Graduate Attribute Rubrics

Faculty of MCA



Maharaja Institute of Technology Mysore Belawadi, Naguvanahalli Post, Srirangapatna Taluk, Mandya-571477

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FOREWORD

Rubrics are used for communicating the performance expectations for any activity.

They are ways to provide transparent criteria for assessment for all stakeholders

(faculty, instructors, students, alumni and Industry). Rubrics are descriptive, and

thereby can be used as a tool to promote understanding, and to direct future

instruction and learning. They can as well be used for self and peer evaluation.

The primary aims of rubrics are to, Define foci and/or indicators for each graduate

attribute; Divide each indicator into four performance levels; Target the level that

indicates student competency.

Rubrics are a tool conducive to outcomes-based education and assessment, a guiding

principle for NBA accreditation. The Faculty of MCA Graduate Attribute Rubrics

can be used to facilitate a common understanding and language for engineering

stakeholders (faculty, instructors, students, alumni and Industry) regarding the ten

NBA graduate attributes. They are intended as a pedagogical assessment tool for use

by instructors of individual courses, as well as for assessment at the program level, as

applicable.

I congratulate the team of faculty for having penned down 'The Faculty of MCA

Graduate Attribute Rubrics' and urge all concerned to make best possible use of it to

ensure continuous improvement in all sphere of academics.

Dr. Naresh Kumar B G

Principal

ACKNOWLEDGEMENTS

The Faculty of Engineering Graduate Attribute Rubrics is intended as a pedagogical assessment tool for use by course instructors of individual courses, as well as for assessment at the program level, as applicable.

The development of this document was initiated by the institute with an objective of defining foci and indicators identified as elements encompassed within the stated graduate attributes.

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Godfrey Devaputra

Convener- NBA Works

PO1: Computational Knowledge: Apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer based systems.

| Focus Areas | Indicators | Level 4 | Level 3 | Level 2 | Level 1 |
|----------------|--------------------------|---------------------------|----------------------------|---------------------------|----------------------------|
| Focus Areas | | Strong | Competent | Developing | Needs Work |
| | Mathematical and | Demonstrates a skilful | Demonstrates an ability | Demonstrates some | Demonstrates minimal |
| | Scientific Terms: | ability to interpret | to interpret most | ability to interpret | or no ability to interpret |
| | Interpret and apply | mathematical and | mathematical and | mathematical and | mathematical and |
| | scientific and | scientific terms | scientific terms | scientific terms | scientific terms |
| | mathematical terms. | correctly. | correctly. | correctly. | correctly. |
| | Theory in Engineering | Demonstrates a | Demonstrates an ability to | Demonstrates some | Demonstrates minimal or |
| | Problems: | comprehensive | Understand the | ability to Understand the | no ability to Understand |
| | Ability to interpret and | Understanding of | application of theory | application of theory to | the application of theory |
| Knowledge Base | apply theory in | underlying theory and | to the problem. | the problem. | to the problem. |
| | engineering problems. | application to the | | | |
| | | problem. | | | |
| | Mathematical Models: | Chooses an optimal | Chooses a mathematical | Chooses a mathematical | Demonstrates minimal or |
| | Ability to apply | mathematical model that | model that applies to an | model that applies to an | no Understanding of the |
| | mathematical models | applies to an engineering | engineering problem, and | engineering problem, but | connection between |
| | to engineering problem | problem, and develops | has some success in | requires assistance in | mathematical models and |
| | and/or formulate | new models. | model development. | model development. | engineering problems. |
| | engineering models. | | | | |

PO2: Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated

conclusions using first principles of mathematics, natural sciences, and engineering sciences.

| Focus Areas | Indicators | Level 4 | Level 3 | Level 2 | Level 1 |
|-----------------|---|---|--|---|--|
| Focus Areas | | Strong | Competent | Developing | Needs Work |
| | Identify/Define and Contextualize Problem: Ability to identify and/or articulate a problem. | Demonstrates a skilful ability to identify/articulate a problem that is strongly supported and clearly linked to the issues at hand and demonstrates a comprehensive and insightful understanding | Demonstrates ability to identify/articulate a problem that is clearly linked to the issues at hand. | Demonstrates some ability to identify / articulate a problem that is partially connected to the issues at hand. | Demonstrates minimal or no ability to identify/articulate a problem. |
| | Formulate Strategies for Solving a Problem: | Demonstrates a skilful ability to identify multiple | Demonstrates an ability to identify an appropriate | Demonstrates some ability to identify a | Demonstrates minimal or no ability to identify a |
| Problem Solving | Ability to identify strategies for solving problems (brainstorming, | strategies for generating approaches to solve a problem, and has insight | strategy for generating approaches for solving a problem. | strategy for generating an approach for solving the problem. | strategy for generating an approach for solving a problem. |
| | research, trial and error). | into the pros and cons of those strategies. | problem. | Strategy may or may not be appropriate. | problem. |
| | Analyze, Evaluate and Select Solutions: Ability to analyze, evaluate and select optimal/practical Solution, including feasibility and impact. | Demonstrates a skilful ability to analysis, evaluate and select optimal/practical solution, thorough and insightful explanation of feasibility and impact. | Demonstrates an ability to analyze, evaluate and select optimal/practical solution. Clear explanation of feasibility and impact. | Demonstrates some ability to analyze, evaluate and select optimal/practical solution. Partial explanation of feasibility and impact. | Demonstrates minimal or no ability to analyze, evaluate or select optimal/practical solution. No explanation of feasibility and impact. |

PO 3: Design/Development of Solutions: Design computing system to meet desired needs within realistic constraints such as safety, security and applicability.

| Focus Areas | Indicators | Level 4 | Level 3 | Level 2 | Level 1 |
|-------------------|------------------------------|--------------------------------|-----------------------------|-----------------------------|-----------------------------|
| rocus Areas | | Strong | Competent | Developing | Needs Work |
| | Understanding the | Demonstrates a | Demonstrates an ability | Demonstrates some | Demonstrates minimal |
| | Design Process: Ability | comprehensive ability to | to understand and | ability to understand and | or no ability to |
| | to explain the design | understand and explain a | explain a design | explain a design process. | understand and explain |
| | process including the | design process. | process. | | a design process. |
| | importance of needs, | | | | |
| | specifications, concept | | | | |
| | generation, selection and | | | | |
| | evaluation. | | | | |
| | Problem Solving: | Considers multiple | Considers multiple | Considers a few | Considers a single |
| | Considering | approaches to solving a | approaches to solving a | approaches to solving a | approach to solving a |
| Design Process | Solutions: | problem, and develops a | problem, which is justified | problem; doesn't always | problem. Does not |
| Design Frocess | Ability to develop an | logical, consistent plan. | and considers | consider consequences. | consider consequences. |
| | approach to solve a | Recognizes consequences of | consequences. | | |
| | problem. | solution and can articulate | | | |
| | | reason for choosing solution. | | | |
| | Implementing Design | Demonstrates a skilful | Demonstrates an ability to | Demonstrates some ability | Demonstrates minimal or |
| | Strategy: Ability to execute | (thorough/insightful/creative) | execute a solution taking | to execute a solution that | no ability to execute a |
| | a solution to an open- | ability to execute a solution | into consideration design | attends to the problem, but | solution. Solution does not |
| | ended problem taking into | taking into consideration all | requirements and some | omits some design | directly attend to the |
| | consideration design | design requirements and | contextual elements. | requirements and/or | problem. |
| | requirements and pertinent | pertinent contextual | | pertinent contextual | |
| | contextual elements. | elements. | | elements. | |
| Creative Thinking | Innovation: | Demonstrates a | Demonstrates an ability | Demonstrates some | Demonstrates minimal |

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| Ability to recognize and | comprehensive | to recognize and | recognition and | or no recognition of |
|--------------------------|--------------------------------|----------------------------|---------------------------|-------------------------|
| incorporate innovation | recognition and | incorporate innovation | incorporation of | innovation when |
| when considering an | incorporation of | when considering an | innovation when | considering an idea. |
| idea. | innovation when | idea. | considering an idea. | |
| | considering an idea. | | | |
| Connecting and | Demonstrates a skilful ability | Demonstrates an ability to | Demonstrates some ability | Demonstrates minimal or |
| Integrating: Ability to | to connect, integrate and | connect, integrate and | to connect, integrate and | no ability to connect, |
| connect, integrate and | transform innovative ideas | transform ideas into | transform ideas into | integrate and transform |
| transform ideas into | into innovative solutions. | solutions. | solutions. | ideas into solutions. |
| solutions. | | | | |

PO 4: Conduct Investigations of Complex Computing Problems: Devise and conduct experiments, interpret data and provide well informed conclusions.

| Focus Areas | Indicators | Level 4 | Level 3 | Level 2 | Level 1 |
|----------------------|-------------------------|----------------------------|----------------------------|-------------------------|--------------------------|
| rocus Arcas | | Strong | Competent | Developing | Needs Work |
| | Lab Preparation: | Exemplary materials are | All required materials | Most required | All required materials |
| | Ability to gather | gathered and recorded | are gathered and | materials are gathered; | are not gathered, nor |
| | materials and record | on the lab report with | recorded on the lab | not all may be | recorded on the lab |
| | on lab report. | clarity and concision. | report. The selected | recorded on the lab | report. The selected |
| | | | materials are suitable | report. The selected | materials are not all |
| | | | for the procedure. | materials are adequate | adequate and/or suitable |
| | | | | for the procedure. | for the procedure. |
| | Purpose: | The hypothesis and | The hypothesis and | The hypothesis and | The hypothesis and |
| | Ability to state the | research question are | research question are | research question are | research question are |
| | hypothesis and the | skilfully specified, and | specified clearly, and the | specified, and the | not specified clearly, |
| | research question, | the connection between | connection between the | connection between the | and the connection |
| Experimental | clarify the connection | the two is explained in | two is explained. The | two is somewhat clear. | between the two is |
| /Theoretical Methods | between them, and | depth. The variables are | variables are identified. | Most variables are | vague or missing. Most |
| | identify the variables. | identified and | | identified. | variables are not |
| | | discussed. | | | identified. |
| | Procedure: | The procedure is | The procedure is well | The procedure could be | The procedure is |
| | Ability to follow | efficiently followed and | followed and student | better followed, but | inadequately followed, |
| | experimental | student skilfully controls | demonstrates control of | student controls all | and student does not |
| | procedures, control | all chosen variables. All | all chosen variables. All | chosen variables. Most | control chosen |
| | variables, and record | procedural steps are | procedural steps are | procedural steps are | variables. Many |
| | procedural steps on | clearly and concisely | recorded on the lab | recorded on the lab | procedural steps are not |
| | lab report. | recorded on lab report. | report. | report. | entered on the lab |
| | | | | | report. |
| | Data/Evidence | Raw data/evidence, as | Raw data/evidence, as | Raw data/evidence, as | Raw data/evidence, as |

| Collection: Ability to | well as units, are | well as units, are | well as units, are | well as units, are not |
|---------------------------|---------------------------|------------------------|------------------------------|----------------------------|
| record raw | skilfully recorded. The | appropriately and | recorded although not as | recorded suitably. The |
| data/evidence. | data table is clearly and | clearly recorded. The | clearly or suitably as | data table is not labelled |
| | concisely, and/or | data table is | they might be. The data | and/or formatted. |
| | creatively labelled and | appropriately labelled | table may lack | |
| | formatted. | and formatted. | appropriate labels and/or | |
| | | | format. | |
| Data Presentation and | Data are presented in | Data are presented in | Data are presented in | Data are not presented |
| Error Analysis: | ways to best enable | ways to enable | ways that somewhat aid | clearly. Error analysis is |
| Ability to present data | comprehension and | comprehension and | comprehension and | wrong or missing. |
| using charts, tables | interpretation, skilfully | interpretation, | interpretation and | |
| and/or graphs to enable | incorporating error | incorporating error | incorporate error analysis, | |
| comprehension and | analysis. | analysis. | but presentation could be | |
| interpretation, including | | | clearer. | |
| erroranalysis. | | | | |
| Evaluation of | The findings are | The findings are | The findings are | The interpretation of the |
| Experiment: Ability to | interpreted insightfully | interpreted and | interpreted and compared | findings is illogical, and |
| interpret findings, | and skilfully compared | compared with values | with values in the | the findings are not |
| compare them to values | with values in the | in the literature. | literature, but not as fully | compared with values in |
| in the literature, | literature. Weaknesses | Weaknesses and | or clearly as they might | the literature. Few or no |
| identify weaknesses and | and limitations are | limitations are | be. Not all of the | weaknesses or |
| limitations, and | analyzed and creative | considered and | weaknesses or | limitations are |
| propose improvements. | recommendations are | recommendations are | limitations are discussed; | discussed; few or no |
| | made to address them. | made to address them. | few recommendations | recommendations are |
| | | | are made to address | made to address them. |
| | | | them. | |

| PO 5: Modern Tool Us | PO 5: Modern Tool Usage: Use selected modern computing tools and techniques with dexterity. | | | | | | |
|---------------------------------|---|-----------------------------|-----------------------------|-------------------------------|-------------------------------|--|--|
| Focus Areas | Indicators | Level 4 | Level 3 | Level 2 | Level 1 | | |
| rocus Arcas | | Strong | Competent | Developing | Needs Work | | |
| | Understand Tools: | Demonstrates skilful | Demonstrates ability | Demonstrates some | Demonstrates minimal | | |
| | Ability to describe and | ability to describe and | to describe and | ability to describe | or no ability to describe | | |
| | explain the principles | explain the principles | explain the principles | and/or explain the | and/or explain the | | |
| | behind and applicability | behind and applicability | behind and | principles behind and | principles behind and | | |
| | of engineering tools. | of engineering tools. | applicability of | applicability of | applicability of | | |
| | | | engineering tools. | engineering tools. | engineering tools. | | |
| | Identify and Use Tools: | Demonstrates skilful | Demonstrates an ability to | Demonstrates some ability | Demonstrates minimal or | | |
| | Ability to identify and use | ability to identify and use | identify and use relevant | to identify and use tools for | no ability to identify or use | | |
| Use of Engineering Tools | relevant tools for an | the most relevant tools for | tools for an engineering | an engineering activity, but | tools for an engineering | | |
| | engineering activity. | a range of engineering | activity. | may not identify the most | activity. | | |
| | | activities. | | relevant tool. | | | |
| | Evaluate Tools: | Demonstrates skilful | Demonstrates the ability to | Demonstrates some ability | Demonstrates minimal or | | |
| | Ability to identify the | ability to evaluate the | identify the limitations of | to identify the limitations | no ability to identify the | | |
| | limitations in the use of | limitations of tools and | tools and understands the | of tools and some | limitations of tools and | | |
| | engineering tools, and | discusses the assumptions. | assumptions. | understanding of the | understand the | | |
| | their underlying | | | assumptions. | assumptions. | | |
| | assumptions. | | | | | | |

PO 6: Professional Ethics: Function professionally with ethical responsibility as an individual as well as in multidisciplinary teams with positive attitude.

| Eagus Amass | Indicators | Level 4 | Level 3 | Level 2 | Level 1 |
|-------------|------------------------------|------------------------|----------------------------|---------------------------|--------------------------|
| Focus Areas | | Strong | Competent | Developing | Needs Work |
| | Ethical Issue | Approaches all | Able to approach | Some ability to | Minimal or no ability |
| | Recognition and | situations with | situations with | approach situations with | to approach situations |
| | Behaviour: Ability to | awareness and | consideration of ethical | consideration of ethical | with consideration of |
| | recognize and act on | consideration of the | issues, and acts to | issues, and/or some | ethical issues. |
| | ethical issues | ethical issues | resolve them. | ability to act to resolve | |
| | (personal, | involved, and actively | | them. | |
| | professional and | work to resolve them. | | | |
| | corporate). | | | | |
| | Equity: | Approaches all | Able to approach | Some ability to approach | Minimal or no ability |
| | Ability to recognize | situations with | situations with | situations with | to approach situations |
| | equitable issues | consideration of | consideration of | consideration of | with consideration of |
| Ethics | (ethnicity, gender, age, | equitable issues | equitable issues, and acts | equitable issues, and | equitable issues. |
| | sexual orientation, | involved, and actively | with inclusivity. | behaves with some | |
| | faith, geography, | behave with | | regard for inclusivity. | |
| | socio-economic status, | inclusivity. | | | |
| | etc.), and acts/behaves | | | | |
| | with inclusivity. | | | | |
| | Accountability: | Always assumes | Assumes responsibility | Recognizes the need to | Minimal or no ability to |
| | Recognizes the need | responsibility for own | for own actions. | assume responsibility for | recognize the need to |
| | to assume | actions. | | own actions, but may | assume responsibility |
| | responsibility for | | | not always act on this | for own actions. May |
| | own actions. | | | recognition. | blame others for own |
| | | | | | issues and problems. |

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| Proper Use of | Always recognizes and | Recognizes and applies | Some recognition | Minimal or no |
|------------------------|------------------------|------------------------|------------------------|------------------------|
| Others' Work: | applies proper ethical | proper ethical use of | and application of | recognition and/or |
| Ability to recognize, | use of intellectual | intellectual property, | proper ethical use of | application of proper |
| understand and apply | property, copyrighted | copyrighted materials, | intellectual property, | ethical use of |
| proper ethical use of | materials, and others' | and others' research. | copyrighted | intellectual property, |
| intellectual property, | research. | | materials, and others' | copyrighted materials, |
| copyrighted materials, | | | research. | or others' research. |
| and research. | | | | |

| PO 7: Life-long Learn | PO 7: Life-long Learning: Recognize the need for life-long learning with an ability to appreciate the importance of goal setting. | | | | | | | |
|-----------------------|---|--------------------------|----------------------------|--------------------------|--------------------------|--|--|--|
| Focus Areas | Indicators | Level 4 | Level 3 | Level 2 | Level 1 | | | |
| 1 00 45 111 045 | | Strong | Competent | Developing | Needs Work | | | |
| | Interest and | Demonstrates a skilful | Demonstrates an ability | Demonstrates some | Demonstrates minimal | | | |
| | Curiosity: | ability to explore a | to explore a | ability to explore a | or no ability to explore | | | |
| | Inclination/ability to | subject/topic | subject/topic, generating | subject/topic, providing | a subject/topic, | | | |
| | explore a | thoroughly, generating | a variety of knowledge, | some knowledge, | demonstrating minimal | | | |
| | subject/topic in the | a variety of knowledge, | demonstrating | demonstrating mild | interest or curiosity. | | | |
| | pursuit of | possibly specialized or | fascination and curiosity. | interest and growing | | | | |
| | knowledge. | obscure, demonstrating | | curiosity. | | | | |
| | | deep fascination and | | | | | | |
| | | curiosity. | | | | | | |
| | Initiative: | Creates and seeks | Finds and pursues | Some inclination | Minimal or no | | | |
| | Inclination/ability | additional opportunities | additional opportunities | to explore | inclination to identify | | | |
| | to explore | for learning. | for learning. | additional | additional | | | |
| Life Long Learning | additional | | | opportunities for | opportunities for | | | |
| | opportunities for | | | learning. | learning. | | | |
| | learning. | | | | | | | |
| | Adaptability to New | Demonstrates a skilful | Demonstrates an ability | Demonstrates some | Demonstrates minimal | | | |
| | Situations: Ability to | ability to apply prior | to apply prior | ability to apply prior | or no ability to apply | | | |
| | apply prior | knowledge, skills and/or | knowledge, skills and/or | knowledge, skills and/or | prior knowledge, skills | | | |
| | knowledge, skills | behaviours in an | behaviours to new | behaviours to new | and/or behaviours to | | | |
| | and/or behaviours to | innovative way to new | situations. | situations. | new situations. | | | |
| | new situations. | situations. | | | | | | |
| | Staying Current: | Demonstrates an active | Demonstrates | Demonstrates some | Demonstrates minimal | | | |
| | Engaged in staying | and thorough | engagement in staying | engagement in staying | or no awareness or | | | |
| | current in the chosen | engagement, and | current in the chosen | current in the chosen | appreciation for staying | | | |

| field. | promotes staying | field. | field. | current in the chosen |
|-----------------------------|---------------------------|-------------------------|--------------------------|-----------------------------|
| | current and immersed in | | | field. |
| | the chosen field. | | | |
| Asking Questions: | Demonstrates a skilful | Demonstrates an ability | Demonstrates some | Demonstrates minimal |
| Ability to recognize | ability to recognize and | to recognize and | ability to recognize | or no ability to recognize |
| and/or construct | construct meaningful | construct meaningful | and/or construct | or construct meaningful |
| meaningful and | and pertinent questions. | and/or pertinent | meaningful or | or pertinent questions. |
| pertinent questions. | | questions. | pertinent questions. | May not be inclined to |
| | | | | ask questions. |
| Handling Constructive | Demonstrates a skilful | Demonstrates an ability | Demonstrates some | Demonstrates minimal |
| Criticism: Ability to | ability to seek, accept | to accept and use | ability to accept and/or | or no ability to accept |
| accept and use | and use constructive | constructive feedback. | use constructive | and use constructive |
| constructive feedback | feedback. | | feedback. | feedback. |
| (desists from | | | | |
| quarrelling; considers | | | | |
| others' points | | | | |
| of view; shows | | | | |
| appreciation for | | | | |
| feedback; implements | | | | |
| change). | | | | |
| Reflection (Lessons | Reflect with depth and | Demonstrates an ability | Demonstrates some | Demonstrates minimal |
| Learned): Ability to | insight on | to reflect on | ability to reflect on | or no ability to reflect on |
| reflect on (analyze and | experiences/situations. | experiences/situations. | experiences/situations. | experiences/situations. |
| evaluate) | Skilfully applies what is | Demonstrates learning | Demonstrates some | Tends to repeat mistakes. |
| experiences/situations, | learned from reflections | through reflection. | learning through | |
| and apply results from | to subsequent | | reflection. | |

| | reflections to subsequent | experiences/situations. | | | |
|----------------------|---------------------------|----------------------------|--------------------------|---------------------------|------------------------|
| | experiences/situations. | | | | |
| | (Learns from successes | | | | |
| | and | | | | |
| | mistakes, and | | | | |
| | recognizes | | | | |
| | limitations.) | | | | |
| | Formulate a Topic | Demonstrates the ability | Demonstrates the ability | Demonstrates some | Demonstrates minimal |
| | /Define Research Scope: | to succinctly articulate a | to articulate a topic. | ability to articulate a | or no ability to |
| | Ability to frame a topic, | topic. Clearly and | Determines the research | topic, but the research | articulate a topic. |
| | determine research | concisely determines | scope, identifies key | scope is either too | Difficulty determining |
| | scope, identify essential | the research scope, | concepts and drafts | expansive or too limited. | the research scope, |
| | concepts and define | identifies essential | research questions. | Can identify some key | identifying key |
| | research questions. | concepts and outlines | | concepts and draft some | concepts and/or |
| | | research questions. | | research questions. | drafting research |
| | | | | Work needs refining. | questions. |
| Research/Information | Execute a Search | Demonstrates the ability | Demonstrates the ability | Demonstrates the ability | Demonstrates minimal |
| Literacy | Strategy and Retrieve | to use efficient and | to use an assortment of | to use search strategies | or no ability to |
| | Needed Information: | effectively-designed | search strategies to | to retrieve some | formulate simple |
| | Ability to use search | search strategies to | retrieve relevant and | information sources, but | searches effectively. |
| | strategies and access | retrieve the most | appropriate information | strategies are mainly | Performs very basic |
| | information. | relevant and appropriate | sources. Refines search | simplistic and limited, | keyword searches |
| | | information sources. | as needed. | and search scope too | (single words and/or |
| | | Effectively and | | broad for task at hand. | simple phrases), which |
| | | recurrently refines | | (Does not use controlled | retrieve unacceptably |
| | | search. | | vocabularies.) | large numbers of hits. |

| | | | Information is found | Information is selected |
|----------------------------|--------------------------|---------------------------|----------------------------|----------------------------|
| | | | within a narrow range of | randomly, with little or |
| | | | sources. | no applicability or |
| | | | | value. |
| Select and Evaluate | Selects a variety of | Selects variety of | Selects some relevant | Selects few sources with |
| Information and | sources which | sources which covers | sources, but includes | little breadth, i.e., many |
| Sources Critically: | thoroughly covers the | the range of research | irrelevant sources. | sources are from the |
| Ability to use criteria to | range of research and | and relates to concepts | Chosen information is | same journal or web site, |
| select and evaluate | directly relates to | or answers research | somewhat connected to | or from non- referred |
| sources and | concepts or answers | questions. | research concepts or | articles and/or very |
| information. | research questions. Able | Demonstrates ability to | questions. Rarely | general web sites. |
| | to skilfully analyze | distinguish between | evaluates information | Chosen information is |
| | information sources | relevant and irrelevant | for reliability, validity, | not connected to |
| | based on reliability, | information. Usually | accuracy, authority, | research concepts or |
| | validity, accuracy, | selects sources using | purpose, currency or | questions. Selects |
| | authority, purpose, | multiple criteria, such | relevance. Many sources | sources using limited |
| | currency, relevance, | as reliability, validity, | are not authoritative, | criteria, such as |
| | partiality and audience. | accuracy, authority, | neither is there a variety | reliability, validity, |
| | Sources are balanced | purpose, currency, and | or balance of sources. | accuracy, authority, |
| | and mostly | relevance. Sources not | | purpose, currency or |
| | authoritative. | always balanced. | | relevance. |

PO 8: Communication Efficacy: Communicate effectively on complex problems with the associated audience through effective documentation,

presentations, and give and receive clear instructions.

| Focus Areas | Indicators | Level 4 | Level 3 | Level 2 | Level 1 |
|-----------------------------------|----------------------------|------------------------|-------------------------|---------------------------|----------------------------|
| Focus Areas | Indicators | Strong | Competent | Developing | Needs Work |
| | Purpose: | Purpose is clear and | Purpose is evident, and | Purpose is | Purpose is unclear. Does |
| | Ability to identify the | effectively guides the | mostly guides the | somewhat clear and | not guide the |
| | reason for the | communication. Choice | communication. Choice | somewhat guides the | communication. Choice |
| | communication, chooses | of communication is | of communication is | communication. | of communication is |
| | the best communication for | optimal. | effective. | Choice of | ineffective. |
| | the task, and use the | | | communication is | |
| | purpose to guide the | | | somewhat effective. | |
| | communication. | | | | |
| | Main Idea: | Main idea is clearly | Main idea is | Main idea is | Main idea is difficult to |
| | Ability to communicate the | and precisely stated. | understandable. | somewhat | understand. |
| | main idea. | | | understandable. | |
| Technical Communication Skills | Supporting | Demonstrates skilful | Demonstrates | Demonstrates an attempt | Demonstrates minimal or |
| | Materials: Ability to | use of superior, | consistent use of | to use trustworthy, | no attempt to use |
| | use information | trustworthy, pertinent | trustworthy, | appropriate and pertinent | trustworthy, appropriate |
| | sources (texts, | and compelling | appropriate and | materials that support | and pertinent materials to |
| | journals, research) | materials that support | pertinent materials | and develop the purpose | support the purpose |
| | and/or generate | the purpose and main | that support the | and main idea. | and/or main idea. |
| | materials (examples, | idea. | purpose and main | | |
| | statistics, analogies) | | idea. | | |
| | to support the | | | | |
| | purpose and main | | | | |
| | idea, and establish | | | | |

| credibility. | | | | |
|--------------------------|--------------------------|---------------------------|--------------------------|------------------------------|
| Organization: | Materials are seamlessly | Material moves | Material has some | Material has little logical |
| Ability to structure | arranged in a logical | logically forward, and | logical order and is | order, and is often unclear, |
| ideas to move | sequence and both macro | both macro and micro | somewhat coherent or | incoherent and difficult to |
| logically forward. | and micro elements | elements are clear, | easy to follow. | follow. |
| E.g., For written | enhance the work and the | coherent, and easy to | | |
| communication both | reader's comprehension. | follow. | | |
| macro (introduction, | | | | |
| paragraphs, sequence of | | | | |
| content, conclusion) and | | | | |
| micro organization | | | | |
| (sentences, transitions) | | | | |
| are considered. | | | | |
| Clarity and | Uses language that | Uses language that | Uses language that | Uses language that may |
| Conciseness: Ability to | conveys meaning with | clearly and concisely | generally conveys | be unclear and/or in |
| use language that | clarity and parsimony, | conveys meaning, and | meaning, is somewhat | concise, may |
| clearly and concisely | and enhances the | supports the purpose of | concise, and supports | sometimes impede |
| conveys meaning and | purpose of the work. | the work. | the purpose of the work. | meaning, and |
| supports the purpose of | | | | minimally supports the |
| the work. | | | | purpose of the work. |
| Mechanics: | Communication | Communication | Communication | Communication |
| Ability to use language | contains very few or | contains some errors, | contains errors. | contains many errors. |
| that is mechanically | no errors. | but errors do not detract | Errors may be | Errors impede meaning. |
| corrects (punctuation, | | from meaning. | distracting. | |
| spelling, grammar). | | | | |
| Genre and | Demonstrates | Demonstrates | Demonstrates some | Demonstrates minimal |

| | Conventions: Ability to | thorough/sophisticated | understanding of and | understanding of and | or no understanding of |
|-----------------------------------|--------------------------|---------------------------|----------------------------|-----------------------------|-----------------------------|
| | understand and use | understanding of and | use of the | attempts to use the | or effort to use the |
| | conventions intrinsic to | skilful use of the | conventions inherent | conventions inherent | conventions inherent |
| | engineering genres | conventions inherent | within the | within the engineering | within the engineering |
| | (formal/informal | within the engineering | engineering genre. | genre. | genre. |
| | reports, lab reports, | genre. | | | |
| | final completion | | | | |
| | reports, proposals, | | | | |
| | presentations). | | | | |
| | Illustrations (Graphs, | Illustrations are | Illustrations are properly | Illustrations are for the | Illustrations are used, but |
| | Tables, Figures and | skilfully used to support | used to support ideas | most part properly used | minimally support ideas, |
| | Diagrams): Ability to | ideas (correctly cited, | (correctly cited, | to support ideas (an | and are not properly |
| | use illustrations | skilfully positioned on | positioned on page, | attempt is made to | cited, positioned on page, |
| | properly to support | page, well integrated | integrated and designed; | correctly cite, position on | integrated and/or |
| | ideas (citations, | and designed; they | they support, explain | page, integrate, and/or | designed. They do not |
| | position on page, | enhance points, explain, | and interpret | design, and to support, | support, explain or |
| | integration, design and | interpret, and assess | information). | explain or interpret | interpret information. |
| Visuals for Written Communication | support of ideas). | information). | | information). | |
| Communication | Formatting/Layout/Design | The | The appropriate/ | The appropriate/ | The appropriate/ |
| | of Communication: | appropriate/prescribed | prescribed format is | prescribed format is | prescribed format is not |
| | Ability to use | format is precisely | followed. Design is | followed in most | followed. Design of |
| | appropriate or | followed. Design is | effective; headings are | portions of the | communication is |
| | prescribed format, which | exemplary. Headings | clear, and work is | communication. Design | ineffective; headings are |
| | is effectively designed, | are clear and add to the | neatly and | is somewhat effective; | unclear, and work is not |
| | clearly labelled, neatly | overall meaning of, | professionally | headings are somewhat | neatly presented. |
| | and professionally | and/or enhance the | presented. Format | clear, and work is for | Format does not invite |

| | presented. | communication. Work | invites reading. | the most part, neatly | reading. |
|-----------------------|-----------------------------------|----------------------------|--------------------------|----------------------------|-------------------------------|
| | | is exceptionally neat | | presented. | |
| | | and professionally | | | |
| | | presented. Format | | | |
| | | compels reading. | | | |
| | Active Listening: | Demonstrates skilful | Demonstrates ability to | Demonstrates some | Demonstrates minimal or |
| | Ability to pay attention to a | ability to actively listen | actively listen by | ability to actively listen | no ability to actively listen |
| | speaker, summarize key ideas | by rephrasing/repeating | rephrasing/repeating | by | to the speaker. Is unable |
| | and supporting information. | all of the speaker's key | most of the speaker's | rephrasing/repeating | to rephrase/repeat key |
| | | ideas and supporting | key ideas and | some of the speaker's | ideas and/or supporting |
| | | information. | supporting information. | key ideas and | information. May be |
| | | | | supporting | distracting to others. |
| | | | | information. | |
| | Following | Is able to concisely and | Is able to follow | Is partially able to | Is unable to follow |
| | Instructions: Ability to | effectively follow | spoken and/or | follow spoken and/or | spoken and/or |
| General Communication | follow instructions (spoken | spoken and/or written | written instructions. | written instructions. | written instructions. |
| Skills | and/or written). | instructions. | | | |
| | Giving/Writing | Gives/writes clear and | Gives/writes clear | Gives/writes somewhat | Gives/writes unclear |
| | Instructions: Ability to | concise directions or | directions or | clear directions or | directions or instructions. |
| | give/write clear directions or | instructions. Skilfully | instructions. Conveys | instructions. Generally | For the most part does |
| | instructions, convey the sequence | conveys the sequence | the sequence of steps | conveys the sequence of | not convey the sequence |
| | of steps and use clear | of steps and uses model | and uses clear | steps; uses some | of steps. Uses few or no |
| | examples/references. | examples/references. | examples/references. | examples/references. | examples/references. |
| | | Listener/reader easily | Listener/reader can | Listener/reader can | Listener/reader has |
| | | and smoothly follows | follow the instructions. | for the most part | difficulty following the |
| | | instructions. | | follow the | instructions. |
| | | | | instructions. | |

| | Asking Questions: | Demonstrates a skilful | Demonstrates an | Demonstrates some | Demonstrates minimal or |
|--|----------------------------------|---------------------------|--------------------------|----------------------------|-----------------------------|
| | Ability to recognize and/or | ability to recognize and | ability to recognize | ability to recognize | no ability to recognize or |
| | construct meaningful and | construct meaningful | and construct | and/or construct | construct meaningful or |
| | relevant questions. | and relevant questions. | meaningful and/or | meaningful or relevant | relevant questions. May |
| | | | relevant questions. | questions. | not be inclined to ask |
| | | | | | questions. |
| | Key Ideas: Organization | Presentation logically | Presentation has clear | Presentation has some | Presentation rambles. Not |
| | and Articulation | and skilfully structured. | structure and is easy to | structure. Key ideas | organized; key ideas are |
| | Ability to present strong key | Key ideas are | follow. Key ideas are | generally identifiable, | difficult to identify, and |
| | ideas and supporting details | compelling, and | clearly and concisely | although not very | are unremarkable. No |
| | with clarity and concision | articulated with | articulated, and are | remarkable. | clear introduction, |
| | (logical sequencing, clear | exceptional clarity and | interesting. There is | Introduction, supporting | supporting details and |
| | transitions between points, | concision. Introduction, | sufficient detail to | details and/or summary | summary. Speaker has no |
| | introduction, supporting details | supporting details and | ascertain speaker's | may be too broad, too | credibility. |
| | and summary). | summary are clearly | authority, and | detailed or missing. | |
| | | evident and memorable, | presentation includes an | Credibility of the | |
| Communication Skills for Oral Reports | | and ascertain the | introduction and | speaker may be | |
| Of all Reports | | credibility of the | summary. | questionable at times. | |
| | | speaker. | | | |
| | Tailoring | Communication is | Communicator takes | Communicator takes | Communicator takes |
| | Communication: | skilfully crafted to suit | into consideration the | some consideration of | minimal or no |
| | Ability to use language | level of target audience | target audience and | the target audience and | consideration of the target |
| | that is appropriate for: | and is appropriate for | company/persons | company/persons | audience or |
| | (i) the target audience; | company/persons | represented. | represented. | company/persons |
| | (ii) The company/persons | represented. | Communication | Communication may still | represented. |
| | that the communicator is | | contains details and/or | contain some detail or | Communication may |
| | representing. | | technical content that | technical content that are | contain details or |

| | | are suitable for level of | unsuitable for level of | technical content that are |
|---------------------------------------|---|---------------------------------------|--|-----------------------------|
| | | target audience. | target audience. | unsuitable for level of |
| | | | | target audience. |
| Time Management: | Presentation fits | Presentation fits within | Presentation does not | Presentation is unsuitably |
| Ability to complete | perfectly within time | time constraint, though | quite fit within time | short or unreasonably long. |
| presentation in the time | constraint. | presenter might have to | constraint; presenter | |
| allocated. | | subtly rush or slow | has to rush or slow | |
| | | down. | down at end. | |
| Delivery (verbal): | Delivery makes the | Delivery makes the | Delivery makes the | Delivery detracts from |
| Ability to use diction, | presentation | presentation interesting. | presentation | the presentation. |
| enunciation, volume, pacing to | compelling. | | understandable. | |
| effectively deliver the presentation. | | | | |
| Delivery (non- | Excellent delivery: | Good delivery: | Has minor difficulties | Major difficulties with |
| verbal): Evidence of | Sustained and | Makes eye contact | with non-verbal | the non-verbal delivery |
| Preparation: Ability of | comfortable eye | · Can be heard easily | delivery of presentation:Effort to maintain eye | of the presentation. |
| presenter to: | contact | • Speaks comfortably | contact | • Sporadic or no eye |
| Speak easily with few aids | · Can be clearly heard | with some aids | At times difficult to | contact |
| (note cards/slides) | · Speaks confidently with | • Does not block screen | hear or understandMay overuse/underuse | • Hard to understand or |
| Control posture | few aids | · No distracting nervous | aids | hear |
| and gestures | • Does not block screen | habits | · At times hesitates, | • Uses aids excessively or |
| Position oneself | No distracting, nervous | • Speaker appears | makes mistakes, or loses place; | not at all |
| in relation to | habits | comfortable | presentation | • Reads from paper |
| audience, podium | Speaker is polished | | seems memorized | • Stands in front of screen |
| and slides | | | At times blocks screen Displays persons | • Nervous habits are |
| Control distractions | | | Displays nervous habits (pauses, | distracting (pauses, |
| (nervous habits, | | | tapping, "um-ing" | tapping, "um-ing" |
| stall words) | | | etc.) | etc.) |
| | | | Speaker appears | |

| Audience Rapport: | | | tentative | • Speaker appears |
|----------------------------------|---------------------------|------------------------|----------------------------|--------------------------------|
| Ability of presenter to: | | | | uncomfortable. |
| Sustain eye contact | | | | |
| Scan audience | | | | |
| Visual Aids: | Visual aids are | Visual aids are well | Visual aids are somewhat | Visual aids poorly designed |
| Ability to design, use and | skilfully/creatively | designed, used and | well designed, used and | (difficult to read; poor level |
| integrate visual aids (slides, | designed, skilfully used | integrated into the | integrated into the | of detail; missing captions |
| illustrations, props, | and seamlessly | presentation. The | presentation. The | or labels; misspelled |
| demonstrations) that effectively | integrated into the | presentation looks | presentation looks | words), and poorly |
| support and focus the | presentation. The | professional. | somewhat professional. | used/overused. The |
| presentation. | presentation looks | | | presentation looks |
| | polished and | | | unprofessional. |
| | professional. | | | |
| Appearance/Attire of | Professional appearance | Appearance/attire is | Appearance/attire is | Little or no |
| Presenter: | /attire that is well | appropriate for | not quite | consideration of |
| Ability to adopt an | suited for presentation. | presentation. | appropriate for the | appearance/attire |
| appearance/attire that is | | | presentation. | taken. |
| appropriate to the presentation. | | | | |
| Q & A with Audience: | Seamless transition from | Smooth transition from | Some ability to transition | Minimal or abrupt |
| Ability to transition from | presentation to Q & A. | presentation to Q & A. | from presentation to Q | transition from |
| presentation, listen to, answer | Skilfully manages and | Listens carefully and | & A. Understands most | presentation. May not |
| and manage questions from the | responds to questions; | responds courteously, | questions, responds | actively listen to questions, |
| audience. | gauges questioners' | knowledgeably and | somewhat | or provide knowledgeable |
| | understanding; is able to | clearly to questions. | knowledgeably and/or | answers, and/or may be |
| | clarify answers for | | somewhat succinctly. | unable to answer |
| | diverse audiences and | | | questions succinctly. |
| | objectives. | | | |

PO 9: Societal and Environmental Concern: Understand the impact of system solutions in a contemporary, global, economical, environmental, and

societal context for sustainable development.

| Focus Areas | Indicators | Level 4 | Level 3 | Level 2 | Level 1 |
|--------------------------|---------------------------|-----------------------------|-----------------------------|-----------------------------|---------------------------|
| Focus Areas | indicators | Strong | Competent | Developing | Needs Work |
| | Solutions for Societal | Identifies, explains and | Identifies and explains | Identifies some | Minimal or no ability |
| | and Environmental | evaluates multiple | multiple solutions to | solutions to challenges | to identifying solutions |
| | Challenges: Ability to | solutions to challenges | challenges in society | in society and the | to challenges in society |
| | identify solutions to | in society and the | and the environment. | environment. | and the environment. |
| | challenges in society | environment. | | | |
| | and the environment. | | | | |
| Impact of Engineering on | Personal and | Recognizes the | Recognizes the | Some recognition of the | Minimal or no recognition |
| Society and the | Collective | responsibility of engineers | responsibility of engineers | responsibility of engineers | of the responsibility of |
| Environment | Responsibility: | and evaluates the | and identifies the | and the consequences of | engineers and the |
| | Ability to recognize the | consequences of | consequences of | engineering interventions | consequences of |
| | individual and collective | engineering interventions | engineering interventions | on society and | engineering interventions |
| | responsibility of | on society and | on society and | environment. | on society and |
| | engineering and its | environment. | environment. | | environment. |
| | interventions on society | | | | |
| | and the environment. | | | | |

| PO 10: Individual and Team Work: Execute the project either individually or in a group exhibiting skills to achieve productive goals. | | | | | | |
|---|-------------------------|--------------------------|--------------------------|-------------------------|----------------------------|--|
| Focus Areas | Indicators | Level 4 | Level 3 | Level 2 | Level 1 | |
| rocus Arcas | | Strong | Competent | Developing | Needs Work | |
| | Individual Idea | Routinely contributes | Contributes useful | Sometimes contributes | Rarely contributes useful | |
| | Contributions: | useful ideas to advance | ideas to advance the | useful ideas to advance | ideas to advance the work | |
| | Ability to contribute | the work of team. | work of the team. | work of team. | of the team. | |
| | useful ideas to | | | | | |
| | advance work of | | | | | |
| | team. | | | | | |
| | Individual Work | Designated jobs are | Designated jobs are | Designated jobs are | Some designated jobs are | |
| | Contributions: | accomplished by | accomplished by | accomplished by | accomplished by | |
| | Ability to carry out | deadline; completed | deadline; completed | deadline; completed | deadline; completed work | |
| | individual | work is carefully and | work meets | work meets most | meets some requirements. | |
| | responsibilities. | meticulously prepared | requirements. | requirements. | | |
| Individual Contributions | | and meets all | | | | |
| Within a Team | | requirements. | | | | |
| | Individual Preparation | Thoroughly and | Prepared for team | Usually prepared for | Routinely fails to prepare | |
| | and/or Contribution to | carefully prepared for | meetings. Provides | team meetings. Provides | for team meetings. | |
| | Team Meetings: | team meetings. | contributions. | some contributions. | Provides little or no | |
| | Ability to prepare | Contributes by sharing | | | contributions. | |
| | and/or to contribute to | information and | | | | |
| | team meetings. | knowledge. | | | | |
| | Time Management: | Demonstrates the ability | Demonstrates the ability | Demonstrates | Demonstrates | |
| | Ability to manage time | to manage time, | to manage time, | some ability to | minimal or no | |
| | (estimate, prioritize, | including | including | manage time. | ability to manage | |
| | establish deadlines/ | communicating and/or | communicating and/or | | time. | |

| | milestones, follow | reacting and adapting to | reacting to changes. | | |
|-------------|-----------------------------|--------------------------|--------------------------|-------------------------|------------------------|
| | timeline, plan for | changes. | | | |
| | contingencies, adapt to | | | | |
| | change). | | | | |
| | Credit and | Shares credit and | Shares credit and | Sometimes shares credit | Has difficulty or does |
| | Accountability: | always accepts | accepts | and accepts | not share credit or |
| | Ability to share credit and | accountability. | accountability. | accountability. | accept accountability. |
| | accept accountability | | | | |
| | when working in a team. | | | | |
| | Leadership Skills: | Exemplifies leadership | Demonstrates leadership | Demonstrates some | Demonstrates |
| | Ability to lead a | skills. | skills. | leadership skills at | minimal or no |
| | team. (i) Mentors | | | times. | leadership skills. |
| | and accepts | | | | |
| | mentoring from | | | | |
| | others. | | | | |
| | (ii) Demonstrates | | | | |
| | capacity for initiative | | | | |
| Team Skills | while respecting others' | | | | |
| | roles. (iii) Facilitates | | | | |
| | others' | | | | |
| | Involvement. (iv) | | | | |
| | Evaluates team | | | | |
| | effectiveness and plans | | | | |
| | for improvements. | | | | |
| | Working with Others: | Skilfully listens to, | Listens to, collaborates | Sometimes listens to, | Rarely listens to, |
| | Ability to listen to, | collaborates with, and | with, and champions | collaborates with, and | collaborates with, or |

| collaborate with, and | champions the efforts | the efforts of others. | champions others' | champions others' |
|-------------------------|---------------------------|---------------------------|------------------------|--------------------------|
| champion the efforts of | of others. | | efforts. | efforts. |
| others. | | | | |
| Promoting Positive | Always upholds and | Promotes a constructive | Sometimes promotes a | Rarely supports a |
| Team Atmosphere: | promotes a constructive | team atmosphere by | constructive team | constructive team |
| Ability to foster a | team atmosphere by | exhibiting courtesy, | atmosphere by | climate with regards to |
| positive and productive | exhibiting courtesy, | respect and a positive | exhibiting courtesy, | courtesy, respect, |
| team atmosphere and | respect and a positive | attitude, and by offering | respect and a positive | attitude, motivation |
| keep team members | attitude, and by offering | motivation and | attitude, and offering | and assistance. Does |
| working together. | motivation and | assistance. Tries to keep | motivation and | not try to keep people |
| (i) Is courteous and | assistance. Works | people working together. | assistance. At times | working together. |
| respectful with team | tirelessly to try to keep | | tries to keep people | |
| members; (ii) | people working well | | working together. | |
| Demonstrates a positive | together. | | | |
| attitude using verbal | | | | |
| and non-verbal cues, | | | | |
| and tone. | | | | |
| (iii) Inspires team | | | | |
| members; (iv) Helps | | | | |
| and encourages team | | | | |
| members. | | | | |
| Addresses Conflict: | Identifies and responds | Identifies and responds | Sometimes identifies | Rarely identifies and/or |
| Ability to identify, | to negative conflict in a | to negative conflict, and | conflict and tries to | addresses conflict. |
| respond to and | prompt and helpful | is able to mediate it. | manage it. | |
| resolve potentially | manner. Fortifies team | | | |
| damaging conflict | relations and | | | |

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| among team | productivity through | | | |
|------------------------|--------------------------|--------------------------|---------------------------|-------------------------|
| members. | skilful conflict | | | |
| | mediation. | | | |
| Management of | Has great appreciation | Has appreciation for and | Has some appreciation | Has no appreciation for |
| Multidisciplinary | for and understanding of | understanding of | for and understanding | or understanding of |
| Teams: | disciplines outside of | disciplines outside of | of disciplines outside of | disciplines outside of |
| Ability to appreciate, | own. Works profitably | own. Works effectively | own, but works less | own. Is unable to work |
| understand and work | with multidisciplinary | with multidisciplinary | effectively with | effectively with |
| with multidisciplinary | team members. | team members. | multidisciplinary team | multidisciplinary team |
| team members. | | | members. | members. |