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ABSTRACT

Democratization of education has formed the base for open and free education. The movement of Open Education is gaining its impetus through the emerging trends of new educational technologies. In the context of OER (Open Education Resource), the Massive Open Online Courses (MOOCs) concept is providing a framework for virtual classroom and collaborative learning. 'Study Webs of Active Learning for Young Aspiring Minds' (SWAYAM), as an Indian MOOC, has been providing several courses in various disciplines. The present study tries to analyse the courses in engineering and technology category on SWAYAM during the COVID-19 situation. The present study has critically analysed the courses. The analysis of present study shows the trends of learners' interest in engineering and technology discipline. The present study summarizes that the most sought after area is computer science and engineering, followed by a multidisciplinary sub-category. The National Programme on Technology Enhanced Learning (NPTEL), is the course coordinator for a maximum number of courses, and IIT Kharagpur is that institute which provides maximum courses.

KEYWORDS- SWAYAM, MOOC, OER, Jupyter Notebook, Engineering and technology, Course provider, Course coordinator

INTRODUCTION

Open Educational Resources (OER) have created the notion of open education and open classroom. The OER movement has crossed all the barriers of physical classroom and time. The omnipresence of World Wide Web (WWW) and related technologies have ignited the inquisitiveness for new and emerging knowledge which results in stimulating the OER movement. As a by-product of OER, Massive Open Online Courses (MOOCs) have paved the way for online education and training. (Mossley, 2013) mentioned OER based on the logic of freely and openly sharing the ideas, knowledge, methods, platforms, tools, approaches and materials.

The present situation of COVID-19 has created a dilemmatic condition in almost every sector. The impact of this pandemic has been affecting the entire education system. (Vega Falcón et al., 2020) stated in their study that about 900 million students have been affected due to this pandemic. (Jena, 2020) mentioned in his study that about 32 crore learners in India stopped to go to schools/colleges. This unprecedented situation may be managed through the new education technologies. (Jain & Agarwal, 2020) had concluded that the consistency in education could be maintained through the online learning.

SWAYAM is an endeavour of Government of India to accelerate the OER movement by providing Massive Open Online Courses (MOOCs). The SWAYAM platform provides free and open education in various disciplines. The courses are designed by various reputed institutes such as IITs, IIMs, Central Universities and other institutes of repute. The SWAYAM platform facilitates learners to learn at their own pace and also provides certification after the successful completion of the exam in the concerned course. The present study tries to access the courses available in the field of engineering and technology.

REVIEW OF LITERATURE

The following literatures have been carefully reviewed for the present study. The important points have been mentioned below.

(Ambadkar, 2020) accessed the interest among commerce students for SWAYAM and found maximum students wanted undergraduate/post graduate degree courses under SWAYAM followed by skill based certification courses.(Shukla (PhD), 2020) conducted a quantitative research on courses completed by the SWAYAM during 2014-2019 and found that a total number of 1659 courses were conducted during that time, out of which 218 numbers of courses were provided in the field of computer science and engineering during that time.

(Lan & Hew, 2020) interviewed some MOOC learners and found that learners were perusing MOOC to increase their knowledge and MOOC course completers are more active than non completers.(Paswan, 2020) found "Blended MOOCs Programme (2017-19) was conducted through direct counselling sessions, personal contact programme, workshops for practical work, school-based activities, SWAYAM MOOCs courses, and SWAYAM PRABHA audio-video lessons."

(Charles & Rice, 2012) conducted a study on science teachers and found that science teachers revitalized their lessons with embedded OERs lessons that they were sharing in the class room and sharing with their colleagues. (ANURADHA, 2020) studied the utility of MOOC in 11 selected districts of Punjab and found that approximately 30% private and 64% Government institute students were engaged in IOT(internet of things) courses on MOOC.(Perryman & Seal, 2016) conducted a pan-India survey to know the attitude of learners towards OER and found that OER were largely valued for being free and convenient to use that can be republished.

(Nath & Karmakar, 2014) studied the impact of MOOC on Higher Education institution of India and suggested that India could adopt MOOC to improve the quality of higher education as student spending was lower which resulted declination in quality.(Ally & Samaka, 2021) emphasized how the mobile technologies can be helpful for accessing the open educational resources and increase the learner's participation regardless of their geographic location in developing.(Wiley et al., 2012) summarized OER facilitate learners to engage in "4R" activities such as revise, reuse, remix, redistribute when using the resources.

BACKGROUND OF THE STUDY

SWAYAM is an endeavour by the Ministry of Human Resource Development (MHRD), Government of India, to provide an online teaching-learning platform (Samanta, 2018). SWAYAM is providing its quality content with the help reputed institutions through the online course coordinators. SWAYAM is gaining its popularity due to its 4 quadrant approach.

Four quadrant approach of SWAYAM along with their descriptions have been mentioned in Figure 1.

FIGURE 1(4 QUADRANT APPROACH OF SWAYAM)
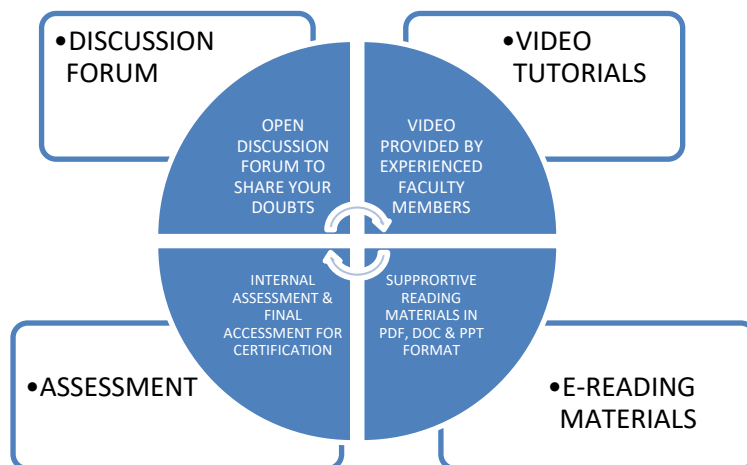
OBJECTIVES OF THE STUDY

The present study tries to assess eachcourse available on engineering and technology discipline by analyzing the metadata of each available course. The objective of the present study emphasizes:

  I.   To analyse the number of enrolled students in each available courses of engineering and technology discipline in SWAYAM platform
 II.   To assess the number of learners under each course coordinator.
III.   To analyse students interest with respect to course duration.
 IV.   To analyse the most preferred course provider institute.

SCOPE AND LIMITATIONS OF THE STUDY

There are several courses available on the SWAYAM Platform, the present study tries to analyse the courses available under engineering and technology discipline only. The scope of the present study is limited to the course coordinators, who are providing engineering and technology courses only. The engineering and technology courses are provided by 5 course coordinators such as, National Programme on Technology Enhanced Learning (NPTEL), Indira Gandhi National Open University (IGNOU), Consortium for Educational Communication (CEC), All India Council for Technical Education (AICTE) and National Institute of Open Schooling (NIOS). The present study emphasizes on the ongoing courses whose enrolment has already been closed.

METHODOLOGY OF THE STUDY

The present study covers each available course under engineering and technology discipline on SWAYAM platform. The data have been collected from SWAYAM website by selecting engineering and technology option from course category. The sub category data have been collected after selecting the concerned category. Each course available under subcategory has been analysed for required objectives.

DATA COLLECTION

The data have been collected during 3rd week of March 2021 for ongoing courses whose registration has been closed. The registration start and end date of each of the concerned courses varies during the last 6 months of the present study. The data have been collected on excel sheet for calculation. The virtue of Python programming language and its various Python Libraries such as Pandas, Seaborn, Matplotlib , Numpy, SciPy have been used for the critical analysis of data and data visualization. The Jupyter Notebook has been used as IDE (Integrated Development Environment) to use the Python language.

ENROLMENT OF LEARNERS: Learning is a lifelong process. Number of Learners in distance mode of education depends on their own perception. They usually enrol themselves when they perceive the value of subject for their own benefit. So in order to find out the number of enrolment of students in different subjects the following data has been collected for interpretation.

There are 13 sub categories available in the engineering and technology category. The number of courses available under each sub category, number of enrolled students along with their respective average has been represented in Table 1.

TABLE 1(SUB CATEGORIES, NUMBER OF COURSES, NUMBER OF ENROLLED STUDENTS, AVERAGE NUMBER OF ENROLMENT)

SL. NO.	SUB CATEGORIES	NO. OF COURSES	NO. OF ENROLLED STUDENTS	Avg. Enrolment
1	Aerospace Engineering	7	19191	2741.571
2	Agricultural and Food Engineering	20	49194	2459.7
3	Biological Sciences & Bioengineering	41	71739	1749.732
4	Chemical Engineering	34	36378	1069.941
5	Civil Engineering	36	109429	3039.694
6	Computer Science and Engineering	84	768152	9144.667
7	Design Engineering	7	21599	3085.571
8	Electrical, Electronics and Communications Engineering	60	189163	3152.717
9	Mechanical Engineering	68	122247	1797.75
10	Metallurgy and Material science & Mining Engineering	21	16598	790.381
11	Multidisciplinary	68	205094	3016.088
12	Ocean Engineering	1	658	658
13	Textile Engineering	5	2866	573.2
14	TOTAL	452	1612308	3567.053

The analysis of Table 1 shows the maximum number of courses is provided by computer science and engineering subcategories i.e. 84 courses followed by mechanical engineering. It is observed that total 1612308 numbers of students are enrolled on SWAYAM platform to pursue various engineering courses. Maximum 768152 numbers of students are enrolled under computer science sub category i.e. 48 % of total enrolled students are followed by multidisciplinary sub category. The value of average enrolment of students is the highest in the computer science and engineering discipline followed by electrical, electronics and communications engineering.

COURSE COORDINATOR: the course coordinator, as the back bone of a course, plays a vital role in design, delivery, monitoring and review of the courses. The role contributes to quality content, excellence and relevance of the course, ensuring that the course is aligned with: It is designed by universities and faculty or departments and is effectively integrated with other courses and units as needed. It ensures a quality management of resources related to course delivery, monitor, evaluate and Course related reports.

The courses in SWAYAM platform are provided by 9 course coordinators. But only 5 course coordinators are providing engineering and technology courses. The role of course coordinators in SWAYAM is to provide necessary infrastructure to conduct the courses.There are 5 course coordinators available in Engineering and technology category.

The number of courses available under each course coordinator, and their respective percentage has been represented on Table 2.

TABLE 2(COURSE COORDINATOR, NUMBER OF COURSES & NUMBER OF ENROLLEDSTUDENTS)

SL. NO.	COURSE COORDINATOR	NUMBER OF COURSES	%	NUMBER OF ENROLLED STUDENTS	%	Average enrolment
1	IGNOU	38	8%	76844	5%	2022.211
2	CEC	76	17%	291254	18%	3832.289
3	AICTE	2	0%	30959	2%	15479.5
4	NPTEL	334	74%	1201796	75%	3598.192
5	NIOS	2	0%	11455	1%	5727.5
	TOTAL	452	100%	1612308	100%	3567.053

The analysis of Table 2 shows that there are total 452 courses provided by 5 national course coordinators. Maximum 334 courses are provided under NPTEL i.e. 74% of overall course followed by CEC. The analysis of table 2 also shows maximum 75% of total enrolled students in engineering and technology category are under NPTEL course coordinator followed by CEC i.e. 18%.

Table 3 represents courses provided by various discipline of engineering and technology through the various course coordinator.

TABLE 3 (SUB CATEGORIES AND COURSE COORDINATOR)

	NUMBER OF COURSES UNDER COURSE COORDINATOR					
SUB- CATEGORIES	IGNOU	CEC	AICTE	NPTEL	NIOS	TOTAL
Aerospace Engineering	0	0	0	7	0	7
Agricultural and Food Engineering	11	9	0	0	0	20
Biological Sciences & Bioengineering	1	16	0	24	0	41
Chemical Engineering	0	0	0	34	0	34
Civil Engineering	0	0	0	36	0	36
Computer Science and Engineering	15	14	0	54	1	84
Design Engineering	0	0	0	7	0	7
Electrical, Electronics and Communications Engineering	0	0	0	60	0	60
Mechanical Engineering	0	0	0	68	0	68
Metallurgy and Material science & Mining Engineering	0	3	0	18	0	21

Multidisciplinary	11	34	2	20	1	68
Ocean Engineering	0	0	0	1	0	1
Textile Engineering	0	0	0	5	0	5
TOTAL	38	76	2	334	2	452

The analysis of Table 3 shows- among the above-mentioned five course coordinator, NPTEL is coordinating for maximum 68 courses under mechanical engineering category, IGNOU is coordinating maximum 15 for computer science and engineering category, CEC is providing maximum 14 courses under Multidisciplinary sub category, AICTE is providing only 2 courses both from multidisciplinary sub category and NIOS is providing 1 course each from computer science and engineering and multidisciplinary sub category.

COURSE DURATION: It refers to time required to complete a course. Maximum number of courses in SWAYAM portal have fixed course duration time except few self paced courses. The enrolled students are entitled to finish their video courses along with their assignments within this stipulated time period. The course duration also limits the assignments within a particular course for a particular time period after which the assignments will be inactive.

The time duration of courses under engineering and technology category varies between 6 weeks to 24 weeks. Number of enrolled students under each course duration category and each sub category has been represented in Table 4.

TABLE 4(NUMBER OF ENROLLED STUDENTS UNDER EACH SUB CATEGORY OF DIFFERENT COURSE DURATION)

SUB CATEGORY	NUMBER OF ENROLLED STUDENTS								
	Self Paced	4 weeks	6 weeks	8 weeks	12 weeks	15 weeks	16 weeks	24 weeks	Total
Aerospace Engineering	0	1869	0	4171	13151	0	0	0	19191
Agricultural and Food Engineering	976	2494	0	8725	16335	15125	5539	0	49194
Biological Sciences & Bioengineering	0	9133	0	17957	33522	8337	2790	0	71739
Chemical Engineering	0	2920	0	13128	20330	0	0	0	36378
Civil Engineering	0	7065	0	38382	63982	0	0	0	109429
Computer Science and Engineering	0	44589	2686	167091	440184	101256	2062	10284	768152
Design Engineering	0	6637	0	5232	9730	0	0	0	21599

Electrical, Electronics and Communications Engineering	0	9102	0	27821	152240	0	0	0	189163
Mechanical Engineering	0	21611	0	37222	63414	0	0	0	122247
Metallurgy and Material science & Mining Engineering	0	598	0	6004	8912	0	1084	0	16598
Multidisciplinary	0	5005	0	24921	63930	62381	47686	1171	205094
Ocean Engineering	0	0	0	0	658	0	0	0	658
Textile Engineering	0	0	0	1755	1111	0	0	0	2866
Total	976	111023	2686	352409	887499	187099	59161	11455	1612308

The analysis of table 5 shows the maximum number of students i.e. 887499, are enrolled in 12 weeks course category followed by 352409 numbers of students under 8 weeks course category. The minimum numbers of students are enrolled under self paced course.

Each sub category provides various courses of different course duration. Number of courses under individual time duration has been represented in Table 5.

## TABLE 5 (NUMBER OF COURSES UNDER EACH SUB CATEGORY OF DIFFERENT COURSE DURATION)

SUB CATEGORY	NUMBER OF COURSES								
	Self Paced	4 weeks	6 weeks	8 weeks	12 weeks	15 weeks	16 weeks	24 weeks	Total
Aerospace Engineering	0	1	0	2	4	0	0	0	7
Agricultural and Food Engineering	1	2	0	3	6	5	3	0	20
Biological Sciences & Bioengineering	0	3	0	8	22	7	1	0	41
Chemical Engineering	0	3	0	7	24	0	0	0	34
Civil Engineering	0	2	0	11	23	0	0	0	36
Computer Science and Engineering	0	4	1	19	50	6	3	1	84
Design Engineering	0	3	0	2	2	0	0	0	7
Electrical, Electronics and Communications Engineering	0	3	0	13	44	0	0	0	60
Mechanical Engineering	0	9	0	26	33	0	0	0	68

Metallurgy and Material science & Mining Engineering	0	1	0	8	10	0	2	0	21
Multidisciplinary	0	3	0	8	30	18	8	1	68
Ocean Engineering	0	0	0	0	1	0	0	0	1
Textile Engineering	0	0	0	2	3	0	0	0	5
Total	1	34	1	109	252	36	17	2	452

The analysis of Table 5 shows Maximum, 252 courses are provided under "12 weeks course" duration followed by 109 courses under "8 week course" duration. One course is provided by IGNOU which is self paced.

The average number of enrolled students in each time duration category is found by dividing number of enrolled students in each category by number of courses provided under each category.The average number of enrolled students under each time duration category has been represented in Figure 1.

FIGURE 2(REPEATED COURSE)
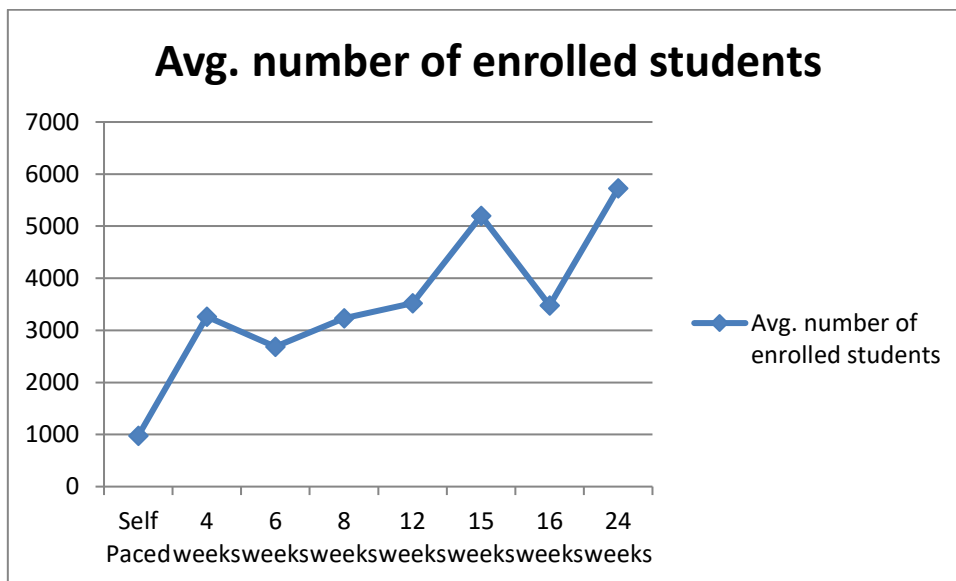
The analysis of Figure 1 shows the average number of enrolment is highest in the 24 week course category, followed by the 15 week course category.

COURSE PROVIDER INSTITUTE: A number of institutes are providing courses on SWAYAM under the supervision of National coordinators. The necessary courses are selected by the national coordinators and various recognised institutes are invited to conduct the courses. In particular, Government institutes are invited for credit courses and mostly non-credit courses are given by private institutes.

The number of courses under each course provider institute has been found by analyzing the data through Jupyter Notebook IDE. The figure 2 shows the top contributor data. The

"Other values" on figure represents the institutes those contribute minimum number of courses. It has been noted that for one of the course the institute name is not mentioned. The analysis has been represented on Figure 2.

FIGURE 3 (NUMBER OF COURSES UNDER INSTITUTES)
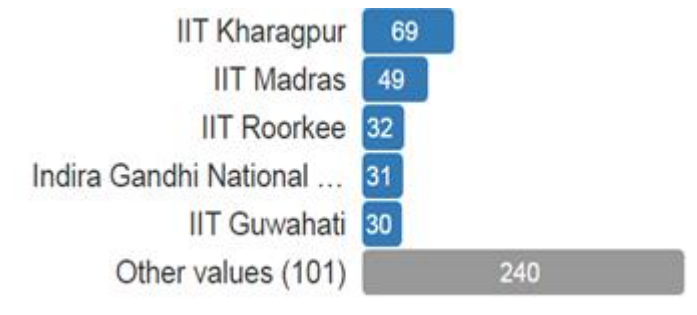
The analysis of Figure 2 shows that maximum 69 courses have been provided by IIT Kharagpur followed by IIT Madras. 240 numbers of courses were provided by various other institutes.

INFERENCES

From the above data, it is clear that SWAYAM is providing total 452 numbers of Engineering and Technology courses under 13 sub categories. The above data analysis can be concluded with the following inferences:

1. The computer science and engineering discipline is the most preferred discipline under engineering and technology category. (Table 1)
2. The maximum numbers of courses are provided under NPTEL and maximum numbers of students are enrolled under NPTEL, but the average enrolment is highest under NIOS. (Table 2)
3. The NPTEL is the most preferred course coordinator for providing institutes the maximum number of courses. (Table 2)
4. Although maximum numbers of courses are provided under the 12 week duration category and maximum number of students are also enrolled under the 12 week category but the average enrolment under course duration category is highest for the 24 week course duration category. (Table 4, Table 5, Figure 2)
5. IIT Kharagpur tops the list as it is providing maximum number of courses followed by IIT Madras. (Figure 3)

CONCLUSION

The synchronization of a physical classroom with digital class room has been gaining its pace through implementing various educational technologies. The class room without boundaries and time boundless is becoming a reality day by day. The MOOCs and OER

like concepts have been becoming more popular among the academic community in scenarios of pandemics like COVID. The underpinning concepts of MOOC and OER are the standalone substitute for this time. The SWAYAM, as an Indian MOOCs, is providing a range of course in almost every branch of knowledge. The present study has emphasized on engineering and technology courses in the SWAYAM platform. Although engineering and technology discipline needs physical and practical environment for teaching-learning process, the present study has depicted the interest of learners for online courses in engineering and technology discipline on SWAYAM, but more research needs to be conducted to leverage free and open education in various disciplines.

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