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**Research Article****Development of CBCS Evaluation Model by using Machine Learning Technique****Santosh Kumar Miri**<sup>1\*</sup> <sup>1</sup>Department of Computer Science, St. Thomas College, Bhilai, Chhattisgarh, IndiaCorresponding Author: [drskmiri75@gmail.com](mailto:drskmiri75@gmail.com)**Received:** 27/Feb/2024; **Accepted:** 03/Apr/2024; **Published:** 30/Apr/2024. **DOI:** <https://doi.org/10.26438/ijcse/v12i4.3238>

**Abstract:** The CBCS (Choice Based Credit System) is a grading system that provides an opportunity for the students to select courses from the prescribed courses. It provides flexibility in designing curriculum. It assigns credits based on the course content and hours of teaching. The prescribed courses can be core, elective/minor or skill-based courses. The students earn credits based on their performance. The CBCS Evaluation Model is a model for the design, development and evaluation of student-centered instructional paradigm by using Machine Learning Technique. It provides a cross-cultural learning environment for the development of quality education. It upgrades educational and occupational aspiration of the upcoming generation of the higher education.

**Keywords:** CBCS, SGPA, CGPA, and MLT.

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**1. Introduction**

A document that defines the objectives and requirements of a project is known as project proposal. The Choice Based Credit System is a pilot project implementing in the higher education sector. It was introduced in the University of Delhi in the year 2016. To fulfill the aims of the New Education Policy (NEP) 2020, the CBCS was introduced by the UGC. The Indian Higher Education system is moving from the conventional annual system to semester system. The UGC NEP-2020 guidelines shall apply to all postgraduate degree, undergraduate degree, diploma and certificate programmes run under the Central, State and Deemed universities in India. It defines 13 keywords [1]. They are Academic Year, CBCS, Course, Credit Based Semester System (CBSS), Credit Point, Credit, Cumulative Grade Point Average (CGPA), Grade Point, Letter Grade, Programme, Semester Grade Point Average (SGPA), Semester and Certificate (Transcript or Grade Card).

One academic year constitutes two consecutive (one odd + one even) semesters. The CBCS is a grading system that provides an opportunity for the students to select courses from the prescribed courses. The prescribed courses can be core, elective/minor or skill-based courses. The courses should define learning objectives and outcomes. The requirement for awarding a degree or diploma or certificate is prescribed in the term CBSS. The credit point keyword defines grade point and number of credits for a course. The students earn credits based on their performance. The term

credit is a unit that measures the course work hours per week. One credit is equivalent to one hour of teaching (lecture or tutorial) or two hours of practical/field work per week. CGPA stands for Cumulative Grade Point Average. It measures overall cumulative performance of a student over all semesters [2]. The grade point is a numerical weight allotted to each letter grade on a 10-point scale. Letter grade is an index of the performance of students denoted by letters O, A, B, C, D, E and F [3]. An educational programme leads award of a Degree, diploma or certificate. SGPA stands for semester grade point average.

The SGPA is a measure of performance of work done in a semester. Each semester consists of 15-18 weeks of academic work equivalent to 90 actual teaching days. After every semester, a grade certificate shall be issued to all the registered students [5].

Courses in CBCS may be of three kinds: Core, Elective and Foundation. A core course may be compulsorily studied by a student in every semester. An elective course may be "Generic Elective" which adds generic proficiency to the students. The foundation courses may be compulsory and Elective. The examination process will be conducted at various stages (sessional, mid-term, end-semester etc.) in a semester. There will be marked variations (grades, grade points and letter grades) across the colleges and universities levels [4].

The CBCS Evaluation Model is a model for the design, development and evaluation of student-centered instructional paradigm by using Machine Learning Technique. My proposed model is summarized into CBCS Base Model, CBCS Course-Credit Model, SGPA Evaluation Model and CGPA Evaluation Model. The CBCS base model represents programme, academic year and academic work. The CBCS Course-Credit Model represents prescribed courses and credit point. The SGPA Evaluation Model represents courses, credit points, grade points and SGPA formula [6]. In this model, I calculated credit points firstly by using credits and grade points. Secondly, I calculated SGPA by using Total Credit Point (TCP) and Total Credit (TC). Finally, I calculated CGPA by using the formula  $\frac{\sum(C_i \times S_i)}{\sum C_i}$ . It is represented in the CGPA evaluation model [7].

## 2. Related Work

Chakraborty S. and Mahanayak B. (2021) published a research paper on the topic "Introduction of choice based credit system in higher education in India: issues and concern". They discussed major reform of CBCS in higher education in India. They compared it with traditional Higher Education system.

Das Samar (2021) published a research paper entitled "Choice Based Credit System: Implications & its Challenges". He discussed the aim of CBCS to redefine the curriculum for keeping pace with the liberalization and globalization in education. He motioned basic features of the CBCS system in this paper. He calculated one credit by using the following formula:

$$L:T:P - \frac{2L}{WEEK} = 2 \text{ CREDIT} - \frac{2T \text{ or } 2L}{WEEK} = 1 \text{ CREDIT}$$

Biswas Santu (2018) wrote a research paper on the topic Choices Based Credit System (CBCS) — an analytical study. He highlighted the analytical study of Choice-Based Credit System. He discussed grading system of the CBCS.

Kapur Shikha (2017) published a research paper on the topic "Choice Based Credit System (CBCS) and Higher Education in India". She discussed core papers, elective courses and foundation courses. She included SGPA and CGPA calculations in this paper.

Chaubey A. K. (2015) published a research paper on the topic "Choice Based Credit System (CBCS): A Better Choice in Education System". He discussed semester system, evaluation system and credit system. According to author, CBCS system recommends the reduction manner (Course – Paper – Unit – Subunit – Credit). He also discussed types of credit transfer. He included SGPA and CGPA formulas for the marking and grading. He also included LTP and ATKT system.

Karthikeyan P. (2015) published a research paper entitled "Choice Based Credit System of Evaluation in Higher Education". In this paper, he discussed about SGPA calculation in detail.

## 3. Research Method

In this project, I will first study the Choice Based Credit System and collect its basic elements. These elements will be pillars of our proposed model. An educational programme is leading to award of a degree, diploma or certificate. Two consecutive (one odd + one even) semesters constitute one academic year. Each semester will consist of 15-18 weeks of academic work equivalent to 90 actual teaching days. The odd semester may be scheduled from July to December and even semester from January to June.

- Programme: Degree, Diploma or Certificate
- Academic Year: Odd semester, Even semester
- Academic Work: 15-18 weeks = 90 Days

The CBCS base model relates programme, academic year and academic work which are shown in the Figure 1. The core, elective or minor or soft skill courses are the prescribed courses of the CBCS. A course may be designed to comprise lectures/ tutorials/laboratory work/ field work/ outreach activities/ project work/ vocational training/viva/ seminars/ term papers/assignments/ presentations/ self-study etc. or a combination of some of these. The prescribed courses are core, elective or minor or soft skill courses.

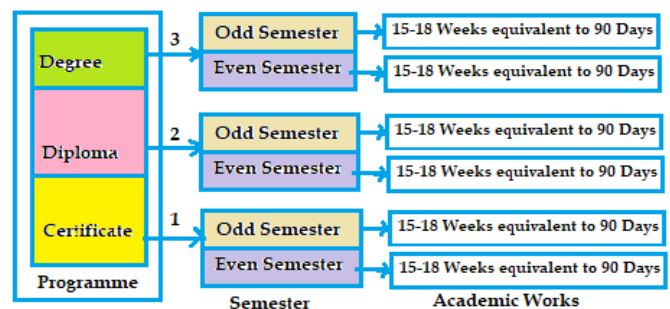


Figure 1: Representation of CBCS Base Model

Credit Point is the product of grade point and number of credits for a course. Credit is a unit by which the course work is measured. It determines the number of hours of instructions required per week. One credit is equivalent to one hour of teaching (lecture or tutorial) or two hours of practical work/field work per week [4]. The CBCS Course-Credit Model relates prescribed courses and credit point which is shown in the Figure 2.

Prescribed Courses: Core/Elective/Minor/ Soft skill courses.  
Credit: Lecture/Practical, Practical/Field work

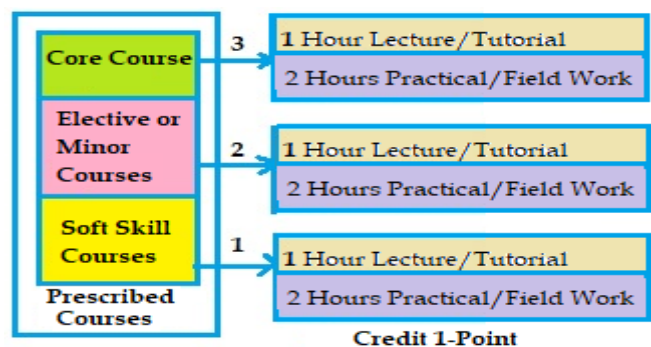


Figure 2: Representation of CBCS Course-Credit Model

Cumulative Grade Point Average (CGPA) is a measure of overall cumulative performance of a student over all semesters. The CGPA is the ratio of total credit points secured by a student in various courses in all semesters and the sum of the total credits of all courses in all the semesters. It is expressed up to two decimal places. Grade Point is a numerical weight allotted to each letter grade on a 10-point scale. Letter Grade is an index of the performance of students in a said course. Grades are denoted by letters O, A+, A, B+, B, C, P and F.

Courses: Course 1, Course 2, Course 3, Course 4, Course 5 and Course 6

Credits: 1, 2, 3 and 4

Grade Letters: O, A+, A, B+, B, C, P and F.

Grade Points: 10-point scale

Credit point = Credit x Grade Point = Credit x GP ..... (1)

$$SGPA = \frac{\text{Total Credit Point}}{\text{Total Credit}} = \frac{TCP}{TC} \quad \dots\dots (2)$$

The SGPA is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student.

$$SGPA (S_i) = \frac{\sum(C_i \times G_i)}{\sum C_i} = \frac{\sum CP}{\sum C} \quad \dots\dots(3)$$

Where  $S_i$  is the SGPA of the  $i^{th}$  semester,  $G_i$  is the Grade Point of the  $i^{th}$  semester and  $C_i$  is the total number of credits in that semester.

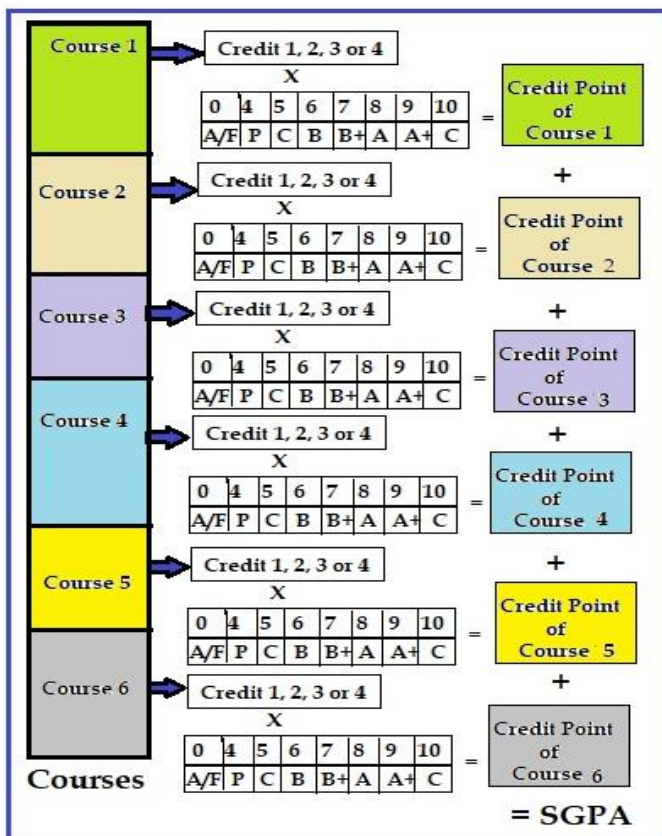


Figure 3: Representation of SGPA Evaluation Model

The UGC recommends the following procedure to compute the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA). The CGPA is calculated by using the following formula:

$$CGPA = \frac{(Total\ Credit \times SGPA)\ of\ Semester-1 + (Total\ Credit \times SGPA)\ of\ Semester-2 + (Total\ Credit \times SGPA)\ of\ Semester-3 + (Total\ Credit \times SGPA)\ of\ Semester-4 + (Total\ Credit \times SGPA)\ of\ Semester-5 + (Total\ Credit \times SGPA)\ of\ Semester-6}{TC_1 \times SGPA_1 + TC_2 \times SGPA_2 + TC_3 \times SGPA_3 + TC_4 \times SGPA_4 + TC_5 \times SGPA_5 + TC_6 \times SGPA_6} \quad \dots\dots (4)$$

The CGPA is also calculated in the same manner taking into account all the courses undergone by a student over all the semesters of a programme.

$$CGPA = \frac{\sum(C_i \times S_i)}{\sum C_i} \quad \dots\dots (5)$$

Where  $S_i$  is the SGPA of the  $i^{th}$  semester and  $C_i$  is the total number of credits in that semester. The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

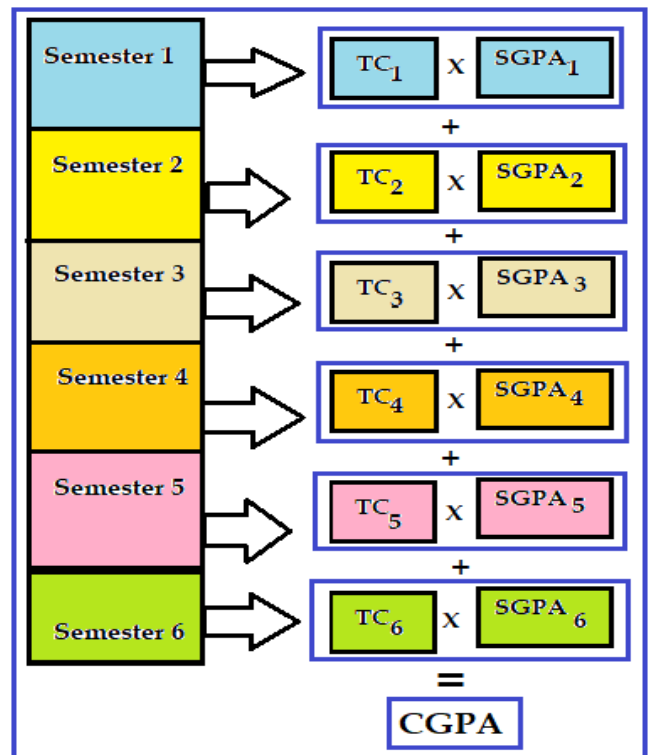


Figure 4: Representation of CGPA Evaluation Model

The SGPA model is used to calculate the SGPA of the student. It is shown in the Figure 3. The CGPA model is used to calculate the CGPA of the student. The CGPA evaluation model is shown in the Figure 4. I am use equations (1), (2) and (3) for the creation of my proposed model. The CBCS Evaluation Model is composed of CBCS Base Model, CBCS Course-Credit Model, SGPA and CGPA Evaluation Models. In this research, my research tool is Jupiter Anaconda.

### 4. Observation, SGPA and CGPA Calculations

In the CBCS Base Model, programme is classified into Certificate, Diploma and Degree numbered 1, 2 and 3 respectively. Each programme is distributed into odd semester and even semester. Each semester consists of 15-18 weeks of academic work equivalent to 90 actual teaching days.

**Table 1:** Data of CBCS Base Model

Pid	Programme	Semesters	Academic Works
1	Certificate (1)	Odd	15-18 weeks equivalent to 90 days
2	Certificate (1)	Even	15-18 weeks equivalent to 90 days
3	Diploma (2)	Odd	15-18 weeks equivalent to 90 days
4	Diploma (2)	Even	15-18 weeks equivalent to 90 days
5	Degree (3)	Odd	15-18 weeks equivalent to 90 days
6	Degree (3)	Even	15-18 weeks equivalent to 90 days

In the CBCS Course-Credit Model, prescribed courses (PCourses) are classified into Soft-skill Courses, Elective Courses and Core Courses numbered 1, 2, and 3 respectively. Each course has 1 hour of Lecture or Tutorial (LorT) and 2 hours of Practical or Field work (PorF) of 15 days which gives Credit 1-Point.

**Table 2:** Sample Data of Course Credit Model

PCid	PCourses	Works	Time	Days	Credits
1	Soft-skill	LorT	1 Hour	15	1
2	Elective	LorT	1 Hour	15	1
3	Core	LorT	1 Hour	15	1
4	Soft-skill	PorF	2 Hours	15	2
5	Elective	PorF	2 Hours	15	2
6	Core	PorF	2 Hours	15	2

The grade letters and grade points are tabulated in the Table 3. It is used for the calculation of the SGPA and CGPA.

**Table 3:** Tabulation of Grade Points

Grade Letter	O	A+	A	B+	B	C	P	F	Ab
Grade Point	10	9	8	7	6	5	4	0	0

Consider the **CBCS4.csv** data given in the **table 4** for the illustration of SGPA.

**Table 4:** Illustration of SGPA

Semesters	Courses	Credit	Grade Letter	Grade point	Credit Point (Credit x Grade)
1	Course 1	3	A	8	24
1	Course 2	4	B+	7	28
1	Course 3	3	B	6	18
1	Course 4	3	C	5	15
1	Course 5	3	O	10	30
1	Course 6	4	B+	7	28
2	Course 1	3	A	8	24
2	Course 2	4	B+	7	28
2	Course 3	3	B+	7	21
2	Course 4	3	B	6	18
2	Course 5	3	B	6	18
2	Course 6	4	A	8	32
3	Course 1	3	A	8	24
3	Course 2	4	B+	7	28
3	Course 3	3	B	6	18
3	Course 4	3	A+	9	27
3	Course 5	3	B+	7	21

3	Course 6	4	B+	7	28
4	Course 1	3	A+	9	27
4	Course 2	4	A	8	32
4	Course 3	3	B	6	18
4	Course 4	3	A	8	24
4	Course 5	3	B+	7	21
4	Course 6	4	B+	7	28
5	Course 1	3	A	8	24
5	Course 2	4	A	8	32
5	Course 3	3	B	6	18
5	Course 4	3	A	8	24
5	Course 5	3	B+	7	21
5	Course 6	4	B+	7	28
6	Course 1	3	O	10	30
6	Course 2	4	A	8	32
6	Course 3	3	B	6	18
6	Course 4	3	A	8	24
6	Course 5	3	B+	7	21
6	Course 6	4	A	8	32

By using equation 3, semester wise SGPAs for CBCS.csv dataset are calculated as

$$SGPA (S_1) = \frac{\sum C P_1}{\sum C_1} = \frac{143}{20} = 7.15$$

$$SGPA (S_2) = \frac{\sum C P_2}{\sum C_2} = \frac{141}{20} = 7.05$$

$$SGPA (S_3) = \frac{\sum C P_3}{\sum C_3} = \frac{146}{20} = 7.03$$

$$SGPA (S_4) = \frac{\sum C P_4}{\sum C_4} = \frac{150}{20} = 7.5$$

$$SGPA (S_5) = \frac{\sum C P_5}{\sum C_5} = \frac{147}{20} = 7.35$$

$$SGPA (S_6) = \frac{\sum C P_6}{\sum C_6} = \frac{157}{20} = 7.85$$

Here  $S_1, S_2, S_3, S_4, S_5$  and  $S_6$  are SGPA of the first, second, third, fourth, fifth and sixth semesters of students which are calculated 7.15, 7.05, 7.03, 7.5, 7.35 and 7.85 respectively. By using the equation 5 and putting the above SGPA ( $S_i$ ), the CGPA is calculated as

$$CGPA = \frac{\sum (C_i \times S_i)}{\sum C_i} = \frac{(20 \times 7.15 + 20 \times 7.05 + 20 \times 7.03 + 20 \times 7.5 + 20 \times 7.35 + 20 \times 7.85)}{120} = 7.32$$

### 6. Development of CBCS Evaluation Model

CBCS Evaluation Model is the combination of CBCS Base Model, CBCS Course Credit Model, SGPA Evaluation Model and CGPA Evaluation Model.

#### 6.1 CBCS Base Model

In this section, I am discussing the development of CBCS Base Model by using the Table 1. The basic elements of CBCS Base Model (shown in Figure 5) are Pid, Programme, Semesters and Academic\_Works which are generated by the following Python code:

```

In [1]: import numpy as np
In [2]: import pandas as pd
In [3]: from matplotlib import pyplot as plt
In [6]: cols= ['Pid', 'Programme', 'semesters', 'Academic_works']
In [10]: df=pd.read_csv('e://skm/rp24/cbc_base.csv')
In [11]: print(df)

```

Pid	Programme	Semesters	Academic_Works
0	1 Certificate (1)	Odd	15-18 weeks equivalent to 90 days
1	2 Certificate (1)	Even	15-18 weeks equivalent to 90 days
2	3 Diploma (2)	Odd	15-18 weeks equivalent to 90 days
3	4 Diploma (2)	Even	15-18 weeks equivalent to 90 days
4	5 Degree (3)	Odd	15-18 weeks equivalent to 90 days
5	6 Degree (3)	Even	15-18 weeks equivalent to 90 days

Figure 5: Implementation of CBCS Base Model

Suppose BSc, BCom, BA, BBA and BCA etc are programme offered. Each programme offered is distributed into certificate, diploma and degree programmes. We can generate CBCS Base Model for individual programme offered.

### 6.2 CBCS Course Credit Model

In this section, I am discussing the development of CBCS Course Credit Model by using the Table 2. The basic elements of CBCS Course Credit Point Model (shown in Figure 6) are PCid, PCourses, LorT, PorF, Days and Credit Points which is generated by the following python code.

```

In [1]: import numpy as np
In [2]: import pandas as pd
In [6]: df=pd.read_csv('e://skm/rp24/cp.csv')
In [7]: print(df)

```

PCid	PCourses	Works	Time	Days	Credit Point
0	1 Soft-skill	LorT	1 Hour	15	1
1	2 Elective	LorT	1 Hour	15	1
2	3 Core	LorT	1 Hour	15	1
3	4 Soft-skill	PorF	2 Hours	15	2
4	5 Elective	PorF	2 Hours	15	2
5	6 Core	PorF	2 Hours	15	2

Figure 6: Implementation of CBCS Course Credit Model

Suppose FC-Hindi & FC-English are core prescribed courses, Physics & Mathematics are soft-skill prescribed courses and

Computer Science & Economics are elective prescribed courses. We can generate CBCS Course credit Model for it. Similarly, Chemistry and Zoology are soft-skill prescribed courses Botany and Microbiology are elective prescribed courses. We can also generate CBCS Course Credit Model for it.

### 6.3. SGPA Evaluation Model

In this section, I am discussing the development of SGPA Evaluation Model by using the Table 4. The basic elements of SGPA Evaluation Model are Semesters, Courses, Credit Point, Grade Letter, Grade Point and Credit Point (shown in the Figure 3). It is the heart of the CBCS Evaluation Model. In my calculation, the CBCS4.csv is used. I created df1 data-frame having Semesters, Credit and Grade\_Point fields of df data-frame. Now, I calculated Credit\_Points (CP) by multiplying Credit and Grade\_Point. Finally, I calculated Semesters wise total of Credit and Credit\_Points represented with ΣC and ΣCP respectively. By dividing ΣCP to ΣC, SGPA of each semester are calculated which is displayed after a code line 38. These are equal to the SGPA calculated manually.

```

In [2]: import numpy as np
In [3]: import pandas as pd
In [4]: df=pd.read_csv('e://skm/rp24/sgpa1.csv')
In [6]: df1=df[['Semesters', 'Credit', 'Grade_Point']]
In [34]: df1['CP']= df1.Credit * df1.Grade_Point
In [32]: total= df1.groupby('Semesters').sum()
In [35]: print(total)

```

Semesters	Credit	Grade_Point	CP
1	20	43	143
2	20	42	141
3	20	44	146
4	20	45	150
5	20	44	147
6	20	47	157

```

In [37]: SGPA=total.CP/total.Credit
In [38]: print(SGPA)

```

Semesters	SGPA
1	7.15
2	7.05
3	7.30
4	7.50
5	7.35
6	7.85

Figure 7: Implementation of SGPA Evaluation Model

### 6.4. CGPA Evaluation Model

In this section, I am discussing the development of CGPA Evaluation Model by using the SGPA's found in the section 6.3. The basic elements of CGPA Evaluation Model are Semesters, total of all Credit and SGPA and Credit Point (shown in the Figure 4). The CGPA Evaluation Model is shown in the Figure 8.

In this model, CS is first calculated by using the code CS=SGPA\*total.Credit. It is found 143.0, 141.0, 146.0, 150.0,

147.0 and 157.0 for the semesters 1, 2, 3, 4, 5 and 6 respectively. It is displayed by using the Python code print(CS).

The python code Total\_Credit=total.Credit.sum() is used to calculate the sum of all Credits. It is calculated 120. It is displayed by using the Python code print(Total\_Credit).

Total\_SGPA=CS.sum() Python code is used to calculate the sum of SGPA of all Semesters. It is calculated 884.0. It is displayed by using the Python code print(Total\_SGPA).

Finally, the Python code CGPA=Total\_SGPA/Total\_Credit is used to calculate the CGPA. It is calculated 7.36. It is displayed by using the Python code print(CGPA).

```

In [54]: CS=SGPA*total.Credit
In [55]: print(CS)
Semesters
1    143.0
2    141.0
3    146.0
4    150.0
5    147.0
6    157.0
dtype: float64
In [43]: Total_Credit=total.Credit.sum()
In [44]: print(Total_Credit)
120
In [57]: Total_SGPA=CS.sum()
In [58]: print(Total_SGPA)
884.0
In [59]: CGPA=Total_SGPA/Total_Credit
In [60]: print(CGPA)
7.366666666666666

```

Figure 8: Implementation of CGPA Evaluation Model

## 7. Results and Discussion

The CBCS Base Model is created firstly. It has three basic elements programme, semesters and Academic\_Works. The programme element is classified into Certificate, Diploma and Degree. The semester element is classified into odd and even semesters. Odd semesters means First, Third and Fifth semesters. Even semesters means Second, Fourth and Sixth semesters. The Academic\_Works element contains only one data "15-18 weeks equivalent to 90 Days". The programmes offered are B.Sc. B.Com., BA, BCA, BBA, LLB etc. The CBCS Base Model is represented in the Figure 1 and implemented in the Figure 5. The implementation of CBCS Base Model for the Certificate programme is shown in the Figure 9.

```

In [17]: Certi_BM=df[0:2]
In [18]: print(Certi_BM)
Pid  Programme Semesters Academic_Works
1 Certificate (1) Odd 15-18 weeks equivalent to 90 days
2 Certificate (1) Even 15-18 weeks equivalent to 90 days

```

Figure 9: CBCS Base Model for Certificate Programme

The implementation of CBCS Base Model for the Diploma programme is shown in the Figure 10.

```

In [27]: Diploma_BM=df[2:4]
In [28]: print(Diploma_BM)
Pid  Programme Semesters Academic_Works
3 Diploma (2) Odd 15-18 weeks equivalent to 90 days
4 Diploma (2) Even 15-18 weeks equivalent to 90 days

```

Figure 10: CBCS Base Model for Diploma Programme

The implementation of CBCS Base Model for the Degree programme is shown in the Figure 11.

```

In [31]: Degree_BM=df[4:6]
In [32]: print(Degree_BM)
Pid  Programme Semesters Academic_Works
5 Degree (3) Odd 15-18 weeks equivalent to 90 days
6 Degree (3) Even 15-18 weeks equivalent to 90 days

```

Figure 11: CBCS Base Model for Degree Programme

The CBCS Course-Credit Model is created secondly. It has two elements Prescribed\_Courses and Credits. The Prescribed\_Courses are classified into Core, Elective and soft skill. There are 1, 2, 3 and 4 Credits. Sample data of this model is given in the Table 2. One-one Credits for LorT of one-one hour of 15 days and two-two credits for PorF of two-two hours of 15 days are listed in the Table 2. Grade points are listed in the Table 3.

Based on illustration Table 4, Credit, Grade Point and Credit Point (CP) evaluated first group by semester. Credit 20 is found for each semester. The Credit Points (CP) of semesters 1, 2, 3, 4, 5, and 6 are calculated 143, 141, 146, 150, 147 and 157 respectively. By using these Credits and CPs are SGPA are calculated and denoted by  $S_1$ ,  $S_2$ ,  $S_3$ ,  $S_4$ ,  $S_5$  and  $S_6$  respectively.  $S_1$ ,  $S_2$ ,  $S_3$ ,  $S_4$ ,  $S_5$  and  $S_6$  are calculated 7.15, 7.05, 7.03, 7.5, 7.35 and 7.85 respectively. It is show in the Figure 12. Based on  $S_1$ ,  $S_2$ ,  $S_3$ ,  $S_4$ ,  $S_5$  and  $S_6$ , CGPA is calculated 7.32 manually.

The Certificate is provided when student is completed one year (first and second semesters) of the programme. In this condition, SGPA of Table 4 data will be 7.15 & 7.05 and CGPA will be 7.1. The Diploma is provided those students who are completed two years (first second, third and fourth semesters) of the programme. In this condition, SGPA of Table 4 data are 7.15, 7.05, 7.03 and 7.5. Its CGPA is found 7.15.

```
In [84]: import matplotlib.pyplot as plt
In [88]: plt.plot([7.15, 7.05, 7.03, 7.5, 7.35, 7.85])
plt.show()
```

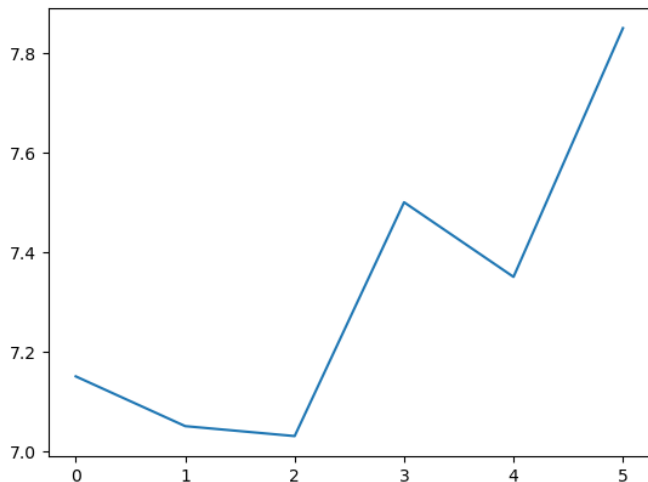


Figure 12: SGPA Graph

According to this graph, SGPA of Credit=20 and Credit Point=141 is lowest but SGPA of Credit=20 and Credit Point (CP) = 157 is highest. The performance of respective student is shown in the Figure 12. The performance of student is found down for the semester 3 as compared to semesters 1 and 2. The performance of student is also found down for the semester 5 as compared to semesters 4 and 6. I can also say that performance of the student is growing up for the semester 4 and 6 as compared to previous semesters. According to this SGPA Graph, CGPA 7.32 (manually calculated) is found less than to SGPA for the semesters 1, 2 & 3 and more than to the SGPA for semesters 4, 5 and 6. In this calculation, SGPA and CGPA Evaluation Models are used. By using Anaconda Jupiter python tool, CGPA is calculated 7.36 shown in the Figure 8.

## 8. Conclusion

The CGPA and SGPA are very easily and fast calculated by using my developed models. I concluded that SGPA Evaluation Model is very useful for the evaluation of SGPA of each and every semester. SGPAs are calculated based on Credit and Credit Point of each semester. They are found 7.15 for first semester, 7.05 for second semester, 7.03 for third semester, 7.5 for fourth semester, 7.35 for fifth semester and 7.85 for sixth semester. They are SGPAs of a single student. The CGPA is calculated (7.32 manually and 7.36 practically) which is based on all SGPA of the single student. We can also calculate the SGPAs and CGPA of any student. The CGPA Evaluation Model is useful the evaluation of the CGPA.

## 9. Future Scope

My developed model is useful for the calculation of CGPA of any student for any stream or any class of the college or university. Any private or semi, state govt. or central university can be applied this model for the improvement of

their CBCS system. My developed CBCS model will be applicable in the future research. SGPA and CGPA Evaluation Models can be applicable for the evaluation of CGPA of any class.

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