

**College:** Science      **Department:** Mathematics      **Program:** B.Sc. (Mathematics)

**Code**  
**MUP09**

## Student Outcome Rubric

Student Learning Outcome: **On successful completion of this programme, students should be able to Define and write fundamentals and concepts of mathematics.**

		Unsatisfactory	Developing	Satisfactory
<b>KPIs</b>	Use of mathematical steps toward solving several problems	Incorrect or invalid mathematical steps	Except for minor errors, completion of appropriate mathematical steps	Completion of appropriate mathematical steps
	Identification of Mathematics Principles	Lack of Knowledge	Average knowledge	Complete Knowledge
	Interpretation and appropriate presentation of results	Lack of Valid results	some results that include some units	Complete results that include proper units

Student Learning Outcome: **On successful completion of this programme, students should be able to Recall and reproduce fundamentals and concepts of General sciences and Computer skills**

		Unsatisfactory	Developing	Satisfactory
<b>KPIs</b>	General science Concepts	Explanation shows very limited understanding of the underlying concepts needed to solve the problem(s) OR is not written.	Explanation shows some understanding of concepts needed to solve the problem(s).	Explanation shows complete understanding of concepts used to solve the problem(s).
	Errors measurements	More than 75% of assumptions and solution steps <b>are not correct</b> .	Most (60-75%) of assumptions and solution steps have <b>no</b> errors.	80-100% of assumptions and solution steps <b>have no</b> errors.
	Explanation	Explanation is difficult to understand and is missing several components OR was not included.	Explanation is a little difficult to understand, but includes critical components.	Explanation is detailed and clear.

Student Learning Outcome: **On successful completion of this programme, students should be able to** Continue to **acquire** and **outline** mathematical and statistical knowledge and skills appropriate to professional activities

		Unsatisfactory	Developing	Satisfactory
<b>KPIs</b>	Mathematical Reasoning	Little evidence of mathematical reasoning.	Some evidence of mathematical reasoning.	Uses complete evidence and refined mathematical reasoning.
	Strategy/Procedures	Rarely uses an effective strategy to solve problems.	Sometimes uses an effective strategy to solve problems, but does not do it consistently.	Typically, uses an efficient and effective strategy to solve the problem(s).
	Mathematical Terminologies and Notations	There is little use, or a lot of inappropriate use, of terminologies and notations.	Correct terminologies and notations are used, sometimes it is not easy to understand what is going on.	Correct terminologies and notations are always applied.
	<b>Integrative and Applied Learning</b> (A mental process that integrates existing knowledge to develop further learning)	Relies on experience to aid in the learning process.	Is able to use previous knowledge and experience to expand one's horizon of learning new knowledge.	Uses experience, disciplinary knowledge, and transfers this background into learning new material.

Student Learning Outcome: **On successful completion of this programme, students should be able to Construct mathematical arguments and proofs and apply the underlying unifying structures of mathematics**

		<b>Unsatisfactory</b>	<b>Developing</b>	<b>Satisfactory</b>
<b>KPIs</b>	Solving equations and finding an answer	unsolved	solved with some errors	completely solved
	Formulate the problem using equations	the problem is not formulated	the problem is formulated with some errors	the problem is correctly formulated

Student Learning Outcome: **On successful completion of this programme, students should be able to Develop and explain critical thinking skills to solve problems that can be modeled mathematically**

		Unsatisfactory	Developing	Satisfactory
<b>KPIs</b>	<b>Problem Solving</b> Is a process in which one works through a series of operations to come to a conclusion	Identifies issues, and creates a plan to manage them.	Is able to identify and solve issues in a creative manner. Creates and follows a plan.	Sets out to solve issues in creative ways that will not only fix a current issue, but also look to the future to prevent similar problems. Evaluates the appropriateness of different approaches to solving problems, and devises arguments using these methods.
	<b>Inquiry and Analysis</b> A systematic process of exploring issues/ objects/works through the collection and analysis of evidence that result in informed conclusions/judgments	Is able to ask appropriate questions and find evidence related to inquiry of material with a critical eye.	Asks in-depth and specific questions regarding the material including reliability of the source, and evaluates it critically. Includes evidence to back up statements.	Is able to not only ask specific and in-depth questions, but also explores further possibilities with the aid of quality research. Asks and attempts to answer many questions from a critical perspective.
	<b>Creativity</b> Involves the ability to adapt to situations of Change.	Has the ability to think of creative solutions to problems and look for beneficial future changes.	Shows a creative mind that is also able to look at long-terms goals. Considers changes in an innovative way.	Exemplifies the quality to think in new and innovative directions in a logical and realistic manner. Plans for change and growth.

Student Learning Outcome: **On successful completion of this programme, students should be able to Demonstrate the work independently and within a team**

		<b>Unsatisfactory</b>	<b>Developing</b>	<b>Satisfactory</b>
<b>KPIs</b>	<b>Quality of Work</b>	Provides work that usually needs to be checked/redone by others to ensure quality.	Provides work that occasionally needs to be checked/redone by other group members to ensure quality.	Provides work of the highest quality.
	<b>Monitors Group Effectiveness</b>	Rarely monitors the effectiveness of the group and does not work to make it more effective.	Occasionally monitors the effectiveness of the group and works to make the group more effective.	Routinely monitors the effectiveness of the group, and makes suggestions to make it more effective.
	<b>Working with Others</b>	Rarely listens to, shares with, and supports the efforts of others. Often is not a good team player.	Often listens to, shares with, and supports the efforts of others, but sometimes is not a good team member.	Almost always listens to, shares with, and supports the efforts of others. Tries to keep people working well together.
	<b>Personal Organization/Time Management</b> An ability to manage several tasks at once and prioritize	Completes important or urgent tasks, and has a mind for organization.	Sets a plan for completion of many tasks, and prioritizes them for ease of accomplishment.	Prioritizes events based on importance and urgency in a manner where tasks are organized, and everything is accomplished. Is able to multi-task effectively. Clearly shows personal accountability and responsibility.

Student Learning Outcome: **On successful completion of this programme, students should be able to illustrate and bear responsibility for different situations**

		<b>Unsatisfactory</b>	<b>Developing</b>	<b>Satisfactory</b>
<b>KPIs</b>	<b>Problem-solving</b>	Does not try to solve problems or help others solve problems. Let others do the work.	Does not suggest or refine solutions, but is willing to try out solutions suggested by others.	Actively looks for and suggests solutions to problems.
	<b>Contributions</b>	Rarely provides useful ideas when participating in the group and in classroom discussion. May refuse to participate.	Sometimes provides useful ideas when participating in the group and in classroom discussion. A satisfactory group member who does what is required.	Routinely provides useful ideas when participating in the group and in classroom discussion. A definite leader who contributes a lot of effort.
	<b>Preparedness</b>	Often forgets needed materials or is rarely ready to get to work.	Almost always brings needed materials but sometimes needs to settle down and get to work	Brings needed materials to class and is always ready to work.
	<b>Leadership</b> Involves having a vision of where the organization is headed and the ability to give direction and guidance to others	Has a positive effect on others when in a leadership role, and realizes a long-term plan is needed.	Is able to delegate work to others, and have the sense to follow-up and encourage others. Developed a plan for the future, there is evidence of a final vision.	Is able to designate tasks, and influence and guide others to work in a manner which is effective, organized, and motivates others to do their best. Has a strategic vision that is accurately planned.

Student Learning Outcome: **On successful completion of this programme, students should be able to Analyze and realize the codes of ethics and their importance**

		Unsatisfactory	Developing	Satisfactory
<b>KPIs</b>	<b>Focus on the task</b>	Rarely focuses on the task and what needs to be done& lets others do the work.	Focuses on the task and what needs to be done some of the time. Other group members must sometimes nag, prod, and remind to keep this person on-task.	Consistently stays focused on the task and what needs to be done. Very self-directed.
	<b>Attitude</b>	Often is publicly critical of the project or the work of other members of the group. Often has a negative attitude about the task(s).	Occasionally is publicly critical of the project or the work of other members of the group. Usually has a positive attitude about the task(s).	Never is publicly critical of the project or the work of others. Always has a positive attitude about the task(s).
	<b>Pride</b>	Work reflects very little effort on the part of this student.	Work reflects some effort from this student.	Work reflects this student\'s best efforts.
	<b>Personal Organization/Time Management</b> An ability to manage several tasks at once and prioritize	Completes important or urgent tasks, and has a mind for organization.	Sets a plan for completion of many tasks, and prioritizes them for ease of accomplishment.	Prioritizes events based on importance and urgency in a manner where tasks are organized, and everything is accomplished. Is able to multi-task effectively. Clearly shows personal accountability and responsibility.



Student Learning Outcome: **On successful completion of this programme, students should be able to Communicate** mathematical ideas, both orally and in writing

		<b>Unsatisfactory</b>	<b>Developing</b>	<b>Satisfactory</b>
<b>KPIs</b>	<b>Ability to express ideas and answer questions</b>	not able to express ideas or answer questions	Ideas expressed reasonably well but answers to questions is lacking.	ideas expressed clearly and all questions are answered properly.
	<b>Oral Communication</b> Includes interpersonal skills and oral speaking	Demonstrates the ability to present information in a comprehensive manner, clearly, and effectively.	Demonstrates oral communication skills that are organized, and presented in a creative and interesting manner. The student speaks clearly and articulately.	Demonstrates the ability to present information in that the receiving party can easily understand the information. The speaker is clear and shows confidence in public speaker. Has mastered oral communication skills.
	<b>Written Communication</b> The ability to express one's ideas through a variety of writing styles	The ability to write clearly, and demonstrate a general knowledge about describing an idea.	Has the ability to write a clear message with good vocabulary and little grammatical, spelling or functional errors.	The student has shown a breadth of vocabulary and can write in a sophisticated manner that clearly conveys the message of the speaker.

	<p><b>Active Listening</b> Involves being attentive and respectful when others are speaking, and responding effectively to others' comments during conversation</p>	<p>The ability to pay attention when a speaker is talking.</p>	<p>The receiver shows evidence they are intently listening, occasionally asking questions.</p>	<p>The receiver engages with the speaker, including asking questions, and reiterating points the speaker states.</p>
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Student Learning Outcome: **On successful completion of this programme, students should be able to Critically interpret numerical and graphical data**

		Unsatisfactory	Developing	Satisfactory
<b>KPIs</b>	<b>Quantitative Expertise</b> Includes numeracy, and a confidence in working with numerical data	Understands the need for evidence and use of numerical data, and is able to generally interpret this data.	Is able to use quantitative data to one's advantage by using it as evidence for a claim. Is comfortable with everyday situations with numeracy.	Possesses the ability to reason and solve quantitative problems from a wide array of authentic contexts and everyday life situations, and from this, can develop sophisticated arguments supported by quantitative evidence. Is also able to create an
	<b>Depth and Breadth of Understanding</b> An ability to break disciplinary boundaries and bring together information.	Realizes the differences of information from a variety of disciplines.	Is able to extract information, and understands the advantages of using a variety of disciplines.	Gathers, reviews, evaluates and interprets information; compares the merits of alternate hypotheses in many different disciplines. Understands the limits of their own knowledge and ability and how this influences analyses.
	<b>Diagrams and/or sketches</b>	Diagrams and/or sketches are clear and greatly add to the reader's understanding of the procedure(s).	Diagrams and/or sketches are difficult to understand or are not used.	Diagrams and/or sketches are somewhat difficult to understand.
	<b>Information Gathering</b>	Is able to locate and use materials from a variety of resources.	Individual not only locates materials, but also is able to understand when more information is needed and how to evaluate its effectiveness.	This skill is developed where one can easily identify, locate, evaluate many resources and effectively and responsibly to use the information discover new information.