Department of Computer Science and Engineering

Academic Year 2024 – 2025 (Even Semester)

Degree, Semester & Branch: IV Semester B.E. CSE-A

Course Code & Title: CS3452 Theory of Computation

Name of the Faculty member (s): Mrs.S.Manjula

Innovative Practice Description

Unit / Topic: Unit IV / Turing Machine (TM) as Computer of Integer functions
Course Outcome: CO 4

Topic Learning Outcome: TLO 14

Activity Chosen: Pioneers to Peers

Justification:

- The "Pioneer to Peer" initiative aims to promote collaborative learning by allowing senior students to share their knowledge and experience with juniors. The topic "TM as a Computer of Integer Functions – Reversing the String" was selected as it is a foundational concept in the Theory of Computation, often perceived as challenging by students. Peer explanation in simple terms helps juniors grasp abstract computational concepts more effectively.
- **Time Allotted for the Activity:** 40 minutes

Details of the Implementation:

The activity was conducted during a scheduled mentoring hour with the II CSE-A students as part of the Pioneer to Peer initiative. The focus of the session was on “Turing Machine (TM) as a Computer of Integer Functions – Reversing the String”**,** a core topic that introduces students to the functioning of abstract machines in computational theory. The implementation involved the following steps:

Introduction to Turing Machines:

- Kiruthika B (953621104022), IV CSE began the session with a brief theoretical overview of Turing Machines, including its components like states, tape, head movement, and transition functions.
- She explained how TMs differ from DFAs/NFAs and emphasized their role in modeling real computation.

Explaining the Problem – Reverse the String:

- The specific focus was on designing a Turing Machine that can reverse a given binary string (e.g., input "1011" should result in "1101").
- She illustrated the algorithmic steps a TM takes to identify characters from both ends and swap them iteratively until the string is reversed.

Step-by-step Problem Solving:

- A sample problem was solved on the board:
  - Input string: `1010`
  - The transition table was presented and each move of the TM (head movement and tape content change) was demonstrated in sequence.
- She used a hand-drawn tape model and pointer to simulate the TM's read/write actions.
- Explained how states change during the reversal and what halting conditions indicate a successful output.

Interactive Learning:

- After the demonstration, students were given two problems to try on their own.
- Kiruthika B (953621104022), IV CSE monitored their approach, provided hints when needed, and corrected misconceptions on the spot.

CO – PO / PSO mapping:

CO	PO1	PO2	PO3	PO9	PO10	PSO1
CO 1	2	2	2	1	1	1

(1 – Low 2 – Moderate 3 – High)

PO / PSO mapped:

Innovative practice	PO1	PO2	PO3	PO9	PO10	PSO1
	2	2	2	1	1	1
Justification for correlation	Applied basic knowledge of Finite Automata in mathematical modeling	Analyzed complex engineering problems using automata models.	TM was designed to reverse a binary string	Worked as an individual.	Communicated effectively on complex engineering activities.	Designing the TM will help students develop software components in the future by strengthening their computational thinking skills.

- **Images / Screenshot of the practice:**

Figure 1: Student Engagement and Interaction by Kiruthika B (953621104022), IV CSE

Figure 2: TM Design for String Reversal by Kiruthika B (953621104022), IV CSE

Reflective Critique:

❖ ***Feedback of practice from students and other stakeholders:***

- The students responded positively to the session and appreciated the approachable and relatable teaching style of their senior.
- The step-by-step explanation helped students understand the logic of the reversal process clearly, and they felt more confident in learning the Turing Machine concept.

❖ ***Benefit of the practice:***

- This activity helped the student to enhanced interaction and bonding between juniors and seniors.
- This activity encouraged the students to share their knowledge with others.
- From this activity, the students can have improved understanding of complex theoretical concepts.
- Most students actively participated, and many quickly completed the practice problem and successfully designed the Turing Machine, while only a few needed additional support.

❖ ***Challenges faced in implementation:***

- Most students actively participated, except for a few.
- The non-participating students were encouraged by highlighting the benefits of self-learning.

References:

1. https://www.ishcmc.com/news-and-blog/peer-led-learning/
2. https://www.cascadiaschool.org/what-are-the-benefits-of-mixing-ages-and-grades-in-a-classroom-doesnt-this-make-teaching-way-harder-sorryteachers
3. https://www.21kschool.com/in/blog/benefits-of-activity-based-learning/