

NZDE Mechanical Engineering Courses

| Course Code | Course Name | Learning Outcomes |
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| Compulsory | | |
| DE4101 | Engineering Fundamentals | <ol style="list-style-type: none"> 1. Demonstrate an understanding of, and apply, the fundamentals of statics, dynamics and mechanical energy concepts. 2. Evaluate direct stress and strain, and derive elastic properties from tensile test results. 3. Demonstrate an understanding of the engineering properties of fluids and apply the fundamentals of hydrostatics. 4. Demonstrate an understanding of electrical voltage, current and resistance and explain the difference between AC and DC. 5. Demonstrate awareness of the New Zealand Electricity system and describe some of its safety features. 6. Demonstrate an understanding of heat energy and transfer; temperature and humidity of air |
| DE4102 | Engineering Mathematics | <ol style="list-style-type: none"> 1. Manipulate and solve algebraic expressions and equations. 2. Solve, manipulate, and apply mathematical functions, including application of graphs where appropriate. 3. Apply the rules and principles of trigonometry using both degree and radian measure. 4. Demonstrate knowledge of differentiation and integration techniques and apply them to solve engineering problems. 5. Demonstrate knowledge and application of one of the following: <ol style="list-style-type: none"> 5.1 Complex numbers, logic expressions and numbers OR 5.2 Basic statistical concepts and techniques |
| DE4103 | Technical Literacy | <ol style="list-style-type: none"> 1. Utilise information obtained from physical or web based resources in technical problem solving and presentations. 2. Prepare and deliver an oral presentation on a technical subject. 3. Communicate ideas and technical findings in a written format. 4. Create and use pictorial sketches and pictorial/orthographic drawings to current drawing standards as a communication technique to present ideas and data. 5. Demonstrate interpersonal communication skills to develop project outcomes. |
| DE3301 | Engineering Practice | <ol style="list-style-type: none"> 1. Operate safely in an engineering environment and explain the safety |

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| | | <p>requirement required by the appropriate regulations.</p> <p>2. Operate mechanical engineering equipment.</p> |
| DE4301 | Engineering CAD | <p>1. Demonstrate correct draughting practice and the use of different views and projections.</p> <p>2. Produce working drawings including projections, perspective, sectional and assemble views.</p> <p>3. Produce 3D models of parts and assemblies, and output final drawings.</p> <p>4. Explain the CAD/CAM manufacturing process.</p> |
| DE4302 | Mechanics | <p>1. Demonstrate the correct use of analysing forces and moments in mechanical systems.</p> <p>2. Calculate indirect stresses (bending and torsion) in mechanical components and select appropriate sections from standard tables.</p> <p>3. Demonstrate an understanding of energy in mechanical system, including the Conservation of energy theory.</p> <p>4. Demonstrate an understanding of the forces, moments and torques resulting from linear acceleration, rotational acceleration, and centripetal acceleration.</p> |
| DE5301 | Thermodynamics & Heat Transfer | <p>1. Analyse thermodynamics principals for temperature, pressure, gas laws, thermal expansion, conservation of energy, change of phase, heating and thermal efficiency.</p> <p>2. Apply thermodynamics principals to practical applications for refrigeration, heat exchanger, and solar collectors.</p> <p>3. Calculate rates of heat transfer through multiple layers and combined modes.</p> <p>4. Evaluate and compare the sources of energy in NZ including sustainability concepts.</p> |
| DE4303 | Material Properties | <p>1. Demonstrate an understanding of basic materials science chemistry.</p> <p>2. Describe and test properties of materials used in mechanical engineering.</p> <p>3. Describe and specify methods to change engineering material properties.</p> <p>4. Demonstrate an understanding of selection criteria for engineering materials.</p> <p>5. Explain the likely causes of material failure.</p> |
| DE6301 | Fluid Mechanics | <p>1. Analyse and generate solutions using the basic principles of fluid mechanics.</p> <p>2. Describe and assess hydrostatic fluid applications.</p> <p>3. Describe and assess hydrodynamic fluid applications.</p> <p>4. Evaluate the requirements for fluid machinery.</p> |

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| | | 5. Produce fluid power systems (pneumatic and hydraulic) to meet operational requirements. |
| DE5302 | Strength of Materials | <ol style="list-style-type: none"> 1. Evaluate complex states of stress and the effects of dynamic loadings on a mechanical system. 2. Design jointing systems. 3. Analyse beam failure modes and calculate deflections and shear stresses. 4. Calculate failure loads for concentrically loaded columns. |
| DE5303 | Manufacturing Processes | <ol style="list-style-type: none"> 1. Select mechanical engineering manufacturing processes for products. 2. Select equipment and tooling to support mechanical engineering manufacturing processes. 3. Assess an existing manufacturing process. |
| DE5304 | Electrical Fundamentals | <ol style="list-style-type: none"> 1. Demonstrate an understanding of the electrical principles commonly required by mechanical engineers relating to DC, AC, and safety. 2. Demonstrate an understanding of electrical and electronic components relating to Amplifiers, rectifiers, transducers, DC motors, AC motors. 3. Demonstrate an understanding of electrical and electronic control systems. |
| DE6102 | Engineering Project | <ol style="list-style-type: none"> 1. Develop preliminary design(s), based on a given specification, for an engineering project relevant to their strand (Civil, Mechanical, Electrical, Electronics, Fire). 2. Develop a plan or design parameters considering functionality, safety, environmental, cultural and ethical issues. 3. Undertake well-defined planning and produce as project output. 4. Produce supporting documentation relevant to project output. 5. Evaluate compliance of the project output against specification. 6. Present findings to an audience in a professional manner. |
| DE6101 | Engineering Management | <ol style="list-style-type: none"> 1. Identify the parties involved in an engineering project and evaluate the roles and responsibilities that each has. 2. Apply the fundamentals of project management to a well-defined engineering project. 3. Appraise the procurement process, evaluate contract documentation and prepare cost |

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| | | <p>estimates for a well-defined engineering project.</p> <p>4. Demonstrate how to administer and supervise projects, contracts and engineering works in accordance with the relevant standards and/or codes of practice.</p> <p>5. Critically evaluate professional practice principles and their application to an engineering environment.</p> |
| Electives (4 selected) | | |
| DE6302 | Mechanics of Machines | <p>1. Identify dynamic loads in rotational equipment and explain the need for balance and how it is achieved.</p> <p>2. Analyse mechanical systems to determine natural frequencies and the effects of resonance.</p> <p>3. Explain acoustic term and solve for noise level and noise attenuation in an engineering environment.</p> <p>4. Explain gear terminology. Solve velocity ratios and forces in gear systems.</p> <p>5. Analyse power transmission components for life, force, and application.</p> |
| DE6308 | Strength of Materials 2 | <p>1. Apply strengths of materials theory to complicated engineering applications.</p> <p>2. Design beams in steel, timber and concrete and determine deflections for complex loading situations.</p> <p>3. Design pressure cylinder application.</p> <p>4. Calculate the failure load for eccentrically loaded columns.</p> <p>5. Design plate application.</p> <p>6. Design springs and determine operations stresses and deflections.</p> <p>7. Select and apply relevant design codes.</p> |
| DE309 | Advanced Thermodynamics | <p>1. Select and apply appropriate laws of thermodynamics.</p> <p>2. Analyse common engine cycles and explain their operation and their effects on the environment.</p> <p>3. Analyse air compressors, nozzles, Steam plant, energy conservation plant/principles</p> <p>4. Analyse refrigeration/heat pump cycles.</p> <p>5. Outline HVAC system operation and equipment and determine heating, cooling and dehumidifying loads.</p> <p>6. Determine air/fuel ratios and exhaust analysis for common fuels and describe their handling requirements.</p> |

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| DE6315 | Fluid Power | <ol style="list-style-type: none"> 1. Identify fluid power equipment. 2. Describe the operation and construction of fluid power. 3. Analyse multi-actuator fluid power systems to describe application. 4. Design and draw multi-actuator fluid power systems. 5. Construct a multi-actuator fluid power system. 6. Design a Fluids Power distribution system. |
| DE6419 | Maintenance Engineering Management | <ol style="list-style-type: none"> 1. Describe modern maintenance philosophies and their alignment with maintenance business goals. 2. Describe maintenance strategies and their selection. 3. Distinguish between, and select appropriate maintenance methodologies. 4. Relate the need for well-developed planning and scheduling as part of the overall maintenance function. 5. Justify maintenance improvements 6. Develop a maintenance improvement strategy or plan. |