

Module Specification

Module Summary Information

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| 1 | Module Title | Advanced Dynamics |
| 2 | Module Credits | 20 |
| 3 | Module Level | 7 |
| 4 | Module Code | ENG7150 |

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| 5 | Module Overview |
| <p>The Automotive and Mechanical Engineering programmes share the common philosophy of one which aims to provide engineers with a rigorous grounding in industrial standard design, analysis and simulation capability. This module is consistent with this approach since it directly includes content and resources that specifically help you meet these needs.</p> <p>A principal aim of both programmes is to respond to the market need for engineers who are competent and skilled in the use of advanced computer modelling and simulation techniques. This module delivers against this aim, providing you with a thorough technology grounding supported by directly relevant design, simulation and analysis experiences.</p> | |

| 6 | Indicative Content | | | | | | | | | | | | | | | | | | | | | | | | |
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| | <table border="1"> <thead> <tr> <th>Lecture Topics</th> <th>Tutorial and Post-session Activity</th> </tr> </thead> <tbody> <tr> <td>Single degree of freedom systems</td> <td>Dynamics - Simulation Software – pendulum Worked Examples- complimentary function</td> </tr> <tr> <td>Response of system to Excitation</td> <td>Simulation Software/ Worked Examples - particular integral solution</td> </tr> <tr> <td>Mechanisms</td> <td>Simulation Software and worked examples – fixed length mechanisms</td> </tr> <tr> <td>Mechanisms</td> <td>Simulation Software and worked examples – variable length mechanisms (quick return)</td> </tr> <tr> <td>Engine dynamics</td> <td>Simulation Software – single and multi-cylinder</td> </tr> <tr> <td>2 degree of freedom systems</td> <td>Worked Examples – natural frequencies and associated mode shapes.</td> </tr> <tr> <td>Geared Systems</td> <td>Simulation Techniques - use of industrial standard software (eigenvalues and eigenvectors)</td> </tr> <tr> <td>Multi-degree of freedom systems</td> <td>Worked Examples – use of coupled simultaneous equations.</td> </tr> <tr> <td>Natural frequencies of beams</td> <td>Beam vibration equations. Simulation Software – value example.</td> </tr> <tr> <td>Natural frequencies of beams</td> <td>Worked Examples – Dunkerley's and Energy methods</td> </tr> <tr> <td>Whirling of shafts</td> <td>Natural frequency and deflection response.</td> </tr> </tbody> </table> | Lecture Topics | Tutorial and Post-session Activity | Single degree of freedom systems | Dynamics - Simulation Software – pendulum Worked Examples- complimentary function | Response of system to Excitation | Simulation Software/ Worked Examples - particular integral solution | Mechanisms | Simulation Software and worked examples – fixed length mechanisms | Mechanisms | Simulation Software and worked examples – variable length mechanisms (quick return) | Engine dynamics | Simulation Software – single and multi-cylinder | 2 degree of freedom systems | Worked Examples – natural frequencies and associated mode shapes. | Geared Systems | Simulation Techniques - use of industrial standard software (eigenvalues and eigenvectors) | Multi-degree of freedom systems | Worked Examples – use of coupled simultaneous equations. | Natural frequencies of beams | Beam vibration equations. Simulation Software – value example. | Natural frequencies of beams | Worked Examples – Dunkerley's and Energy methods | Whirling of shafts | Natural frequency and deflection response. |
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| Whirling of shafts | Natural frequency and deflection response. | | | | | | | | | | | | | | | | | | | | | | | | |

| 7 | | Module Learning Outcomes |
|--|----------|--|
| On successful completion of the module, students will be able to: | | |
| | 1 | Critically appraise the use of new and emerging technologies and their impact on the design and manufacture of components. |
| | 2 | Model and analyse vibrations in solids and develop simulation models for the purposes of the control of dynamic systems. |
| | 3 | Develop and evaluate linear dynamic models of automotive and mechanical components. |

| 8 | | Module Assessment | | |
|-------------------------|--|--------------------------|-------------|------------------|
| Learning Outcome | | Coursework | Exam | In-Person |
| 1 – 3 | | | X | |

| 9 | | Breakdown Learning and Teaching Activities | |
|--|--|---|--|
| Learning Activities | | Hours | |
| Scheduled Learning (SL) includes lectures, practical classes and workshops, peer group learning, Graduate+, as specified in timetable | | 36 | |
| Directed Learning (DL) includes placements, work-based learning, external visits, on-line activity, Graduate+, peer learning, as directed on VLE | | 0 | |
| Private Study (PS) includes preparation for exams | | 164 | |
| Total Study Hours: | | 200 | |