

STUDENTS' PERFORMANCE EVALUATION SYSTEMS : A COMPARATIVE STUDY

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ABSTRACT

This paper presents a comparative study of two systems, i.e., Credit System and Marking System, used for evaluating students performance in examinations. Main features of the Credit System have been presented. A case study presented discusses these two systems. It has been pointed out that neither of these systems follows normality. However, the process variabilities of both the systems have been found to be almost identical. The paper, it is believed, can generate interest amongst all concerned.

1.0 INTRODUCTION

The Technical and Management Education plays a vital role in promoting national well being and national welfare. Its objectives can be summarized as given below [1] :

- To impart effectively technical and analytical skills to students;
- To inculcate social consciousness amongst student-community.

The fulfillment of these objectives are expected to yield the following end results:

- 1] Development of capacity in students for tackling engineering problems;
- 2] Promotion of technical know-how in students regarding analysis, methods of design and production;
- 3] Inculcation of good moral and ethical values; and
- 4] Sense of social obligations in students.

Introduction of sound curriculum is one of the means for attaining these desired end results. The curriculum (study programme) consist of the following main components :

- Language, humanity and social sciences;
- General basic sciences;
- Professional subjects; and
- Open electives.

In other words, courses classified as core, discipline and elective need to be judiciously incorporated in study programmes prescribed. Though curriculum development is a complex task, evaluation of students performance in the course examinations is equally complex one and needs close attention because a sound evaluation system reflects the extent of students' ability to handle real-life issues. As on today, right from primary to higher education levels, marking system has been widely used for evaluating students' performance in examinations. The recent trend, however, is to switch over to the credit system. The main features of the credit system have been presented in the next section.

2.0 MAIN FEATURES OF THE CREDIT SYSTEM [2]

This system allows multi-point entry based on credits earned in earlier part of similar study programmes undertaken in some other institution. It incorporates qualitative letter grading with cumulative performance index for the award of class.

The credit system observes continuous assessment of a student. The major features of this system are briefly presented as given below.

Course Credits :

Credits are earned as given below :

Lecture : 1 Credit per theory contact hour per week;

Practical : 0.5 credit per practical contact hour per week.

Tutorials are considered as extended teaching periods and earn no credit. Usually, 25% of course marks earns one credit.

Faculty Adviser :

Each student is assigned to a Faculty Adviser who advises the student for course selection in a semester. Four years (levels) duration course consisting of eight semesters leads to the first degree in engineering.

Letter Grades :

The overall performance of a student in a course is represented by a letter grade and its associated grade points are tabulated below.

Letter Grade	Qualitative Meaning	Equivalent Grade Points
A	Excellent	10
B	Good	8
C	Average	6
D	Poor	4
E	Conditional Pass	2
F	Fail	0

A student is said to complete a course successfully if he earns letter grade E or better. A student must obtain at least 25% marks in each course component (theory and practical) to earn letter grade other than F. The letter grade E is in the nature of

condonation. Grade E is considered sufficient to meet a course's pre-requisite requirements. A student is allowed to have a maximum of one grade E at each level (year) of a study programme. In case, he obtains more than one E in a year, he is required to repeat such courses till he is left with not more than one E.

Semester Performance Index (SPI):

It is the weighted average of course grade points obtained by a student in the courses undertaken in a semester and it can be expressed as given below :

$$SPI = \frac{\sum_{i=1}^n C_i * G_i}{\sum_{i=1}^n C_i}$$

Where, C_i = Credit earned for i^{th} course.

G_i = Grade points for i^{th} course.

n = Number of courses offered in a semester.

If a student has SPI less than 3 in a semester, he must seek principal's advice while selecting the next semester courses.

Cumulative Performance Index (CPI) :

It is the weighted average of course grade points obtained by a student for all courses taken together since his admission to the study programme. CPI is computed using the SPI expression given above. A student getting CPI less than 4 at any time after his first four semesters in a programme seeks principal's advice while selecting the subsequent semester courses.

Discontinuation from the programme :

An SPI less than two in two consecutive semesters shall disqualify a student from his studies.

Requirements for the Award of BE degree :

To be eligible for the award of the degree of bachelor of Engineering, a student must earn a total of at least 190 credits with :

- a minimum CPI of 4; and
- not more than one course with letter grade E at each level (year)

The total credit requirements for BE degree must be completed in not more than 12 semesters from the date of student's admission after HSC or an equivalent qualifying examination. In case of a student admitted by transfer (multi-point entry) the maximum permissible duration shall be 50% more than the period prescribed for completion of his programme at the time of admission. In case of, however, extenuating circumstances, a student may be allowed a maximum of 2 additional semesters to complete his degree programme.

Award of Class :

The final CPI is considered for the award of class as presented below :

Class	CPI
Distinction	Not less than 8.5
First	Less than 8.5 but not less than 7
Second	Less than 7 but not less than 4.5
Pass	Less than 4.5 but not less than 4
Fail	Less than 4

Based on the above information, a case study has been presented in the next section.

3.0 THE CASE STUDY

Some vital features of the case study are presented in this section.

3.1 Scope and Data Collection :

This case study is limited to only the result data in respect of BE (Mechanical) Semester II, May 1992 examination held at Karad center under the Shivaji University, Kolhapur. The BE(Mechanical) semester II study programme is presented below.

Sr. No.	Course Title	Teaching Scheme			Examination Scheme			Credit
		L	P	T	T	Term-Work	Oral	
1	Refrigeration & Air Conditioning.	3	2	-	100	25	25	4
2	Industrial Engineering.	3	2	-	100	25	25	4
3	Mechanical Control Systems.	3	2	-	100	25	-	4
4	Mechanical System Design.	3	2	-	100	25	25	4
5	Elective-II (Introduction to CAD/CAM)	3	2	-	100	25	25	4
6	Project.	-	6	-	-	100	100	3
Total :		15	16	-	500	225	200	23

The result of this class as declared by the University is presented elsewhere in this section.

3.2 Methodolgy Adopted For Data Analysis :

The data collected (subjectwise marks) is processed as under :

- 1) Frequency distribution of students getting marks in the designed classes is plotted. The class interval chosen is 5 and frequencies are worked out for

the range 0–120 marks for subject-courses, and for project the range used is 141–190 marks with an additional class with the interval 0-140 marks.

- 2) The frequency distribution for each course is studied and an attempt has been made to weed out halo effect, and latter grades, A to F, are assigned accordingly. For example, letter grade A is assigned to a class 106-120 marks for Refrigeration and Air Conditioning subject, whereas, in case of Elective-II it represents a class of 116-120 marks. Two representative

histograms for such letter grades are presented in Fig.1.

- 3) Using the letter grades for the respective classes, grades points are assigned to each subject offered by a student.
- 4) The SPI is computed for each student.
- 5) Since the data is limited, SPI is considered as CPI and classes are awarded to examinees.
- 6) The frequency of classes awarded using both systems, namely, marking and credit system, then is subjected to statistical tests, such as, chi square, t and F test. And inferences are drawn.

3.3 Results and Discussion :

The results are presented below :-

Class	Marking System	System No. of students	Credit System	
	% Mark Range		CPI Range	No. of Students
Distinction	66 - 100	26	$CPI > 8.5$	1
First	60 - 65	39	$7 < CPI < 8.5$	20
Second	50 - 59	5	$4.5 < CPI < 7$	49
Pass	40 - 49	-	$4 < CPI < 4.5$	-
Fail	0 - 39	5	$CPI < 4$	5
	Total :	75	Total	75

The mean and standard deviations for the systems used are :

Marking system : Mean : 66.4, Standard deviation : 15.91.

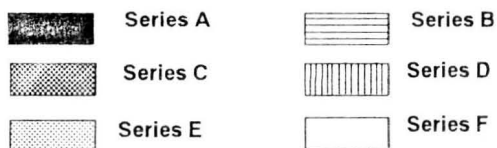
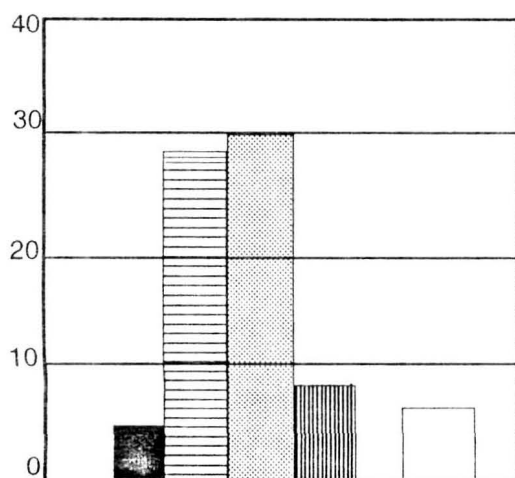
Credit system : Mean : 6.08, Standard deviation : 1.45.

The chi-square test indicates that both the systems do not follow normality. For 't' test, the universe mean is unknown. Therefore, t at 0.05 risk of error with 74 degrees of freedom is read from the 't' table for each system and universe mean is worked out [3]. These are 62.82 and 5.72 for marking and credit system respectively. For 'F' test, grade points of mean and standard deviation of credit system are converted into the same units as those

used for marking system for preserving dimensional uniformity. It is assumed that 1 grade point is equal to be 10 marks. Such converted values of mean and standard deviation are used for F test. The ratio of variances for both the systems works out to be equal to 1.2, thereby indicating that the variances are almost the same for one tail test[3]. Based on the above discussion the following inferences, keeping in view the limited data, can be drawn :

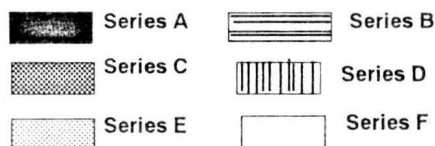
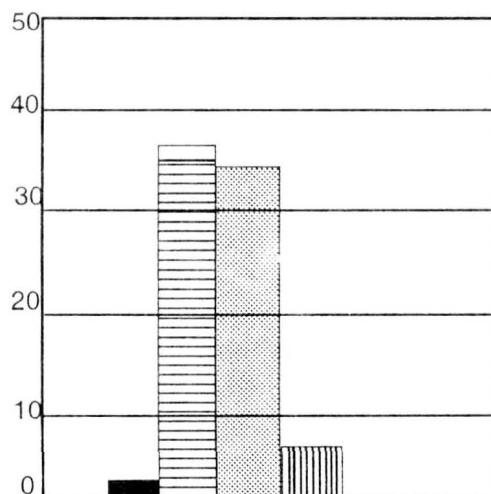
- Credit system is (marking system) path dependent.
- Credit system uses arithmetic progression for grade points.
- Both the systems have identical process variability.

GRADES (A-F) DISTRIBUTION. REFIGERATION & AIR CONDITIONING



A : 106, B : 91, C : 76, D : 66, E : 56, F : 0 (low Its)

GRADES (A-F) DISTRIBUTION. PROJECT



A : 180, B : 161, C : 146, D : 101, E : 96, F : 0 (low Its)

Figure : 1. Letter Grades Distribution.

- Faculty adviser can assign letter grades as he thinks fit.
- Credit system can be considered as a statistical extension of the existing marking system.

4.0 SCOPE FOR THE FUTURE RESEARCH WORK

Since the comparative study of credit and marking system is based on a small size data, extensive work is needed before accepting or rejecting either of the system. Instead of adopting arithmetic progression for grade points, use of preferred number series, like, R5, R10, etc., can advantageously be used. However, to judge its suitability to the credit system needs further research in the area.

5.0 CONCLUSION

This paper has highlighted the major features of credit system.

Through a small size case study, marking system has been compared with the credit system. Statistically it is inferred that both the systems have identical process variability and neither of them shows normality. Scope for further research work is also presented.

REFERENCES

- 1] ANON, 1989, Model Syllabii for Four Year Degree Courses in Engineering, Ministry of Education and Culture, Government of India, New Delhi, Publication No. 81.

2] ANON, 1990, Academic Regulation and Course of Study for Credit System in Faculty of Engineering & Technology, Sardar Patel University, Vallabh Vidyangar, Gujarat.

3] DUNCAN A J, 1970, Quality Control and Industrial Statistics, Bombay: DB Taraporevala Sons & Co. Pvt. Ltd.

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