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Numerical Techniques for Calculating Attainment of Course Outcome and Programme Outcome under NEP-2020

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ABSTRACT

The Outcome Based Learning (OBL) has been one of the major concerns of most academic institutions in Jammu and Kashmir (UT), especially at the UG level. However, various understandings of the concept have resulted in various Programme Outcomes (PO) based on the Course Outcomes (CO). In the present paper, the authors have developed a numerical technique for calculating the CO and PO for the operationalization of the concept offering a fresh approach towards developing an effective, operational technique of measuring CO and PO.

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1. INTRODUCTION

The idea behind OBE is to build the curriculum around the outcomes that students should be able to achieve by the end of their education programme [2]. The implementation of outcome-based education (OBE) has been a major emphasis of academic institutions in Jammu & Kashmir under NEP2020. particularly among UG level programmes. In order to ensure that the curricula design satisfies the programme outcome and programme education aim, which shall reflect the accomplishment of the JK HED mission and vision.

The majority of Jammu & Kashmir academic institutions that offer UG level courses have endorsed the approach toward OBE implementation. In order to facilitate the adoption of OBE, various educational methods have been highlighted [1], [10]. Based on the comments received from the stakeholders, the emphasis of OBE is able to provide the human capital demands as requested by the industry [3].

Abidin et. al. [5] described the step by step algorithm used by the LAB-SPECT using Electrical Engineering Laboratory 2 (EEE361) as a model case. Students' raw marks from the assessments activities during the December 2008-April 2009 semester session were used as inputs for the system. Outputs plots of average score and ranking of achieved POs as well as the students' density for the three different ranking levels were shown. These plots were used and analyzed thoroughly by the respective lecturer and later made recommendations to be implemented for Continuous Quality Improvement (CQI) exercise.

The continuous quality improvement (CQI) process plan that was developed and implemented by the Department of Mechanical Engineering (DME), University Tenaga National (UNITEN), Malaysia for its Bachelor of Mechanical Engineering Programme was described by Anuar et. al. [6]. The plan was part of the

Outcome-Based Education (OBE) system that was required by the Engineering Accreditation Council (EAC) of Malaysia.

Jaafar et. al. [7] describes the office automation system and its strength and weakness after one year of its first implementation. Mutalib et. al. [8] developed the measurement of programme outcome as an implementation in Civil Engineering Programmes courses. Assessing the attainment of course outcomes (CO) for an engineering course was given by Abidin et. al. [9].

Amirulddin et. al. [10] presented the analysis of PO achievement based on student's achievement in formal assessments for core subjects in the Bachelor of Electrical Power Engineering (BEPE) and Bachelor of Electrical and Electronics Engineering (BEEE) programmes in UNITEN for four semesters from Semester 1, 2007/2008 to Semester 2, 2008/2009.

In [11] Aziz et. al. enunciates the Malaysian Engineering Education Model (MEEM) and the processes leading to an outcome based engineering education. Kalyani [12] gave an empirical study on NEP 2020 [National Education Policy] with Special Reference to the Future of Indian Education System and Its effects on the Stakeholders. Gupta et. al. [13] reviewed literature on autonomy related to educational institutions in India and overseas on different dimensions perspectives and levels of autonomy. Based on literature review, experiences of the authors and interaction with experts working in the autonomous institutions, guidelines for obtaining and sustaining autonomy were stated. Saxena [14] collects the information related to the glimpse of NEP 2020. Aithal et. al. [15] highlights the various policies announced in the higher education system and compare them with the currently adopted system. Various innovations and predicted implications of NEP 2020 on the Indian higher education system along with its merits were discussed.

2. DEFINITIONS AND PRELIMINARIES USED IN THIS PAPER:

Formula:

$$C_0 = \frac{AE + AI}{W} \times SF \text{ and } P_0 = \text{Average of course out comes}$$

Where AE: (Average of external marks)

AI: (Average of internal marks)

SF : (Syllabus completion factor)

W: (Weight age of marks)

Terms and conditions for defining (CO^{'s}) course out comes :

1. IF $C_0 > 70$, then highest level of course is attained denoted by L_3 .
2. IF $50 < C_0 < 70$, then moderate level of course is attained denoted by L_2 .
3. IF $35 < C_0 < 50$, then average level of course is attained denoted by L_1 .
4. IF $C_0 < 35$, then poor level of course is attained denoted by L_0 .

Terms and conditions for defining (PO^{'s}) Programme outcomes :

1. IF $80 < P_0 < 100$, then highest level of programme is attained denoted by grade A.
2. IF $60 < P_0 < 80$, then moderate level of programme is attained denoted by grade B.
3. IF $40 < P_0 < 60$, then average level of programme is attained denoted by grade C.
4. IF $P_0 < 40$, then poor level of programme is attained denoted by grade D.

```

SQLQuery3.sql - not connected* - Microsoft SQL Server Management Studio
File Edit View Query Project Tools Window Help
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SQLQuery3.sql - not connected*

/***** Object: StoredProcedure [dbo].[sp_getcourseoutcome] Script Date: 15-02-2023 15:48:56 *****/
/***** Author Name : Sudhakar Hussain *****/

SET ANSI_NULLS ON
GO
SET QUOTED_IDENTIFIER ON
GO

ALTER PROCEDURE [dbo].[sp_getcourseoutcome]
@subjectcode as nvarchar(20),
@batchid as int,
@courseyear as int
AS
DECLARE @temp as table (SubjectCode nvarchar(50), Total bigint, Calculated bigint , Average float )
declare @total as int
declare @calculated as int
declare @subjectcode as nvarchar(20)

BEGIN

set @total =0;
set @calculated =0;
set @subjectcode = @subjectcode + "(";

select @total = count(*) from t_studentsanddetails where batchid=@batchid and courseyear=@courseyear and (resultdetail like " " + @subjectcode + "X" or resultdetail like "X" + @subjectcode + "X" );

with cte1
as
(
select rolno, dbo.getnumericvalue( substring(resultdetail, charindex(@subjectcode, resultdetail)+1, len(@subjectcode) ,
charindex(")", resultdetail, charindex(@subjectcode, resultdetail)+1, len(@subjectcode))) as calmarks
from t_studentsanddetails where batchid=@batchid and courseyear=@courseyear and (resultdetail like " " + @subjectcode + "X" or resultdetail like "X" + @subjectcode + "X" )
)
insert into @temp(subjectcode, total, calculated , average) select @subjectcode, @total , count(*) as Calculated , round(sum(cast(calmarks as float)) / count(calmarks),2) as avg from cte1 where calmarks > 0

select * from @temp
END
    
```

```

SQLQuery6.sql - sharedmsq8.znetindia.net,1234nvcollge (college1 (118)) - Microsoft SQL Server Management Studio
File Edit View Query Project Tools Window Help
SQLQuery6.sql - not connected*
SQLQuery6.sql - not connected*
SQLQuery6.sql - not connected*

/***** Object: StoredFunction [dbo].[getmarks] Script Date: 18-02-2023 22:37:38 *****/
/***** Author Name : Sudhakar Hussain *****/
SET ANSI_NULLS ON
GO
SET QUOTED_IDENTIFIER ON
GO

CREATE FUNCTION [dbo].[getmarks]
(
@subjectcode as nvarchar(20),
@batchid as int,
@courseyear as int
)
RETURNS nvarchar(20)
AS
BEGIN
DECLARE @marks as nvarchar(20)
declare @subjectcode as nvarchar(20)
declare @batchid as int
declare @courseyear as int
declare @marks as nvarchar(20)

SET @subjectcode = @subjectcode + "(";
SET @batchid = @batchid + "X";
SET @courseyear = @courseyear + "X";

if (@subjectcode <> "")
begin
set @marks = substring(@subjectcode, 1, charindex(")", @subjectcode)-1);
set @subjectcode = substring(@subjectcode, charindex(")", @subjectcode)+1, len(@subjectcode)-1);
end
else
begin
set @marks = "";
end

if (@batchid <> 0)
begin
set @marks = @marks + @batchid + "X";
end
else
begin
set @marks = @marks + "X";
end

if (@courseyear <> 0)
begin
set @marks = @marks + @courseyear + "X";
end
else
begin
set @marks = @marks + "X";
end

if (@marks <> "")
begin
set @marks = substring(@marks, 1, charindex("X", @marks)-1);
end

return @marks
END
    
```

```

wwwroot.dll (4) - Microsoft Visual Studio
FILE EDIT VIEW WEBSITE BUILD DEBUG TEAM SQL TOOLS TEST ANALYZE WINDOW HELP
courseoutcome.aspx courseoutcome.aspx.vb searchstudent.aspx.vb studentinfo.vb
Protected Sub Button1_Click(sender As Object, e As EventArgs) Handles Button1.Click
Dim co As Single

If grdlist.Rows.Count > 0 Then
If Val(txtcreditspoints.Text) > 0 And IsNumeric(txtcreditspoints.Text) And IsNumeric(txtsyllabuscovered.Text) Then
If Val(txtcreditspoints.Text) < Val(grdlist.Rows(0).Cells(3).Text) Then
Ibcourseoutcome.Text = "Average Marks Cannot be Greater Than Max Marks"
Exit Sub
End If
co = Math.Round((Val(grdlist.Rows(0).Cells(3).Text) / Val(txtcreditspoints.Text)) * Val(txtsyllabuscovered.Text), 2)
Ibcourseoutcome.Text = "Course Outcome for " & grdlist.Rows(0).Cells(0).Text & " : " & co & "%"
If co >= 75 Then
Ibcourseoutcomeattained.Text = "Highest level of Course Outcome is Attained (L3)"
End If
If co < 75 And co >= 50 Then
Ibcourseoutcomeattained.Text = "Moderate level of Course Outcome is Attained (L2)"
End If
If co < 50 And co >= 35 Then
Ibcourseoutcomeattained.Text = "Average level of Course Outcome is Attained (L1)"
End If
If co < 35 Then
Ibcourseoutcomeattained.Text = "Poon level of Course Outcome is Attained (L0)"
End If
Else
Ibcourseoutcome.Text = "Fill all the Details"
End If
End If
End Sub
End Class
    
```

3. Main Results:

In this Section of the paper, we will calculate OBL, CO's and PO's of the date which we collect from [4]



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Message from Principal's Desk Contact Us

Student Details HOME / STUDENT DETAILS

Select Batch

Active Batches Previous Batches

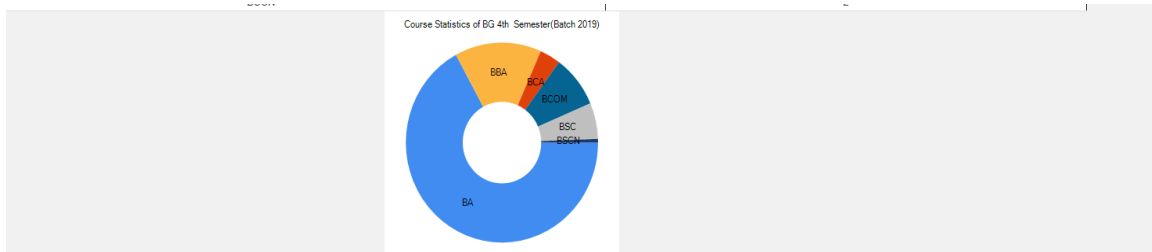
BG 4th Semester(Batch 2019)

Get Course / Subject Statistics

Search Student by Name Search Student by Class Roll No

Course / Subject Statistics of BG 4th Semester(Batch 2019)

Course Statistics	
course	total
BA	230
BBA	50
BCA	12
BCOM	29
BSC	20



Subject Statistics					
Subject Name	Subject Code	Total	View All	View All	Course Outcome
DEVELOPING EMOTIONAL COMPETENCE(2017)	(DEC418)	30	View All		Course Outcome
DISASTER MANAGEMENT	(DM418)	113	View All		Course Outcome
EARLY CHILDHOOD CARE AND EDUCATION	(ECC418)	167	View All		Course Outcome
GENDER SENSITIZATION (2017)	(GDS418)	10	View All		Course Outcome
LEARNING SKILLS OF AFSANA IN URDU (2017)	(LAIU418)	23	View All		Course Outcome
ARABIC LITERATURE	(ARL416)	4	View All		Course Outcome
BIO-CHEMISTRY	(BC416)	1	View All		Course Outcome
BOTANY	(BO416)	17	View All		Course Outcome
BUSINESS RESEARCH	(BRH417)	50	View All		Course Outcome
BIOTECHNOLOGY	(BT416)	5	View All		Course Outcome
COMPUTER APPLICATIONS	(CA416)	3	View All		Course Outcome
CHEMISTRY	(CH416)	16	View All		Course Outcome
CORPORATE ACCOUNTING	(CPA417)	29	View All		Course Outcome
Cost Accounting	(CSA416)	29	View All		Course Outcome
DESIGN AND ANALYSIS OF ALGORITHMS	(DAA417)	12	View All		Course Outcome
DATABASE MANAGEMENT	(DBM417)	12	View All		Course Outcome
ECONOMICS	(EC416)	4	View All		Course Outcome
ENGLISH LITERATURE	(EL416)	4	View All		Course Outcome
ENGLISH II	(ENG419)	22	View All		Course Outcome
GEOGRAPHY	(GG416)	9	View All		Course Outcome

COURSE	COURSE CODE	CREDITS	MARKS	VIEW ALL	COURSE OUTCOME
FINANCIAL MANAGEMENT	FMC417	50		View All	Course Outcome
GENERAL ENGLISH	GE419	259		View All	Course Outcome
HUMAN RESOURCE MANAGEMENT	HRM417	50		View All	Course Outcome
HOME SCIENCE	HSC416	10		View All	Course Outcome
INDIAN MUSIC	IM416	10		View All	Course Outcome
KASHMIRI LITERATURE	KRL416	1		View All	Course Outcome
MATHEMATICS	MM416	2		View All	Course Outcome
PHYSICS	PH416	2		View All	Course Outcome
PRODUCTION AND OPERATIONS MANAGEMENT	POM417	50		View All	Course Outcome
PERSIAN LITERATURE	PRL416	3		View All	Course Outcome
POLITICAL SCIENCE	PS416	13		View All	Course Outcome
PSYCHOLOGY	PSY416	34		View All	Course Outcome
SOCIOLOGY	SC416	142		View All	Course Outcome
STATISTICS	ST416	3		View All	Course Outcome
STATISTICS	ST417	12		View All	Course Outcome
SOFTWARE ENGINEERING	SWE417	12		View All	Course Outcome
TOURISM AND TRAVEL MANAGEMENT	TTM416	2		View All	Course Outcome
URDU LITERATURE	URL416	12		View All	Course Outcome
ZOOLOGY	ZO416	20		View All	Course Outcome

Subject Statistics of BG 4th Semester(Batch 2019)

Course out come for 4th semester (batch -2019) for some specific subjects is as follow:

I. Here course outcome for BO416 is 81.28%, that is $C_0 > 70$, then highest level of course is attained L_3 .

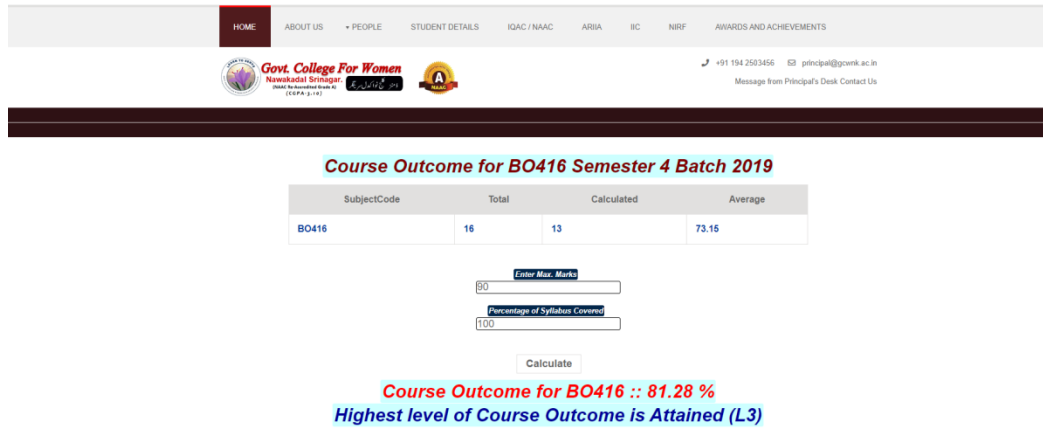


Fig. 1 Course outcome for BO416

II. Here course outcome for HCT416 is 50%, that is $C_0 < 70$, then moderate level of course is attained L_2 .

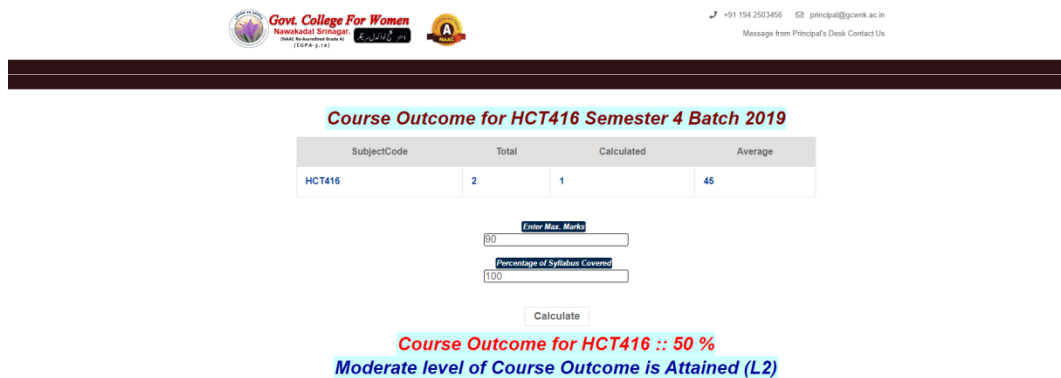


Fig. 2 Course outcome for HCT416

III. Here course outcome for CA416 is 44.81%, that is $C_0 < 50$, then Average level of course is attained L_1 .

Course Outcome for CA416 Semester 4 Batch 2019

SubjectCode	Total	Calculated	Average
CA416	3	3	40.33

Enter Max. Marks
90

Percentage of Syllabus Covered
100

Calculate

Course Outcome for CA416 :: 44.81 %
Average level of Course Outcome is Attained (L1)

Fig. 3 Course outcome for CA416

IV. Here course outcome for MM416 is 44.44%, that is $C_0 < 50$, then average level of course is attained L_1 .

Course Outcome for MM416 Semester 4 Batch 2019

SubjectCode	Total	Calculated	Average
MM416	2	2	40

Enter Max. Marks
90

Percentage of Syllabus Covered
100

Calculate

Course Outcome for MM416 :: 44.44 %
Average level of Course Outcome is Attained (L1)

Fig. 4 Course outcome for MM416

V. Here course outcome for PH416 is 61.67%, that is $C_0 > 50$, then moderate level of course is attained L_2 .

Course Outcome for PH416 Semester 4 Batch 2019

SubjectCode	Total	Calculated	Average
PH416	2	2	55.5

Enter Max. Marks
90

Percentage of Syllabus Covered
100

Calculate

Course Outcome for PH416 :: 61.67 %
Moderate level of Course Outcome is Attained (L2)

Fig. 5 Course outcome for PH416

VI. Here course outcome for POM417 is 40.86%, that is $C_0 < 50$, then average level of course is attained L_1 .

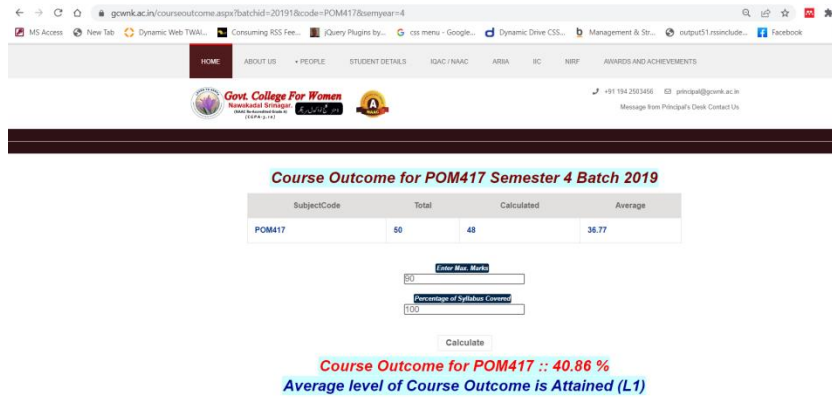


Fig. 6 Course outcome for POM417

VII. Derivation for Programme outcome for the above Course outcomes :

P_0 = Average of course out comes = 53.84

Hence P_0 , lies as follow :

$40 < P_0 < 60$, then average level of programme is attained denoted by grade C.

4. CONCLUSION

The OBL implementation of CO and PO attainment has been explored for Product Skill Development subject that were offered to all undergraduates Students. Two methods have been incorporated which is direct method and segregated method. The direct method implies that the CO attainment directly reflects the PO attainment. On the other hand, the segregated method implies each individual component in the assessment is mapped to its respective CO and PO and shall be assessed in segregated manner. CO & PO attainment incorporating direct measurement and segregated measurement exhibit varying result. The segregated method is more sensitive towards identifying the issues, which affect attainment of CO and PO.

5. ACKNOWLEDGEMENT

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