# **Deakin Learning Futures AGENDA 2020 Stage 2: Assessment and Learning Design**

# **COURSE LEARNING OUTCOMES AND MINIMUM STANDARDS: BACHELOR OF ENGINEERING (MECHANICAL)**

# **(Bachelor Honours, AQF level 8)**



* 1. Course Learning Outcomes & min stds (incorporating Deakin Graduate Learning Outcomes and AQF specifications)
	– Honours (AQF 8) BACHELOR OF ENGINEERING (MECHANICAL)

\* The text under the 2nd and 3rd columns is taken directly from the Australian Qualifications Framework (AQF) Second Edition January 2013 ([www.aqf.edu.au](http://www.aqf.edu.au/PoliciesPublications/tabid/196/Default.aspx)).
In relation to each of the Deakin Graduate Learning Outcomes (GLO), the full text from the AQF is reproduced. However, some concepts from the AQF specifications may not apply to a particular GLO – in these cases, they have placed in parentheses.

| **Deakin Graduate Learning Outcomes** | **AQF Honours Descriptor\*** | **AQF Level 8 (Honours) Criteria (Standards)\*** | **Discipline/ Professional Standards** (e.g. professional association) | **Course Learning Outcomes (CLOs)** | **Minimum Standards (relating to CLOs)**Note: ensure at appropriate AQF specifications and criteria (see columns 2 & 3) |
| --- | --- | --- | --- | --- | --- |
| **1.** **Discipline-specific knowledge and capabilities**: appropriate to the level of study related to a discipline or profession. |  | Knowledge: A coherent and advanced knowledge of the underlying principles and concepts in one or more disciplines and knowledge of research principlies and methods.Skills: * cognitive and technical skills to demonstrate a broad understanding of a body of knowledge and theoretical concepts with advanced understanding in some areas
* technical skills to design and use research in a project.

Application of knowledge and skills: will demonstrate the application of knowledge and skills:* with initiative and judgement in professional practice and/or scholarship
* to adapt knowledge and skills in diverse contexts

to plan and execute project work and/or a piece of research and scholarship with some independence  | Knowledge: advanced theoretical and technical knowledge in one or more disciplines or areas of practice.Application of knowledge and skills: will apply knowledge and skills to demonstrate autonomy, well-developed adaptability and responsibility as a practitioner or learner. | *Engineering …*EA1.1: Comprehensive theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline.EA1.2: Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline.EA1.5: Knowledge of contextual factors impacting the engineering discipline.EA1.4: Discernment of knowledge development and research directions within the engineering discipline. EA2.1: Application of established engineering methods to complex engineering problem solving.EA2.2: Fluent application of engineering techniques, tools and resources.EA2.3: Application of systematic engineering synthesis and design processes.EA2.4: Application of systematic approaches to the conduct and management of engineering projects.- - - - - - - - - - - - - - - - - - - - - - - -*Selected Engineering discipline (Mechanical Engineering) …*EA1.3: In-depth understanding of specialist bodies of knowledge within the selected engineering discipline.EA1.6: Understanding the scope, principles, norm, accountabilities and bounds of contemporary engineering practice in the selected discipline. | *Graduates of a Bachelor of Engineering (Mechanical Engineering) can:*CLO1.1 Demonstrate a comprehensive theory based understanding of engineering fundamentals and underpinning concepts in the natural and physical sciences.CLO1.2 Demonstrate an understanding of the concepts and application of mathematics, numerical analyses, statistics and information technology in the context of engineering principles and practice.CLO1.3 Demonstrate knowledge of contextual factors that impact on engineering including; * Sustainability
* Management
* Economics
* Project management

CLO1.4 Demonstrate fluent and systematic application of established engineering techniques, tools, resources and processes and, where appropriate, research principles and methods in:* Solving complex and ill-defined problems
* Syntheses and design for appropriate formulation of engineering solutions
* Effective and appropriate professional conduct and management of engineering projects

- - - - - - - - - - - - - - - - - - - - - - - -*Selected Engineering discipline (Mechanical Engineering) …*CLO1.5 Demonstrate in-depth understanding of specialist knowledge, contemporary engineering practice and current research directions within the discipline of mechanical engineering. | *Graduates at this level will:*MS1.1 Apply advanced theoretical and technical knowledge and contextual factors to complex engineering systemsMS1.2 Apply advanced knowledge and skills in mathematics, numerical analysis, statistics and IT in engineering practice. MS 1.3, 1.4 Apply advanced cognitive skills including research skills where appropriate, to review, analyse, consolidate and synthesize knowledge to identify and provide solutions to open ended engineering problems that take into account contextual factors (including sustainability, management, economics and project management) and demonstrate well-developed adaptability, autonomy and responsibility.- - - - - - - - - - - - - - - - - - - - - - - - - -MS 1.5 Demonstrate coherent and advanced knowledge of the underlying principles with advanced understanding in the Mechanical Field |
| **2.**  **Communication**: using oral, written and interpersonal communication to inform, motivate and effect change. |  | Skills: communication skills to present a clear and coherent exposition of knowledge and ideas to a variety of audiences.Application of knowledge and skills: will demonstrate the application of knowledge and skills:* to adapt knowledge and skills is diverse contexts
 | Skills: advanced cognitive, technical and communication skills to select and apply methods and technologies to:* analyse, generate and transmit solutions to complex problems

transmit knowledge, skills and ideas to others. | EA3.2: Effective oral and written communication in professional and lay domains.EA3.4: Professional use and management of information. | CLO2.1 Communicate effectively in a range of contexts using oral, written, graphical and interpersonal communication to professional, non-professional and lay audiences. | MS2.1 Select, organise and clearly and coherently transmit knowledge, skills and ideas to engineering and non-engineering audiences using skilful use of English language including important conventions within the engineering discipline to professional and non-professional audiences. |
| **3.** **Digital literacy**: using technologies to find, use and disseminate information. |  | Skills: * cognitive and technical skills to demonstrate a broad understanding of knowledge and theretical concepts with advanced understanding in some areas
* technical skills to design and use research in a project
* communication skills to present and clear and coherent exposition of knowledge and ideas to a to a variety of audiences

Application of knowledge and skills: will demonstrate the application of knowledge and skills:* to adapt (knowledge and) skills in diverse contexts
 | Skills: advanced cognitive, technical and communication skills to select and apply methods and technologies to:* analyse critically, evaluate and transform information to complete a range of activities
* analyse, generate and transmit solutions to complex problems
* transmit knowledge, skills and ideas to others.
 | EA3.4: Professional use and management of information. | CLO3.1 Utilise a range of digital technologies and information sources to discover, select, analyse, employ, evaluate, and disseminate both technical and non-technical information  | MS3.1 Independently, effectively select and apply advanced search strategies and a range of appropriate tools to facilitate information management and knowledge transfer in an Engineering context. |
| **4.** **Critical thinking**: evaluating information using critical and analytical thinking and judgment. |  | Skills: * cognitive skills to review, analyse, consolidate, and synthesise knowledge and identify and provide solutions to complex problems with intellectual independence
* cognitive and technical skills to demonstrate a broad understanding of knowledge and theretical concepts with advanced understanding in some areas

cognitive skills to exercise critical thinking and judgement and developing a new understandingApplication of knowledge and skills: will demonstrate the application of knowledge and skills:* with initiative and judgement in professional practice and/or scholarship
* to adapt knowledge and skills in diverse contexts

plan and execute project work and/or a piece of research and scholarship with some independence.. | Skills: advanced cognitive, (technical and communication) skills to select and apply methods and technologies to:* analyse critically, evaluate and transform information to complete a range of activities

analyse, generate and transmit solutions to complex problems.Application of knowledge and skills: apply knowledge and skills to demonstrate autonomy, well-developed judgement, adaptability and responsibility as a practitioner or learner. | EA2.2: Fluent application of engineering techniques, tools and resources.EA2.3: Application of systematic engineering synthesis and design processes.EA2.4: Application of systematic approaches to the conduct and management of engineering projects. | CLO4.1 Use critical and analytical thinking and judgment in;* Evaluating data and information
* Integrating knowledge to develop new understanding and/or formulate appropriate engineering design solutions and manage their implementation, operation and delivery ensuring sustainable solutions
 | MS4.1 Independently analyse critically, reflect on and synthesise complex information, concepts and theories,.Identify problems, analyse user requirements and propose solutions that are sustainable . |
| **5.**  **Problem solving**: creating solutions to authentic (real world and ill-defined) problems. |  | Skills: * cognitive skills to review, analyse, consolidate, and synthesise knowledge and identify and provide solutions to complex problems with intellectual independence
* cognitive skills to exercise critical thinking and judgement in developing new understanding

technical skills to design and use research in a project.Application of knowledge and skills: will demonstrate the application of knowledge and skills:* with initiative and judgement inprofessional practice and/or scholarship
* to adapt knowledge and skills in diverse contexts

plan and execute project work and/or a piece of research and scholarship with some independence. | Skills: advanced cognitive, technical (and communication) skills to select and apply methods and technologies to:* analyse critically, evaluate and transform information to complete a range of activities

analyse, generated and transmit solutions to complex problems.Application of knowledge and skills: apply knowledge and skills to demonstrate autonomy, well-developed judgement, adaptability and responsibility as a practitioner or learner. | EA2.1: Application of established engineering methods to complex engineering problem solving.EA3.3: Creative, innovative and proactive behaviour. | CLO5.1 Apply creative, innovative and proactive approaches to complex engineering problems and projects.CLO5.2 Plan and execute a research based project, professional project and/or piece of scholarship. | MS5.1 Demonstrate intellectual independence with creativity and proactivity designing innovative solutions to complex engineering problems and projects, using well-developed judgement and consideration of potential contextual factors (such as sustainability).MS5.2 Autonomously plan, conduct and evaluate a research based project, professional project and/or piece of scholarship that is of high quality and adheres to engineering research principles and protocols (including ethical considerations). |
| **6.** **Self-management**: working and learning independently, and taking responsibility for personal actions. |  | Skills: cognitive and creative skills to exercise critical thinking and judgement in identifying and solving problems with intellectual independenceApplication of knowledge and skills: will demonstrate the application of knowledge and skills:with responsibility and accountability for own learning and practice and in collaboration with others within broad parameters. | Application of knowledge and skills: apply knowledge and skills to demonstrate autonomy, well-developed judgement, adaptability and responsibility as a practitioner or learner. | EA3.1: Ethical conduct and professional accountability.EA3.3: Creative, innovative and proactive behaviour.EA3.5: Orderly management of self and professional conduct. | CLO6.1 Demonstrate self-management through professional and ethical conduct, and identification and planning of future learning needs. | MS6.1 Demonstrate a high level of professionalism, consistently applying professional engineering standards with a high level of responsibility and accountability to colleagues and relevant stakeholders and a consistent commitment to continual professional development. |
| **7.** **Teamwork**: working and learning with others from different disciplines and backgrounds. |  | Application of knowledge and skills: will demonstrate the application of knowledge and skills:* with responsibility and accountability for own learning and practice and in collaboration with others within broad parameters.
 | The AQF is silent on this. | EA3.6: Effective team membership and team leadership.EA3.3: Creative, innovative and proactive behaviour. | CLO7.1 Demonstrate effective team membership and team leadership through creative, innovative and proactive behaviour. | MS7.1 Work effectively and collaboratively, demonstrating advanced level of responsibility and accountability in different roles in engineering teams. |
| **8.** **Global citizenship:** engaging ethically and productively in the professional context and with diverse communities and cultures in a global context. |  | Application of knowledge and skills: will demonstrate the application of knowledge and skills:* with responsibility and accountability for own learning and practice and in collaboration with others within broad parameters.

(Note: the AQF descriptor does not relate specifically and directly to global citizenship, however the above mentioned may be indirectly related to engagement within a professional context and/or within diverse communities and cultures by way of its link to responsibility and accountability in collaboration with others).  | Application of knowledge and skills: apply knowledge and skills to demonstrate autonomy, well-developed judgement, adaptability and responsibility as a practitioner or learner.(Note: the AQF criteria for Level 8 do not relate specifically and directly to global citizenship, however the above mentioned criteria may be indirectly related to ethical engagement via the reference to ‘responsibility’.)  | EA3.1: Ethical conduct and professional accountabilityEA3.5: Orderly management of self and professional conduct. | CLO8.1 Demonstrate ability to function effectively as an international engineer. | MS8.1 Demonstrate an advanced ability to consider and address global and community perspectives in engineering projects. |