Outcome Based Education (OBE) Manual

St. Thomas College (Autonomous), Thrissur

CONTENTS

Introduction

Twenty first century's students as well as market demands have pushed educationalist to think about setting clear standards for observable, measurable outcomes through which student's performance can be empirically measured. Globally many universities have shifted towards performance-based education; however, its implementation in all universities and disciplines was successful. With growing technological innovations and its application in the higher education sector as well as the changing trend from teacher-centric to student-centric and outcome-oriented teaching/learning has triggered re-engineering of the curriculum, the teaching and learning approaches, and the way students are assessed.

What is Outcome-Based Education (OBE)?

Outcome-Based Education means clearly focusing and organizing everything in an educational system, around what is essential for all students to be able to do successfully at the end of their learning experiences. It helps create a clear picture of what is important for students to be able to do, then organizing curriculum, instruction, and assessment to make sure this learning ultimately happens. The keys to having an outstanding outcome-based system are:

- Developing a clear set of outcomes around which all system's components can be focused.
- Establishing conditions and opportunities within the system that enable and encourage all students to achieve those essential outcomes.

OBE is a flexible, empowerment-oriented approach to learning. It aims at equipping learners with the knowledge, competence and orientations needed for success after they leave institution. Hence its guiding vision is that of a competent future citizen.

Benefits of OBE

Clarity: The focus on outcome creates a clear expectation of what needs to be accomplished by the end of the course.

• Flexibility: With a clear sense of what needs to be accomplished, instructors will be able to structure their lessons around the students' needs.

• Comparison: OBE can be compared across the individual, class, batch, program and institute levels.

• Involvement: Students are expected to do their own learning. Increased student involvement allows them to feel responsible for their own learning, and they should learn more through this personal learning.

Why follows OBE?

OBE is an educational approach considered in planning, implementing and evaluation of curricula rather than an event occurring in the curricula. It promises high level of learning for all students based on the achievement of clearly unambiguous outcomes with consideration to the appropriateness of each learner's development level and assuring active and experienced-based learning. It provides the learner with the destination of the educational journey before voyaging.

The induction of India in the Washington Accord in 2014 with the permanent signatory status of The National Board of Accreditation (NBA) is considered a big leap forward for the higher education system in India. It means that an Engineering graduate from India can be employed in any one of the other countries who have signed the accord. NAAC is also now following the same path and OBE is benchmarked as a standard for accreditation.

Steps for planning and implementing outcome-based curriculum:

1. Deciding on the outcomes: The educational outcomes are clearly identified and unambiguously specified regarding the content, context and competence.

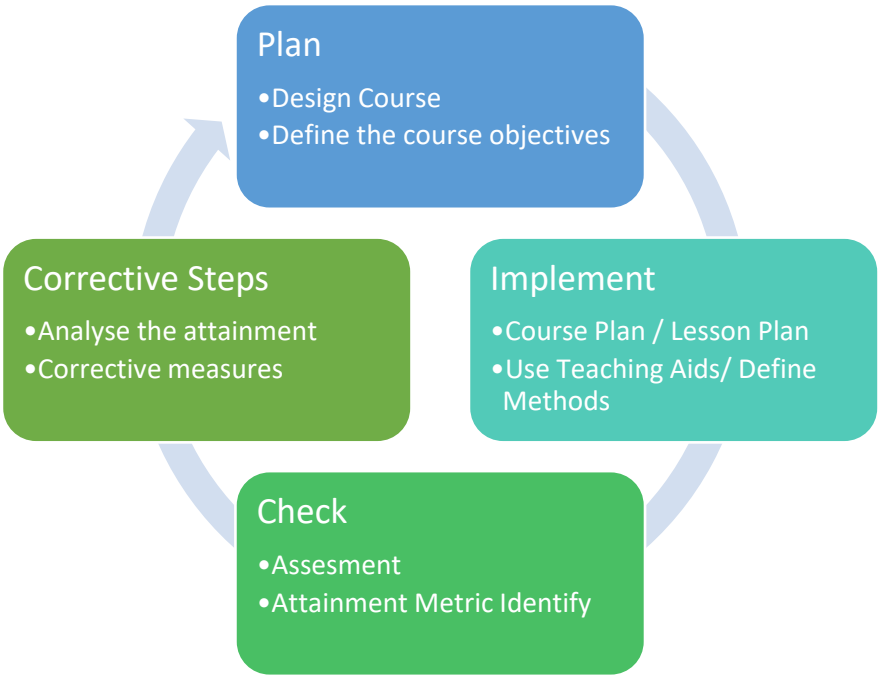
2. Demonstrating outcomes: the expected outcome should be defined by setting 'benchmarks' for each level of the program. Each benchmark is a skill that must be demonstrated by the student. Benchmarks should tackle and define specifically the goals of the curriculum and verify ways to assess whether students have reached these goals at that level of study.

3. Deciding on contents and teaching strategies OBE can be implemented as a 'Whole-class' models which aim to bring all learners in a classroom up to high levels of learning before proceeding further or by the 'Flexible' models which use flexible grouping, continuous progress, technological approaches and instructional management.

4. Assessments in OBE: OBE is driven by assessments that focus on well-defined learning outcomes and not by other factors such as what is taught, the duration taken by the student to achieve the outcomes or which path the students take to achieve their targets. In OBE standard-referenced assessment could be used which is similar to criterion - referenced assessment but

with clearer description of expected performance and since OBE requires ongoing feedback between the student and the lecturer, continuous assessments and student portfolios would be of a great help in assessing OBE.

5. Revise the plan after assessments and evaluations, incorporating feedback from students and peers as well as self-reflection



How is OBE measured?

The OBE model measures the progress of graduates in three parameters, through:

- Program Outcomes (PO)
- Program Specific Outcomes (PSO)
- Course Outcomes (CO)

Programme Outcome (PO)

Programme Outcome describe the career and professional developments of graduates, which are to be assessed after 2 or 3 years of graduation/ Post Graduate. They are the Knowledge, Skills and Attitude students should possess during graduation. The POs are important as a guideline when developing or revising the course outcomes. Knowing the POs helps the faculty in designing the appropriate delivery and assessment methods.

Program Specific Outcome (PSO)

Program Specific Outcomes are broad statements that describe the career and professional accomplishments that the program is preparing the graduates to achieve. These are the components indicative of the graduate's potential to acquire competence to practice at the appropriate level. The audiences for this educational outcome statements are external constituents such as prospective students, alumni, employers, transfer institutions and student sponsors. While designing the curriculum in any discipline, inputs from various stakeholders through feedbacks and surveys are to be taken into account.

Course Outcome (CO)

Course Outcomes are the measurable parameters which evaluates each student's performance in blooms taxonomy levels for each course that the student undertakes in every semester. The method of assessment of the candidates during the program is left for the institution to decide. The various assessment tools for measuring Course Outcomes include Mid -Semester and End Semester Examinations, Tutorials, Assignments, Project work, Labs, Presentations, Employer/Alumni Feedback etc,. These course outcomes are mapped to Program Specific attributes and Program outcomes based on relevance. This evaluation pattern helps Institutions to measure the Program Outcome. The Program Specific Objective is measured through Employer satisfaction survey (Yearly), Alumni survey (Yearly), and Placement records. COs are the statements of Knowledge/ Skills/ Attitude that students are expected to know, understand and perform, as a result from their learning experiences.

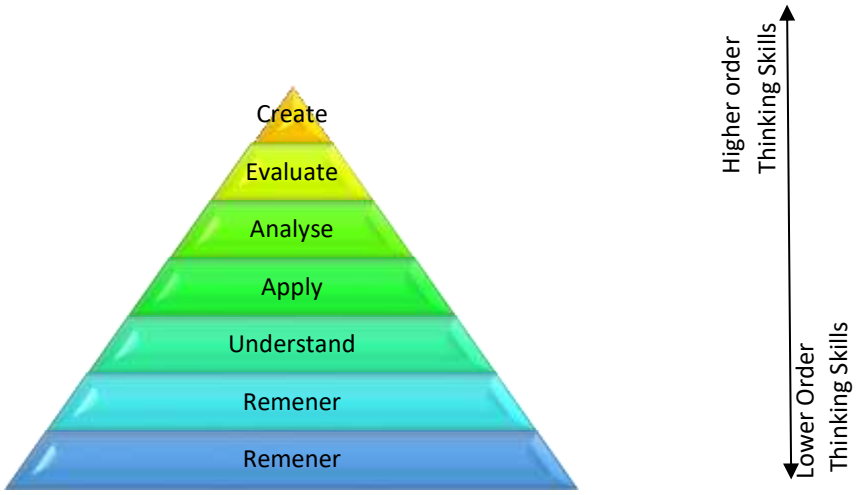
Relation between POs and COs

The COs are mapped to at least one of the POs and PSOs. When designing the COs, faculty handling the course should map their COs to the appropriate PO and PSO, in order to ensure that all POs and PSOs are delivered throughout the period of study.

Blooms Taxonomy

Bloom's Taxonomy was developed by Benjamin Bloom in 1956. It was defined as classification of learning outcomes and objectives that has been utilised for anything, from structuring digital activities to app evaluation to creating questions and exams. Knowledge, understanding, application, analysis, synthesis, and evaluation were the order of cognitive skills in the beginning. Bloom's Taxonomy was changed based on the new framework. The

elimination of 'Synthesis' and the insertion of 'Creation' as the highest level of Bloom's Taxonomy was the most important alteration. And because it's at the highest level, it implies that it's the most complicated or difficult cognitive skill—or at the very least, that it's the pinnacle of cognitive work.



Cognitive levels:

- Remembering: Retrieving, recognizing, and recalling relevant knowledge from long-term memory.
- Understanding: Constructing meaning from oral, written, and graphic messages through interpreting, exemplifying, classifying, summarizing, inferring, comparing, and explaining.
- Applying: Carrying out or using a procedure through executing, or implementing.
- Analysing: Breaking material into constituent parts, determining how the parts relate to one another and to an overall structure or purpose through differentiating, organizing, and attributing.
- Evaluating: Making judgments based on criteria and standards through checking and critiquing.
- Creating: Putting elements together to form a coherent or functional whole; reorganizing elements into a new pattern or structure through generating, planning, or producing.

The cognitive process dimensions vs Knowledge Dimension

Bloom's Taxonomy

The Knowledge Dimension	The Cognitive Process Dimension					
	Remember	Understand	Apply	Analyze	Evaluate	Create
Factual Knowledge	List	Summarize	Classify	Order	Rank	Combine
Conceptual Knowledge	Describe	Interpret	Experiment	Explain	Assess	Plan
Procedural Knowledge	Tabulate	Predict	Calculate	Differentiate	Conclude	Compose
Meta-Cognitive Knowledge	Appropriate Use	Execute	Construct	Achieve	Action	Actualize

OBE Formulation at St. Thomas College (Autonomous), Thrissur

Outcome-based education (OBE) means clearly focusing and organizing everything in an educational system around what is essential for all students to be able to do successfully at the end of their learning experiences. This means starting with a clear picture of what is important for students to be able to do, then organizing curriculum, instruction, and assessment to make sure this learning ultimately happens.

The College IQAC has organized a number of workshops, seminars and extensive discussions on OBE and Blooms taxonomy with the aim of enabling all the faculty members to design PSOs, POs and COs for their programmes and courses.

Committee of experts constituted by the Academic council prepares the Programme Outcomes in after receiving the inputs from Stakeholders, Alumni, Employers, Accrediting Agencies, Industry and Affiliated university.

The Course Outcomes and Programme Specific outcomes prepared by the faculty members in discussion with the external subject experts are finalised and approved by the Board of Studies. Mapping of COs to POs and PSOs are analysed and finalized by the respective department council and then the knowledge levels for each unit are identified and incorporated in the syllabus.

Communication to the Faculty

- The ***Vision***, ***Mission***, ***POs***, ***PSOs*** and ***Cos*** are communicated to the faculty members through ***Printed syllabus, College Manual, Academic management System and College website***.

Communication to the Students

- The ***Vision*** and ***Mission*** of the College are displayed on the ***website*** of the College, included in the main block and IQAC, as well as in the ***Academic Calendar*** and ***Handbook***.
- POs, PSOs and Cos of all the programmes are well **displayed on the College website.**
- PSOs and Cos of all the programmes are well **published on the Student Log in page of Academic Management System.**
- POs, PSOs and Semester wise Cos are displayed on the **Classroom Notice Boards** in all the classes.
- **Soft copies of syllabus with PSOs and COs** are shared with the students through ***Moodle*** (Learning Management System)

- A **hard copy of the syllabus PSOs and COs** is maintained in every department for ready reference.
- Makes first year students aware of Vision, Mission, POs and PSOs from the **Student Induction Program (SIP)** itself.
- Teachers who handle various courses explain course outcomes and relate such outcomes to POs and PSOs **while introducing the course at the beginning of a semester.**
- **Curricular and co-curricular activities** are organized in congruence with the Vision, Mission, POs and PSOs.

Vision:

Transforming the Youth through Holistic Education towards an Enlightened Society.

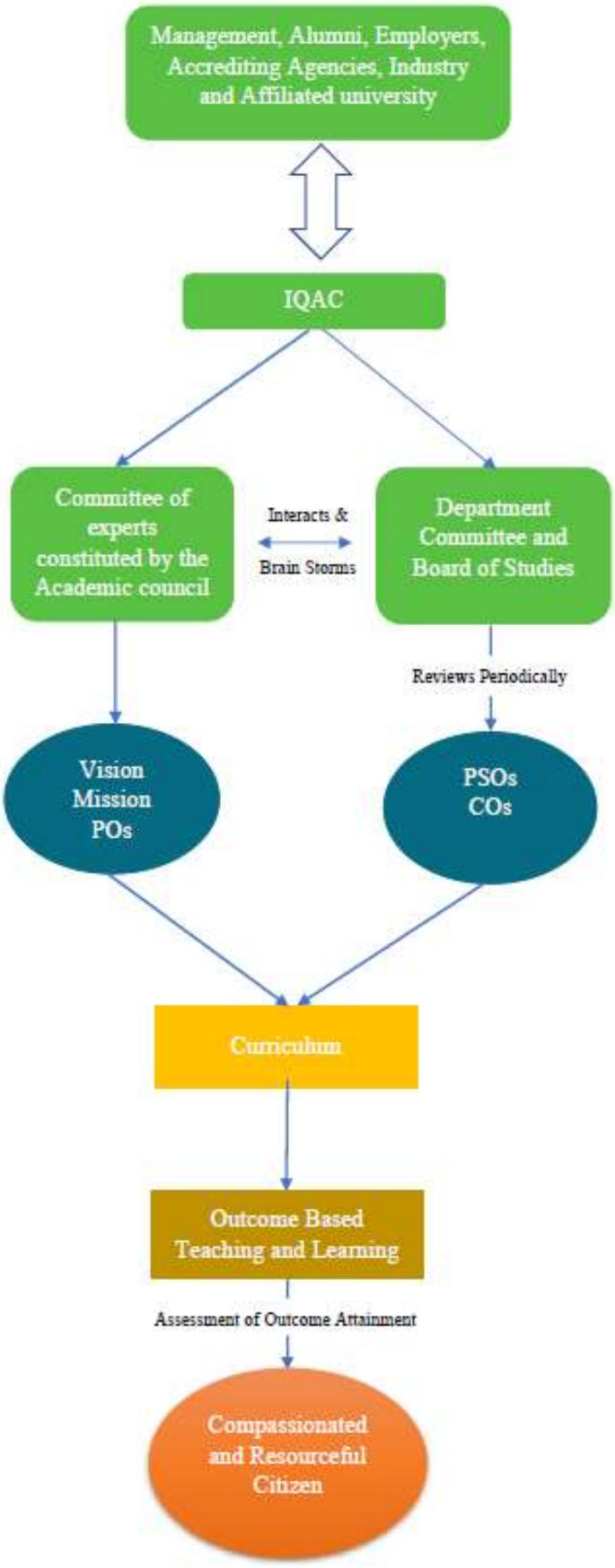
Mission:

- To Ensure Inclusion and Access of Quality Education.
- To Provide an Environment of Learning that enhances Dissemination of Knowledge.
- To Nurture Research and Innovation for the betterment of Life and Progress of the Nation.
- To Undertake Collaborative Partnerships for Facilitating Exposure and Sharing.
- To Impart Social and Environmental Sensitivity in Students through Extension and Outreach.
- To Equip Students with Life Skills in Facing Challenges and Responsibilities.
- To Help Students attain Moral, Spiritual and Emotional integrity.

Core Values:

- Faith in God
- Pursuit of Excellence
- Integrity
- Diversity
- Compassion

OBE Framework



Under Graduate Program Outcomes

PO1: Critical Thinking: Ability to take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives

PO2: Effective Communication: Ability to speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology

PO3: Effective Citizenship: Ability to demonstrate empathetic social concern and equity-centered national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering

PO4: Environment and Sustainability: Ability to understand the issues of environmental contexts and sustainable development

PO5: Ethical Living: Ability to recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them

PO6: Social Interaction: Ability to elicit views of others, mediate disagreements and help reach conclusions in group settings

PO7: Problem Solving and Analytical Skills: Ability to think rationally, analyze situations and solve problems adequately

Post Graduate Program Outcomes:

PO1: Attained profound Expertise in Discipline
PO2: Acquired Ability to function in multidisciplinary Domains
PO3: Attained ability to exercise Research Intelligence in investigations and Innovations
PO4: Learnt Ethical Principles and be committed to Professional Ethics
PO5: Incorporated Self-directed and Life-long Learning
PO6: Obtained Ability to manoeuvre in diverse contexts with Global Perspective
PO7: Attained Maturity to respond to one's calling

Guidelines for defining Course Outcomes (CO)

Well-written course outcomes involve the following parts:

1. Action verb
2. Subject content
3. Level of achievement as per BTL
4. Modes of performing task (if applicable)

While writing cos the following questions/points must be addressed properly.

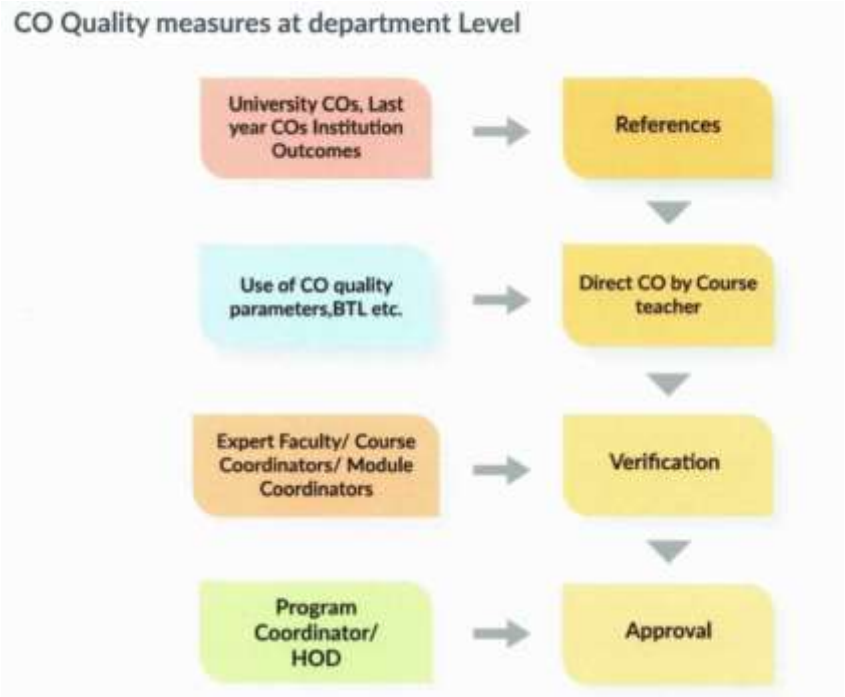
Specific: ls there a description of precise behaviour and the situation in which it is performed? Is it concrete, detailed, focused and defined?

Measurable: Can the performance of the outcome be observed and measured?

Achievable: With a reasonable number of efforts and application can the outcome be achieved? Are you attemptl.ng too much?

Relevant: ls the outcome important or worthwhile to the learner or stakeholder? ls it possible to achieve this outcome?

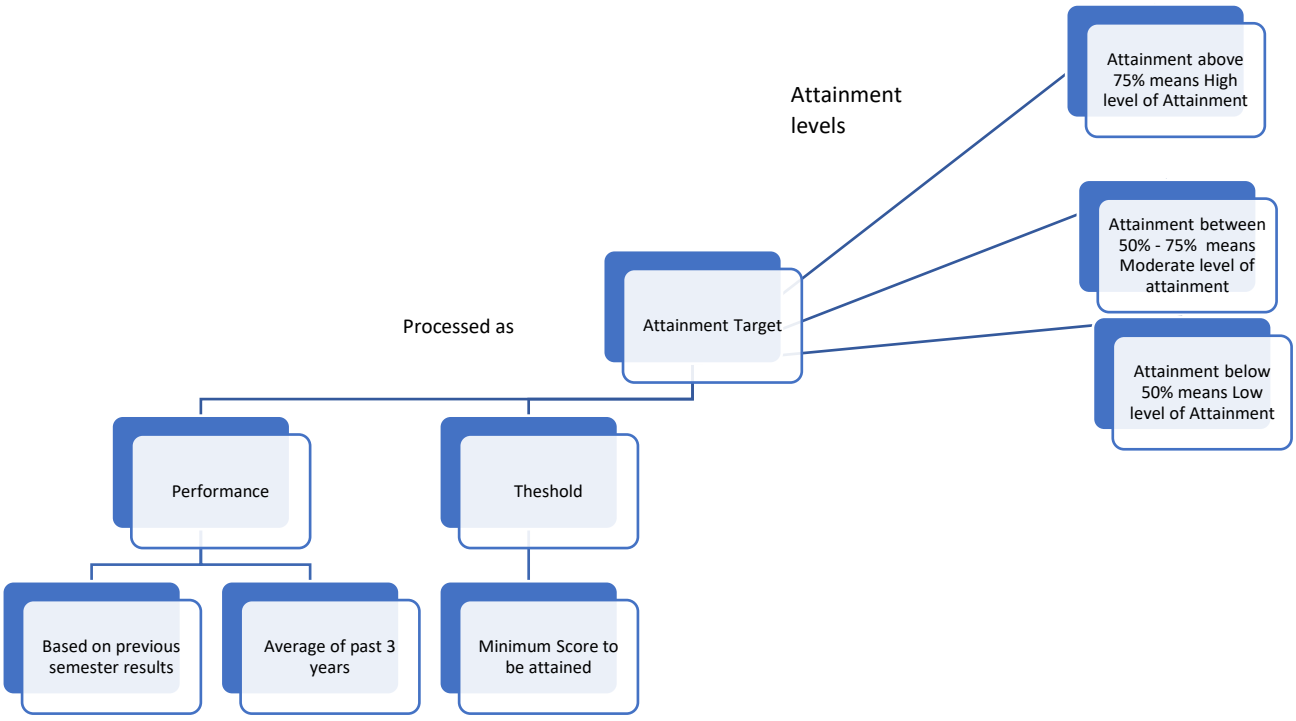
Time-Bound ls there a time limit, rate, number, percentage or frequency clearly stated? When will this outcome be accomplished?



Pedagogy for Theory Course

Before Semester Starts: In Faculty Record Book, the Course coordinator should design the Course Syllabus expected to be delivered throughout the course. Topics to be taught beyond the Course Syllabus should also be planned. Learning Outcomes should be framed and aligned with the Course Outcomes (COs) to follow the Bloom's taxonomy level. For each Learning Outcomes, decide the content of delivery, development and usage of ICT tool methods (Teaching Aids and Teaching Methods) and the assessment frequency

Attainment Target



During Semester: After each assessment is conducted, analysis report should be filled in the faculty diary. Record of Attendance for the students is maintained for during the course delivery. Special Academic Activities are organized based on the course syllabus.

Evaluation of Attainment of Outcomes

Attainment of Course Outcomes

Course outcomes are attained through (i) ***Mandatory questions (MQs)*** included in Continuous Internal Assessments and (ii) ***Mandatory Assessments (MAs)*** namely, Mini project, Assignments, Case study, etc. Course in charge may use any of these methods or both to assess the attainment level of course outcomes (Cos).

Bench marks and Criteria for the attainment of Cos

To meet the expected level of attainment a student must scores more than 60% of the marks for each MQ prepared to assess the attainment of COs.

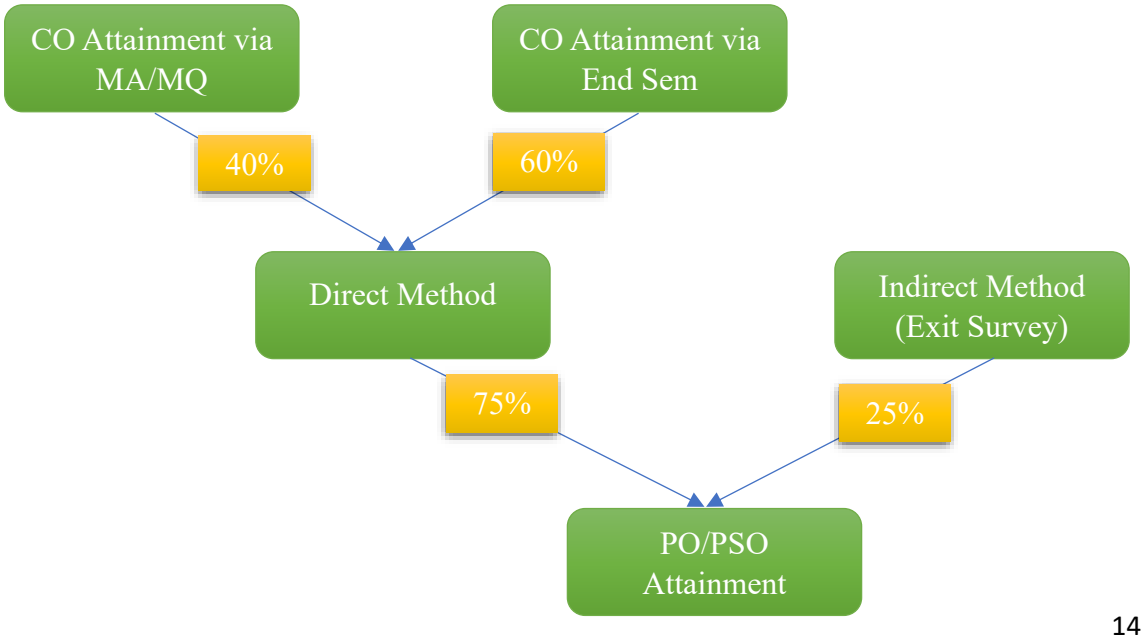
Attainment level 1: If at least 60% of the students met the expected level of attainment.

Attainment level 2: If at least 70% of the students met the expected level of attainment.

Attainment level 3: If at least 80% of the students met the expected level of attainment.

Attainment of Programme Specific Outcomes and Programme Outcomes

Attainments of Programme specific outcomes are evaluated through direct and indirect (Exit survey) method. 75% of the weights is given to direct method and 25% of the weights is given to indirect method. In direct method 60% of the weights are given to the end semester results and 40% weights are given to course attainment scores. End semester question papers are generated from the question bank using ***QnSmarti*** software. All the questions in the Question bank are prepared according to Bloom's taxonomy and pre-specified cognitive levels. Mapping of course outcomes to POs and PSOs helps to evaluate the PO and PSO scores through course attainment scores.



Algorithm 1 Calculation of PSO Attainment for Each Program

Require: CO attainment Values, Indirect Assessment Values

Initialize the set of Programs P = $\{p_1, p_2, p_3, ..., p_n\}$
for each $p_i \in P$ **do**
    $V_1 \leftarrow InternalCOAttainment(p_i)$
    $V_2 \leftarrow$ Semester End Attainment
    Direct Assessment $V_3 \leftarrow 40\%\ V_1 + 60\%\ V_2$
    $V_4 \leftarrow$ Indirect Assessment through Exit Surveys
    $V_5 \leftarrow 75\%\ V_3 + 25\%\ V_4$
end for

Algorithm 2 Computation of COs for each Course, InternalCOAttainment(p_i)

Require: Marks of Mandatory Questions or Assesments, Mapping of CO's with the Questions

Initialize the set of Courses C = $\{c_1, c_2, c_3, ..., c_m\}$ foreach program p_i
for each $c_i \in C$ **do**
    Mandatory Questions M = $\{m_1, m_2, m_3, ..., m_p\}$
    for each $m_i \in M$ **do**
        Ensure the score $s_i \geq 60$ % Total Mark of m_i
        Count the number of students c who obtained the score s_i
        if $c \geq 60\%$ Total Students **then**(Attainment level $\leftarrow 1$)
        end if
        if $c \geq 70\%$ Total Students **then**(Attainment level $\leftarrow 2$)
        end if
        if $c \geq 80\%$ Total Students **then**(Attainment level $\leftarrow 3$)
        end if
    end for
end for

Levels of Achievement

Levels of achievement are set by the OBE preparation committee in discussion with the experts based on last three year's results. It is fixed as follows:

Score Class	Level of Attainment
80-100	High
70-80	Moderate
60-70	Low
< 60	No attainment

These levels will be reviewed and will update each year by incorporating the previous year's result.

Action taken

OBE attainment results will analyze department wise and will act accordingly to improve the level of attainment if it is low or no attainment. In addition, each department will pursue initiatives to improve the quality of teaching and syllabus to increase target value.

Attainment of Outcomes – Sample

Programme**: M.Sc. Statistics**

CO – PO Mapping

Course	CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
MST1C01: ANALYTICAL TOOLS FOR STATISTICS	CO1	1		3				
	CO2	1	2	3				
	CO3	1	2	2				
	CO4	1	2					
	CO5	1		3				
	CO6			3				
MST1C02: ANALYTICAL TOOLS FOR STATISTICS	CO1	1	2	3				
	CO2	1	2	3				
	CO3	1	2	3				
	CO4	1	3					
	CO5	1	2	3				
	CO6	1	2	3				
MST1C03: DISTRIBUTION THEORY	CO1			2		2		
	CO2			2		2	1	
	CO3			3			1	
	CO4		3				1	
	CO5			3			1	
	CO6		3	1			1	
MST1C04: PROBABILITY THEORY	CO1	3		2			1	
	CO2	3		2			1	
	CO3	3		2			1	
	CO4	3		2			1	
	CO5	3		2			1	
	CO6	3		2			1	
MST1L01: STATISTICAL COMPUTING-I	CO1	2	3				1	
	CO2	2	3				1	
MST2C06: DESIGN AND ANALYSIS OF EXPERIMENTS	CO1	3	2		3		2	
	CO2	3		2			2	
	CO3	3		2			2	
	CO4	3			3		2	
	CO5	3					2	
	CO6	3		2		1	1	
MST2C07: ESTIMATION THEORY	CO1	3		1				
	CO2	2		1				
	CO3	3		1				
	CO4	3		2				
	CO5	3		3				
	CO6	1		2		2		
MST2C08: SAMPLING THEORY	CO1	1					1	
	CO2	2	3		3		2	
	CO3	3	3	2			2	

Course	CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
	CO4	2	1	1			1	
	CO5	3	2	2			1	
	CO6	2					2	
MST2C09: TESTING OF STATISTICAL HYPOTHESES	CO1	1	3				2	
	CO2	2	1				2	
	CO3	3	1				2	
	CO4	2	3				2	
	CO5	1	3				2	
	C06	1	1				2	
MST2L02: STATISTICAL COMPUTING-II	CO1	1						
	CO2	3						
MST3C11: APPLIED REGRESSION ANALYSIS	CO1	1	3	2	2	1	2	
	CO2	3		2			2	
	CO3	3		2	2		2	
	CO4	3		3			2	
	CO5	3		3			2	
	CO6	3	2	3			2	
MST3C12: STOCHASTIC PROCESSES	CO1	1	2				2	
	CO2	2	2				2	
	CO3	3	2	2			2	
	CO4	3	3				2	
	CO5	3	2				2	
	CO6	3	3	3			2	
MST3L03: STATISTICAL COMPUTING-III	CO1	3	3					
	CO2	3	3			2		
MST3E05: LIFE TIME DATA ANALYSIS	CO1	3	2				2	
	CO2	3	3				2	
	CO3	2		3	1	2	2	
	CO4	3		2			2	
	CO5	3	2				2	
	CO6	3	1				2	
MST3E10: STATISTICAL QUALITY CONTROL	CO1	1		3	2		2	
	CO2	2		2		2	2	
	CO3	2		3			2	
	CO4	1	3	2			2	
	CO5	3	3	2			2	
	CO6	2	1	3			2	
MST4C14: MULTIVARIATE ANALYSIS	CO1	1		2			2	
	CO2	1		1			2	
	CO3	2		3			2	
	CO4	1		2			2	
	CO5	3	3	1			2	
	CO6	2	2	1	3		2	
MST4P01: PROJECT/DISSERTATION	CO1	2					3	3
	CO2	2		2			2	3
	CO3	2			2	2	3	3

Course	CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
MST4V01: COMPREHENSIVE VIVA-VOCE	CO1	2						3
	CO2	2		2				3
	CO3	2			2	2	3	3
MST4L04: STATISTICAL COMPUTING-IV	CO1	2	3					
	CO2	2	3					
MST4E02: TIME SERIES ANALYSIS	CO1	1					2	
	CO2	2	2				2	
	CO3	3	1	2			2	
	CO4	3	2		1		2	
	CO5	1	2	2				
	CO6	1	2	3			2	

CO – PSO Mapping

Course	CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
MST1C01: ANALYTICAL TOOLS FOR STATISTICS	CO1	3	1	1	1	1	
	CO2	3	1	1	1	1	
	CO3	3	1	1	1	1	
	CO4	3	1	1	1	1	
	CO5	3	1	1	1	1	
	CO6	3	1	1	1	1	
MST1C02: ANALYTICAL TOOLS FOR STATISTICS	CO1	3	1	1	1	1	
	CO2	3	1	1	1	1	
	CO3	3	1	1	1	1	
	CO4	3	1	1	1	1	
	CO5	3	1	1	1	1	
	CO6	3	1	1	1	1	
MST1C03: DISTRIBUTION THEORY	CO1	1	3	2	1	1	
	CO2	1	3	2	1	1	
	CO3	1	3	2	1	1	
	CO4	1	3	2	1	1	
	CO5		3	2	1	1	
	CO6	1	2	2	1	1	
MST1C04: PROBABILITY THEORY	CO1		3	2	1	1	
	CO2		3	2	1	1	
	CO3		3	2	1	1	
	CO4		3	2	1	1	
	CO5		3	2	1	1	
	CO6		3	2	1	1	
MST1L01: STATISTICAL COMPUTING-I	CO1	3	2				
	CO2	2	2				
MST2C06: DESIGN AND ANALYSIS OF EXPERIMENTS	CO1	1		1		3	
	CO2	1		1		3	
	CO3			1		3	
	CO4			1		3	
	CO5			1		3	

Course	CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
	CO6			1		3	
MST2C07: ESTIMATION THEORY	CO1		1	2			
	CO2			3			
	CO3		2	3			
	CO4		2	3			
	CO5		3	3			
	CO6		1	3			
MST2C08: SAMPLING THEORY	CO1			2		2	
	CO2		1	3		2	1
	CO3			3		2	
	CO4			3		2	
	CO5		1	3		1	1
	CO6			2		2	
MST2C09: TESTING OF STATISTICAL HYPOTHESES	CO1		1	3			
	CO2			3			
	CO3			3			
	CO4			3			2
	CO5			3			2
	C06			3		2	
MST2L02: STATISTICAL COMPUTING-II	CO1	1					3
	CO2			2		2	2
MST3C11: APPLIED REGRESSION ANALYSIS	CO1	1		2	3	1	
	CO2		1	2	3	2	
	CO3		1	2	3	2	
	CO4			2	3		
	CO5			1	3		
	CO6			2	3		
MST3C12: STOCHASTIC PROCESSES	CO1	1			3		
	CO2				3		
	CO3		1		3		
	CO4		1		3		
	CO5				3		
	CO6				3	1	
MST3L03: STATISTICAL COMPUTING-III	CO1	2					3
	CO2				2	2	3
MST3E05: LIFE TIME DATA ANALYSIS	CO1			1		3	
	CO2			2		3	
	CO3		1			3	
	CO4		2			2	
	CO5		1			3	
	CO6		2			3	
MST3E10: STATISTICAL QUALITY CONTROL	CO1					3	
	CO2			2		3	
	CO3		1	1		3	
	CO4					3	
	CO5					3	

Course	CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
	CO6					3	
MST4C14: MULTIVARIATE ANALYSIS	CO1	3	2				
	CO2	2	3				
	CO3		3	2			
	CO4		2				
	CO5			3			
	CO6						3
MST4P01: PROJECT/DISSERTATION	CO1	3					2
	CO2	1	3	2	3	2	3
	CO3	1	3	2	3	2	3
MST4V01: COMPREHENSIVE VIVA-VOCE	CO1	3					2
	CO2	1	3	2	3	2	3
	CO3	1	3	2	3	2	3
MST4L04: STATISTICAL COMPUTING-IV	CO1	1					3
	CO2		2	2	2		3
MST4E02: TIME SERIES ANALYSIS	CO1				3		
	CO2				3		
	CO3				3		
	CO4				3		
	CO5						2
	CO6				3		

Attainment of Course Outcomes

Course Code	Course title	CO1	CO2	CO3	CO4	CO5	CO6
MST1C01	Analytical Tools for Statistics – I	3	3	3	3	3	3
MST1C02	Analytical Tools for Statistics – II	2	3	3	3	3	3
MST1C03	Distribution Theory	3	3	3	2	3	3
MST1C04	Probability Theory	3	3	3	3	3	3
MST1L01	Statistical Computing – 1	3	3	NA	NA	NA	NA
MST1A01	Ability Enhancement Course	3	3	2	3	3	3
MST2C06	Design and Analysis of Experiments	3	3	3	3	3	3
MST2C07	Estimation Theory	3	3	3	3	3	3
MST2C08	Sampling Theory	3	3	3	3	3	3
MST2C09	Testing of Statistical Hypotheses	3	3	3	3	3	3
MST2L02	Statistical Computing-II	3	2	3	3	3	3
MST2A02	Professional Competency Course	3	3	3	2	3	3
MST3C11	Applied Regression Analysis	3	3	3	3	3	3
MST3C12	Stochastic Processes	3	3	3	3	3	3
MST3E10	Statistical Quality Control	3	2	3	3	2	3
MST3E05	Lifetime Data Analysis	3	3	3	3	3	3
MST3L03	Statistical Computing-III	3	2	NA	NA	NA	NA
MST4C14	Multivariate Analysis	3	3	3	3	3	3
MST4E02	Time Series Analysis	3	3	3	3	3	3
MST4P01	Project	3	3	2	NA	NA	NA
MST4V01	Comprehensive Viva-Voce	2	3	3	3	3	3
MST4L04	Statistical Computing-IV	3	3	3	3	2	3

CO – PO Weightage Matrix

Course	CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
MST1C01: ANALYTICAL TOOLS FOR STATISTICS	CO1	0.005	0.000	0.022	0.000	0.000	0.000	0.000
	CO2	0.005	0.018	0.022	0.000	0.000	0.000	0.000
	CO3	0.005	0.018	0.015	0.000	0.000	0.000	0.000
	CO4	0.005	0.018	0.000	0.000	0.000	0.000	0.000
	CO5	0.005	0.000	0.022	0.000	0.000	0.000	0.000
	CO6	0.000	0.000	0.022	0.000	0.000	0.000	0.000
MST1C02: ANALYTICAL TOOLS FOR STATISTICS	CO1	0.005	0.018	0.022	0.000	0.000	0.000	0.000
	CO2	0.005	0.018	0.022	0.000	0.000	0.000	0.000
	CO3	0.005	0.018	0.022	0.000	0.000	0.000	0.000
	CO4	0.005	0.026	0.000	0.000	0.000	0.000	0.000
	CO5	0.005	0.018	0.022	0.000	0.000	0.000	0.000
	CO6	0.005	0.018	0.022	0.000	0.000	0.000	0.000
MST1C03: DISTRIBUTION THEORY	CO1	0.000	0.000	0.015	0.000	0.111	0.000	0.000
	CO2	0.000	0.000	0.015	0.000	0.111	0.008	0.000
	CO3	0.000	0.000	0.022	0.000	0.000	0.008	0.000
	CO4	0.000	0.026	0.000	0.000	0.000	0.008	0.000
	CO5	0.000	0.000	0.022	0.000	0.000	0.008	0.000
	CO6	0.000	0.026	0.007	0.000	0.000	0.008	0.000
MST1C04: PROBABILITY THEORY	CO1	0.015	0.000	0.015	0.000	0.000	0.008	0.000
	CO2	0.015	0.000	0.015	0.000	0.000	0.008	0.000
	CO3	0.015	0.000	0.015	0.000	0.000	0.008	0.000
	CO4	0.015	0.000	0.015	0.000	0.000	0.008	0.000
	CO5	0.015	0.000	0.015	0.000	0.000	0.008	0.000
	CO6	0.015	0.000	0.015	0.000	0.000	0.008	0.000
MST1L01: STATISTICAL COMPUTING-I	CO1	0.010	0.026	0.000	0.000	0.000	0.008	0.000
	CO2	0.010	0.026	0.000	0.000	0.000	0.008	0.000
MST2C06: DESIGN AND ANALYSIS OF EXPERIMENTS	CO1	0.015	0.018	0.000	0.125	0.000	0.016	0.000
	CO2	0.015	0.000	0.015	0.000	0.000	0.016	0.000
	CO3	0.015	0.000	0.015	0.000	0.000	0.016	0.000
	CO4	0.015	0.000	0.000	0.125	0.000	0.016	0.000
	CO5	0.015	0.000	0.000	0.000	0.000	0.016	0.000
	CO6	0.015	0.000	0.015	0.000	0.056	0.008	0.000
MST2C07: ESTIMATION THEORY	CO1	0.015	0.000	0.007	0.000	0.000	0.000	0.000
	CO2	0.010	0.000	0.007	0.000	0.000	0.000	0.000
	CO3	0.015	0.000	0.007	0.000	0.000	0.000	0.000
	CO4	0.015	0.000	0.015	0.000	0.000	0.000	0.000
	CO5	0.015	0.000	0.022	0.000	0.000	0.000	0.000
	CO6	0.005	0.000	0.015	0.000	0.111	0.000	0.000
MST2C08: SAMPLING THEORY	CO1	0.005	0.000	0.000	0.000	0.000	0.008	0.000
	CO2	0.010	0.026	0.000	0.125	0.000	0.016	0.000
	CO3	0.015	0.026	0.015	0.000	0.000	0.016	0.000
	CO4	0.010	0.009	0.007	0.000	0.000	0.008	0.000
	CO5	0.015	0.018	0.015	0.000	0.000	0.008	0.000
	CO6	0.010	0.000	0.000	0.000	0.000	0.016	0.000
MST2C09: TESTING OF STATISTICAL HYPOTHESES	CO1	0.005	0.026	0.000	0.000	0.000	0.016	0.000
	CO2	0.010	0.009	0.000	0.000	0.000	0.016	0.000
	CO3	0.015	0.009	0.000	0.000	0.000	0.016	0.000
	CO4	0.010	0.026	0.000	0.000	0.000	0.016	0.000
	CO5	0.005	0.026	0.000	0.000	0.000	0.016	0.000

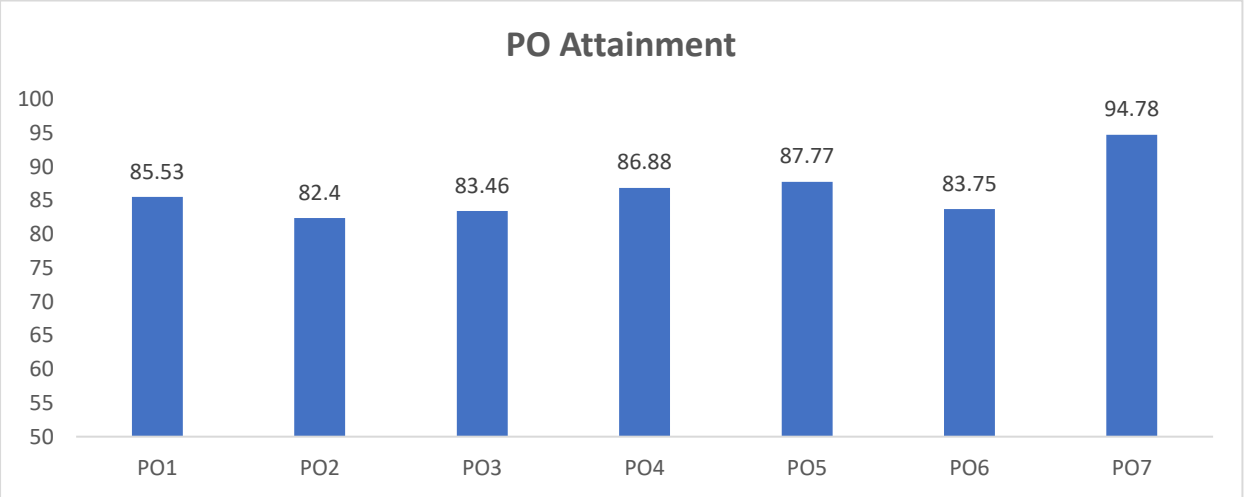
Course	CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
	C06	0.005	0.009	0.000	0.000	0.000	0.016	0.000
MST2L02: STATISTICAL COMPUTING-II	CO1	0.005	0.000	0.000	0.000	0.000	0.000	0.000
	CO2	0.015	0.000	0.000	0.000	0.000	0.000	0.000
MST3C11: APPLIED REGRESSION ANALYSIS	CO1	0.005	0.026	0.015	0.083	0.056	0.016	0.000
	CO2	0.015	0.000	0.015	0.000	0.000	0.016	0.000
	CO3	0.015	0.000	0.015	0.083	0.000	0.016	0.000
	CO4	0.015	0.000	0.022	0.000	0.000	0.016	0.000
	CO5	0.015	0.000	0.022	0.000	0.000	0.016	0.000
	CO6	0.015	0.018	0.022	0.000	0.000	0.016	0.000
MST3C12: STOCHASTIC PROCESSES	CO1	0.005	0.018	0.000	0.000	0.000	0.016	0.000
	CO2	0.010	0.018	0.000	0.000	0.000	0.016	0.000
	CO3	0.015	0.018	0.015	0.000	0.000	0.016	0.000
	CO4	0.015	0.026	0.000	0.000	0.000	0.016	0.000
	CO5	0.015	0.018	0.000	0.000	0.000	0.016	0.000
	CO6	0.015	0.026	0.022	0.000	0.000	0.016	0.000
MST3L03: STATISTICAL COMPUTING-III	CO1	0.015	0.026	0.000	0.000	0.000	0.000	0.000
	CO2	0.015	0.026	0.000	0.000	0.111	0.000	0.000
MST3E05: LIFE TIME DATA ANALYSIS	CO1	0.015	0.018	0.000	0.000	0.000	0.016	0.000
	CO2	0.015	0.026	0.000	0.000	0.000	0.016	0.000
	CO3	0.010	0.000	0.022	0.042	0.111	0.016	0.000
	CO4	0.015	0.000	0.015	0.000	0.000	0.016	0.000
	CO5	0.015	0.018	0.000	0.000	0.000	0.016	0.000
	CO6	0.015	0.009	0.000	0.000	0.000	0.016	0.000
MST3E10: STATISTICAL QUALITY CONTROL	CO1	0.005	0.000	0.022	0.083	0.000	0.016	0.000
	CO2	0.010	0.000	0.015	0.000	0.111	0.016	0.000
	CO3	0.010	0.000	0.022	0.000	0.000	0.016	0.000
	CO4	0.005	0.026	0.015	0.000	0.000	0.016	0.000
	CO5	0.015	0.026	0.015	0.000	0.000	0.016	0.000
	CO6	0.010	0.009	0.022	0.000	0.000	0.016	0.000
MST4C14: MULTIVARIATE ANALYSIS	CO1	0.005	0.000	0.015	0.000	0.000	0.016	0.000
	CO2	0.005	0.000	0.007	0.000	0.000	0.016	0.000
	CO3	0.010	0.000	0.022	0.000	0.000	0.016	0.000
	CO4	0.005	0.000	0.015	0.000	0.000	0.016	0.000
	CO5	0.015	0.026	0.007	0.000	0.000	0.016	0.000
	CO6	0.010	0.018	0.007	0.125	0.000	0.016	0.000
MST4P01: PROJECT/DISSERTATION	CO1	0.010	0.000	0.000	0.000	0.000	0.024	0.167
	CO2	0.010	0.000	0.015	0.000	0.000	0.016	0.167
	CO3	0.010	0.000	0.000	0.083	0.111	0.024	0.167
MST4V01: COMPREHENSIVE VIVA-VOCE	CO1	0.010	0.000	0.000	0.000	0.000	0.000	0.167
	CO2	0.010	0.000	0.015	0.000	0.000	0.000	0.167
	CO3	0.010	0.000	0.000	0.083	0.111	0.024	0.167
MST4L04: STATISTICAL COMPUTING-IV	CO1	0.010	0.026	0.000	0.000	0.000	0.000	0.000
	CO2	0.010	0.026	0.000	0.000	0.000	0.000	0.000
MST4E02: TIME SERIES ANALYSIS	CO1	0.005	0.000	0.000	0.000	0.000	0.016	0.000
	CO2	0.010	0.018	0.000	0.000	0.000	0.016	0.000
	CO3	0.015	0.009	0.015	0.000	0.000	0.016	0.000
	CO4	0.015	0.018	0.000	0.042	0.000	0.016	0.000
	CO5	0.005	0.018	0.015	0.000	0.000	0.000	0.000
	CO6	0.005	0.018	0.022	0.000	0.000	0.016	0.000

CO – PSO Weightage Matrix

Course	CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
MST1C01: ANALYTICAL TOOLS FOR STATISTICS	CO1	0.043	0.010	0.008	0.011	0.009	0.000
	CO2	0.043	0.010	0.008	0.011	0.009	0.000
	CO3	0.043	0.010	0.008	0.011	0.009	0.000
	CO4	0.043	0.010	0.008	0.011	0.009	0.000
	CO5	0.043	0.010	0.008	0.011	0.009	0.000
	CO6	0.043	0.010	0.008	0.011	0.009	0.000
MST1C02: ANALYTICAL TOOLS FOR STATISTICS	CO1	0.043	0.010	0.008	0.011	0.009	0.000
	CO2	0.043	0.010	0.008	0.011	0.009	0.000
	CO3	0.043	0.010	0.008	0.011	0.009	0.000
	CO4	0.043	0.010	0.008	0.011	0.009	0.000
	CO5	0.043	0.010	0.008	0.011	0.009	0.000
	CO6	0.043	0.010	0.008	0.011	0.009	0.000
MST1C03: DISTRIBUTION THEORY	CO1	0.014	0.031	0.016	0.011	0.009	0.000
	CO2	0.014	0.031	0.016	0.011	0.009	0.000
	CO3	0.014	0.031	0.016	0.011	0.009	0.000
	CO4	0.014	0.031	0.016	0.011	0.009	0.000
	CO5	0.000	0.031	0.016	0.011	0.009	0.000
	CO6	0.014	0.020	0.016	0.011	0.009	0.000
MST1C04: PROBABILITY THEORY	CO1	0.000	0.031	0.016	0.011	0.009	0.000
	CO2	0.000	0.031	0.016	0.011	0.009	0.000
	CO3	0.000	0.031	0.016	0.011	0.009	0.000
	CO4	0.000	0.031	0.016	0.011	0.009	0.000
	CO5	0.000	0.031	0.016	0.011	0.009	0.000
	CO6	0.000	0.031	0.016	0.011	0.009	0.000
MST1L01: STATISTICAL COMPUTING-I	CO1	0.043	0.020	0.000	0.000	0.000	0.000
	CO2	0.029	0.020	0.000	0.000	0.000	0.000
MST2C06: DESIGN AND ANALYSIS OF EXPERIMENTS	CO1	0.014	0.000	0.008	0.000	0.028	0.000
	CO2	0.014	0.000	0.008	0.000	0.028	0.000
	CO3	0.000	0.000	0.008	0.000	0.028	0.000
	CO4	0.000	0.000	0.008	0.000	0.028	0.000
	CO5	0.000	0.000	0.008	0.000	0.028	0.000
	CO6	0.000	0.000	0.008	0.000	0.028	0.000
MST2C07: ESTIMATION THEORY	CO1	0.000	0.010	0.016	0.000	0.000	0.000
	CO2	0.000	0.000	0.024	0.000	0.000	0.000
	CO3	0.000	0.020	0.024	0.000	0.000	0.000
	CO4	0.000	0.020	0.024	0.000	0.000	0.000
	CO5	0.000	0.031	0.024	0.000	0.000	0.000
	CO6	0.000	0.010	0.024	0.000	0.000	0.000
MST2C08: SAMPLING THEORY	CO1	0.000	0.000	0.016	0.000	0.019	0.000
	CO2	0.000	0.010	0.024	0.000	0.019	0.023
	CO3	0.000	0.000	0.024	0.000	0.019	0.000
	CO4	0.000	0.000	0.024	0.000	0.019	0.000
	CO5	0.000	0.010	0.024	0.000	0.009	0.023
	CO6	0.000	0.000	0.016	0.000	0.019	0.000
MST2C09: TESTING OF STATISTICAL HYPOTHESES	CO1	0.000	0.010	0.024	0.000	0.000	0.000
	CO2	0.000	0.000	0.024	0.000	0.000	0.000
	CO3	0.000	0.000	0.024	0.000	0.000	0.000
	CO4	0.000	0.000	0.024	0.000	0.000	0.045
	CO5	0.000	0.000	0.024	0.000	0.000	0.045

Course	CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
	C06	0.000	0.000	0.024	0.000	0.019	0.000
MST2L02: STATISTICAL COMPUTING-II	CO1	0.014	0.000	0.000	0.000	0.000	0.068
	CO2	0.000	0.000	0.016	0.000	0.019	0.045
MST3C11: APPLIED REGRESSION ANALYSIS	CO1	0.014	0.000	0.016	0.033	0.009	0.000
	CO2	0.000	0.010	0.016	0.033	0.019	0.000
	CO3	0.000	0.010	0.016	0.033	0.019	0.000
	CO4	0.000	0.000	0.016	0.033	0.000	0.000
	CO5	0.000	0.000	0.008	0.033	0.000	0.000
	CO6	0.000	0.000	0.016	0.033	0.000	0.000
MST3C12: STOCHASTIC PROCESSES	CO1	0.014	0.000	0.000	0.033	0.000	0.000
	CO2	0.000	0.000	0.000	0.033	0.000	0.000
	CO3	0.000	0.010	0.000	0.033	0.000	0.000
	CO4	0.000	0.010	0.000	0.033	0.000	0.000
	CO5	0.000	0.000	0.000	0.033	0.000	0.000
	CO6	0.000	0.000	0.000	0.033	0.009	0.000
MST3L03: STATISTICAL COMPUTING-III	CO1	0.029	0.000	0.000	0.000	0.000	0.068
	CO2	0.000	0.000	0.000	0.022	0.019	0.068
MST3E05: LIFE TIME DATA ANALYSIS	CO1	0.000	0.000	0.008	0.000	0.028	0.000
	CO2	0.000	0.000	0.016	0.000	0.028	0.000
	CO3	0.000	0.010	0.000	0.000	0.028	0.000
	CO4	0.000	0.020	0.000	0.000	0.019	0.000
	CO5	0.000	0.010	0.000	0.000	0.028	0.000
	CO6	0.000	0.020	0.000	0.000	0.028	0.000
MST3E10: STATISTICAL QUALITY CONTROL	CO1	0.000	0.000	0.000	0.000	0.028	0.000
	CO2	0.000	0.000	0.016	0.000	0.028	0.000
	CO3	0.000	0.010	0.008	0.000	0.028	0.000
	CO4	0.000	0.000	0.000	0.000	0.028	0.000
	CO5	0.000	0.000	0.000	0.000	0.028	0.000
	CO6	0.000	0.000	0.000	0.000	0.028	0.000
MST4C14: MULTIVARIATE ANALYSIS	CO1	0.043	0.020	0.000	0.000	0.000	0.000
	CO2	0.029	0.031	0.000	0.000	0.000	0.000
	CO3	0.000	0.031	0.016	0.000	0.000	0.000
	CO4	0.000	0.020	0.000	0.000	0.000	0.000
	CO5	0.000	0.000	0.024	0.000	0.000	0.000
	CO6	0.000	0.000	0.000	0.000	0.000	0.068
MST4P01: PROJECT/DISSERTATION	CO1	0.043	0.000	0.000	0.000	0.000	0.045
	CO2	0.014	0.031	0.016	0.033	0.019	0.068
	CO3	0.014	0.031	0.016	0.033	0.019	0.068
MST4V01: COMPREHENSIVE VIVA-VOCE	CO1	0.043	0.000	0.000	0.000	0.000	0.045
	CO2	0.014	0.031	0.016	0.033	0.019	0.068
	CO3	0.014	0.031	0.016	0.033	0.019	0.068
MST4L04: STATISTICAL COMPUTING-IV	CO1	0.014	0.000	0.000	0.000	0.000	0.068
	CO2	0.000	0.020	0.016	0.022	0.000	0.068
MST4E02: TIME SERIES ANALYSIS	CO1	0.000	0.000	0.000	0.033	0.000	0.000
	CO2	0.000	0.000	0.000	0.033	0.000	0.000
	CO3	0.000	0.000	0.000	0.033	0.000	0.000
	CO4	0.000	0.000	0.000	0.033	0.000	0.000
	CO5	0.000	0.000	0.000	0.000	0.000	0.045
	CO6	0.000	0.000	0.000	0.033	0.000	0.000

PO attainment		
PO	**% of Attainment**	**Level of Attainment**
PO1	85.53	3
PO2	82.40	3
PO3	83.46	3
PO4	86.88	3
PO5	87.77	3
PO6	83.75	3
PO7	94.78	3



PSO attainment		
PSO	**% of Attainment**	**Level of Attainment**
PSO1	84.56	3
PSO2	84.79	3
PSO3	86.11	3
PSO4	82.34	3
PSO5	86.77	3
PSO6	92.08	3