	299	98.75
16	Jatinder pal	1	0.59	300	99.34
17	Suhkinderper Singh	1	0.59	301	99.93
	Total	169	99.93		99.93%

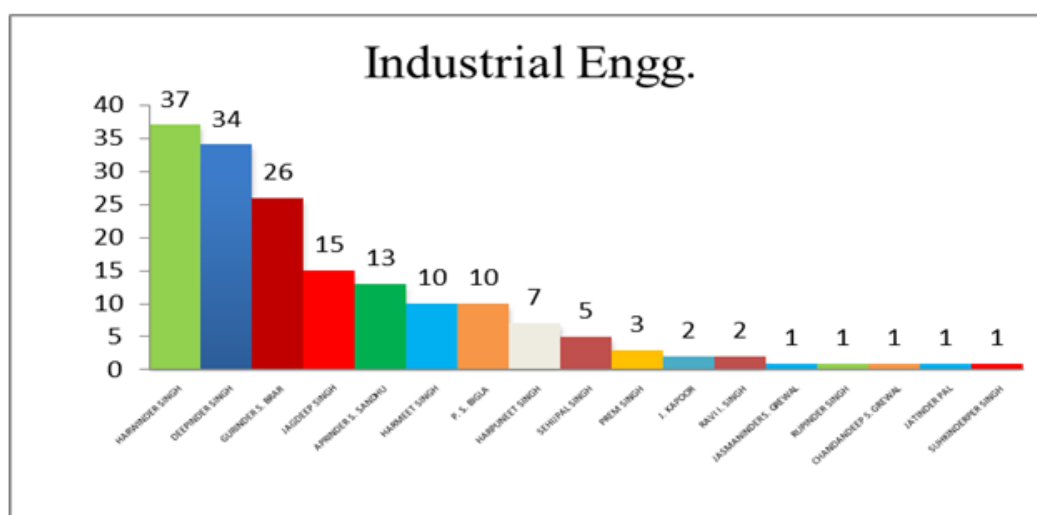
Table 9: Industrial first.

S.No	Faculty guide	Industrial	Age%
1	Harwinder Singh	37	21.89
2	Deepinder Singh	34	20.11
3	Gurinder Singh	26	15.38
4	Jagdeep Singh	15	8.87
5	Aprinder S. Sandhu	13	7.69
6	Harmeet Singh	10	5.91
7	P. S. Bigla	10	5.91

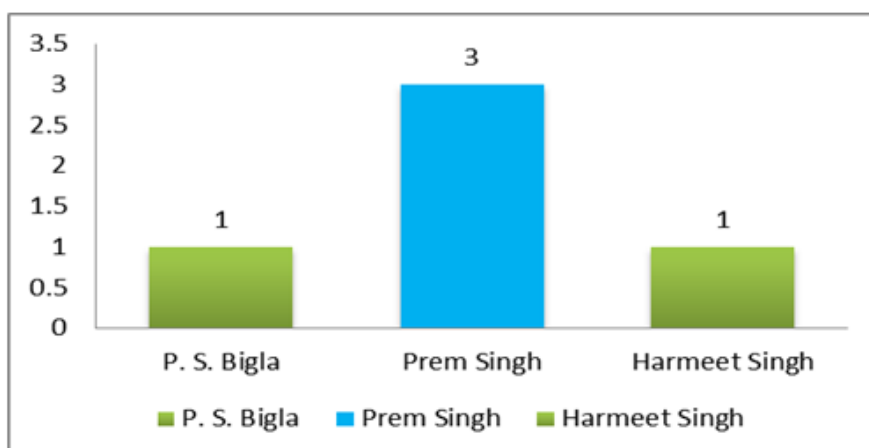
Table 10 gives form wise distribution of citation analyses and has shown that 5069 (44.07%) citations out of total 11502 citations are journals. A rank list is prepared on the basis of the frequency of citations used. It is followed by the year 2011-2020 which received Deepinder Singh (20.11%) 34, Gurinder S. Brar (15.38%) 26, Jagdeep Singh (8.87%) 15, Aprinder S. Sandhu (7.69%) 13, P. S. Bigla and Harmeet (5.91%) both 10, Jasmaninder S. Grewal, Rupinder Singh, Chandandeep S. Grewal, Jatinder pal and Suhkinderpall Singh (0.59%) received. Harwinder Singh got first place in the above table with 37 successful candidates, followed by Deepinder Singh with 34 candidates [9]. Above table with 10 (5.91%) successful candidates, followed by Harmeet Singh and P.S. Bigla with candidates (Figures 8 and 9).

**Table 10: Guide of faculty.**

S. No	Faculty	Energy	Age%	Cumulative	Age%
1	P. S. Bigla	1	20	1	20
2	Prem Singh	3	60	4	80
3	Harmeet Singh	1	20	5	20
	Total	5	100%		100%



*Figure-8: Guide of faculty.*



*Figure-9: Form wise distribution.*

According to the graph, the total number of citations was 5 (100%) in 2014-14 and 86

(1.98%) in 2020. It is followed by the years 2014-2017, which received P. S. Singh (1.0%), Harmeet Singh 1 (1.0%), and Prem Singh 3 (60.00%) for the most successfully generated research [10].

## Conclusion

To better understand the information sources used by the M. Tech citation analysis of these students at the GNDEC this study used citation analysis. Citations in the fields of energy, industrial, and production engineering were studied from 2011-2020 with an average of 11502 (99.97%) citations. A study shows that the highest number of citations (41.88) occurred in the years 2011-2023. The lowest number of citations was 25 (0.21%) in the year 2020. According to one study, the highest number of citations (41.88%) 1818 occurred between 2011-2020. The lowest number of citations was in magazine and Ph.D. 08 (0.18%) in the year 2020. According to one study, the highest number of citations 03 (60.00%) occurred from 2014-2017. The other sources most preferred were periodicals and journals. The shows that the total number of citations for the 212 to 30 (28.30%) of citations occurring in the year 2014-14 and 21 (19.81%) in the year 2016-16. Suggestions for future research might include analyzing M. Tech Theses to develop improved information skills you.

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