•MLO1. Apply knowledge and understanding of scientific principles and methodology related to solving w

Northumbria University Programme Framework for Northumbria Awards - Module Specification

Faculty	Engineering and Environment	**Department**		BEng (Hons) Mechanical Engineering (Manufacturing Systems and Design)	**Subject**		**Module Tutor**	Dong Young JANG			
Module Title	Design of Machine Element						**Module Code**	MSDE 323			
Module Type* *(see key below)*	Choose an item.										
Module size credits	**Level 3:**		**Level 4:**		**Level 5:**	**10**	**Level 6:**		**Level 7:**		
Home programme/s for which the module is designed				BEng (Hons) Mechanical Engineering (Manufacturing Systems and Design)				**Code/s**			
Additional Programme/s other than that/those for which the module for specifically designed								**Code/s**			
Delivery Pattern (Please tick)		**Semester based** *(please specify)*		Sem 1 ☒ Sem 2 ☐	**Year Long**		☐	**Full-time** **Part-time** **Distance Learning**		☒ ☐ ☐	
Location(s) of delivery: If delivered at EPWO partners please give partner name and location											

KEY:

APL	*Accreditation for prior learning*	*P/F*	*Pass/fail module*	*PLIN*	*Placement - Industrial*
CORE	*PNVQ core skills module*	*P/F_DS*	*Pass/fail dissertation module*	*PRAC*	*Practical*
DISS	*Dissertation*	*P/F_PJ*	*Pass/fail project module*	*PROJ*	*Project*
FLDW	*Fieldwork*	*P/F_PL*	*Pass/fail placement module*	*STAN*	*Standard module*
INDS	*Independent study*	*PLAY*	*Placement – academic study abroad FT*	*WKBS*	*Work base study*
MAFOUN	*MA foundation modules - ASS*	*PLCL*	*Placement – Clinical*	*WORK*	*Workshop*

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Module Overview (Max 250 words per section) (This section is aimed at providing a prospective or current student with a brief overview of the module in answer to the specific questions and will form an element of the module handbook)

What will I learn on this module? (SRS 0001) Please give a brief indication of the content of the module including the main topic / subject areas studied
This is the first course that presents mechanical engineering students with design challenges rather than set-piece problems. To understand dynamics, statics, physics of operations, and structural details of machine elements is necessary to build machinery that works safely, reliably, and well by satisfying constrains of material strength and fatigue life.
How will I learn on this module? (SRS 0002) Please provide a brief overview the learning and teaching approaches the student can expect to experience.
This module will be delivered by regular lectures, and during the lectures, students will have opportunities to review mechanics, material technology, solid mechanics, thermodynamics, and fluid mechanics. In the regular tests, they practice their learning of design by solving the actual mechanical problems. Through open ended projects, they have a chance to prove their learning and design methodology in the design of practical mechanical systems.
How will I be supported academically on this module? (SRS 0003) Please provide a brief overview of the academic support available to students, including any support that may be accessed outside formal scheduled teaching.
During your active learning sessions, academic support will be available to facilitate your exploration of the problem-solving activities. Formative feedback will be provided by the module team, including answering student queries and providing guidance concerning the module such as assessments and your academic progress. The electronic learning platform (eLP) provides a comprehensive resource for integrated learning incorporating learning materials and reading lists that will facilitate directed and self-directed learning. Contact with academic tutors and your peers outside formal teaching hours is encouraged through dedicated 'office hours', discussion boards and messaging systems within the eLP. Professional support staff provide the first point of contact for a range of queries, including, for example, those concerning assessment submission, late submission/extensions, and other administrative issues.
What will I be expected to read on this module? (SRS 0004) All modules at Northumbria include a range of reading materials that students are expected to engage with. The reading list for this module can be found at: http://readinglists.northumbria.ac.uk (Reading List service online guide for academic staff, this contains contact details for the Reading List team – http://library.northumbria.ac.uk/readinglists)

Northumbria University Library Reading List Service (please confirm the following)	**Please give date added**
A draft reading list has been created and on the university Library Reading List Service	Click here to enter a date.
Reading material has been acquired and digitised (following approval)	Click here to enter a date.
Reading list has been published to students (for module delivery)	Click here to enter a date.

NB – for PFNA alignment process only, module authors should complete either the University Library e-Reading List, or Appendix 1.

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Module Learning Outcomes (MLOs) *(Max of five in total*, for standard 20-credit modules)*

**this can increase to a maximum of 10, for modules with more than 20 credits*

What will I be expected to achieve? (SRS 0005)	**How will I be assessed?** (SRS 0006) *Please give details of all formative and summative assessment process indicating which MLOs will be addressed and how feedback will be provided.*	**Programme (Level) Learning Outcomes that this module contributes to:** *[Please insert PLO number as listed on the programme specification]*
• C2: Analyse complex problems to reach substantiated conclusions using first principles of mathematics, statistics, natural science and engineering principles. • C6: Apply an integrated or systems approach to the solution of complex problems. • C13: Select and apply appropriate materials, equipment, engineering technologies and processes, recognising their limitations. • C16: Function effectively as an individual, and as a member or leader of a team.	**Formative Assessment** Academic staff on the module will assess you in a formative manner to help build your confidence and highlight any misunderstandings you may have of the theoretical and professional concepts presented in the module. Your formative feedback will be given to you either verbally by academic staff on the module during formally scheduled teaching sessions. Your formative feedback aims to help you learn and prepare for the submission of your summative assessment. **Summative Assessment** Academic staff on the module will assess you in a summative manner by three pieces of assessment: Component 1, one mid-term in-class examination, is to assess your knowledge and understanding mechanical design of machine elements (C2 & C6). Component 2, an open ended design, is used to evaluate your ability to apply creativity and knowledge of design to analyse and design of undefined mechanical systems (C13 & C16)	**Knowledge & Understanding:** • KU1: Evaluate and apply complex knowledge of the scientific and mathematical principles of engineering to solve Real-World problems. • KU2: Perform advanced analysis of unfamiliar engineering systems. • KU3. Identify and utilise advanced methodologies to create solutions to a variety of engineering problems. **Intellectual / Professional skills & abilities:** • IPSA4: Ability to create innovative, sustainable critically evaluated solutions to complex engineering problems. • IPSA5. Demonstrate the ability to solve advanced design problems and apply advanced manufacturing systems **Personal Values Attributes** (Global / Cultural awareness, Ethics, Curiosity) (PVA): • PVA2. Critically analyse advanced solutions to complex engineering problems.

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Pre-requisite(s) (SRS 0007) Any module which must already have been taken, or any stipulated level of prior knowledge required in order to study this module, (co-requisite core models need not be listed	MSDE 216 Energy Studies MSDE 218 Mechanics of Materials MSDE 225 Creative Design
Co-requisite(s) (SRS 0008) Modules at this level which must be taken with this module	N/A

Module abstract (SRS 0009)

Please provide a brief a brief abstract of the module (150 words max). This section acts as the 'shop window' for the module, therefore it needs to engage and inspire the student. This is the first thing that the student will read about this module, so it must immediately grab their attention. The main aim is to encourage the student to read on, however the summary should be written in such a way that if the student reads nothing else this section will convey all key messages and benefits that the module will offer. Start by explaining the module title where necessary. Then highlight any selling points relating to the four pillars: Research-Rich Learning; Technology Enhanced Learning; Assessment and Feedback; Employability and Entrepreneurship. Examples may include student satisfaction rates, learning environment, state-of-the-art facilities etc. Finally indicate benefits of the module such as the key skills that the students will gain for future employment and career paths that are open to them.
This is the design course to integrate totally mechanical engineering subjects. This module presents mechanical engineering students with design challenges rather than set-piece problems. To understand dynamics, statics, physics of operations, and structural details of machine elements is necessary to build machinery that works safely, reliably, and well by satisfying constrains of material strength and fatigue life.

Programme Framework for Northumbria Awards Research Rich Learning Design Pillar (SRS 0090)

Embedding Research Rich Learning into the curriculum: Indicate how students will be actively engaged in research rich learning in this module through: research/enquiry based learning, research tutored learning, research led learning and/or research oriented learning, providing a brief overview of how this / these will feature within the delivery of the module (250 words max) **Note:** • **Research/enquiry Based:** L&T Based on student-centred enquiry and research activities (conducting research). • **Research Tutored**: L&T Emphasises learning focused on students actively discussing research, and critically engaging with research outputs • **Research Led**: T&L structured around subject content and that content is based on the research (learning about research) • **Research Orientated:** T&L Emphasises understanding of the knowledge production process, and methods of enquiry in the subject (learning how to research)
As research may be described as creating and finding new knowledge or using new knowledge to reach and support decisions, your investigation will draw upon all four modes of Research Rich Learning. This may be through the use of existing knowledge to define and plan your Open ended Design project; understanding new knowledge is created in your discipline area; creating new knowledge during your Open ended Design project and practical works; developing your skills of enquiry, practical working, data analysis, prototyping, etc.; and presenting and documenting the results of your process of knowledge creation.

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Notional Student Workload (NSW) for each mode of delivery

Complete for each delivery mode where the distribution of NSW **Full Time Mode of Delivery**				**Part Time Mode of Delivery**			
Activity type	**Hours**	KIS category	KIS category hours		**Hours**	KIS category	KIS category hours
Lecture	30	Scheduled	50	Lecture		Scheduled	
Seminar	10			Seminar			
Tutorial				Tutorial			
Project Supervision				Project Supervision			
Demonstration				Demonstration			
Practical classes and workshops				Practical classes and workshops			
Supervised time in studio/ workshop	10			Supervised time in studio/ workshop			
Fieldwork				Fieldwork			
External visits				External visits			
Tutor guided independent learning		Independent	50	Tutor guided independent learning		Independent	
Student independent learning	50			Student independent learning			
Placement		Placement		Placement		Placement	
Study abroad				Study abroad			
Work based learning				Work based learning			
Total workload *200 hours for 20 credit module*	*100*		*100*	**Total workload**			

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Summative Assessment

Sequence *001, 002 etc.*	**Activity type** *indicate **ONE** of the following types:*	**Brief description of assessment (max.120 characters)** *e.g. type/ length of exam, type/ word limit of coursework*	**Weighting** % or Pass/Fail (for grade only components) *Note: % weightings should add up to 100% for module overall*	**Final assessment**		**Anonymous submission**		**ESAF submission**	
				Yes	*No*	*Yes*	*No*	*Yes*	*No*
001	EXAM (Written examination)	Mid Term Exam (120 min)	50%	☐	☒	☐	☒	☐	☒
002	PRE (Presentation)	Group project Final presentation (20 min) Final report (3000 words)	50%	☒	☐	☐	☒	☐	☒

Reassessment (specify either synoptic or non-synoptic)

Synoptic reassessment *One form of reassessment that tests all module learning outcomes*	Yes	☒	No	☐
Non-synoptic reassessment *Where module referred overall, individual failed components of assessment are reassessed*	Yes	☐	No	☒

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Date of FPARSC Approval	Click here to enter a date.

Date of entry onto SITS	Click here to enter a date.

LOG OF CHANGES POST-APPROVAL

Please indicate any changes to the approved module descriptor from 2012/13 onwards

Section No.	Brief description of change	Date of Approval	Semester and year of first implementation
		Click here to enter a date.	
		Click here to enter a date.	
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Appendix 1

Indicative Reading for PFNA alignment approval only *(to be completed only if e-reading list unavailable at point of alignment approval)*

N.B. This outline indicative reading list will be utilised for approval purposes only, and **a full e-reading list must be produced and available by the June of the academic year prior to the first delivery date of the module** (at which point the section of p.2 referring to University Library Reading Lists should be completed).

Please list below essential key text underpinning the module content and ultimately the learning outcomes:
1) Shigley's Mechanical Engineering Design, Richard G. Budynas and J. Keith Nisbett, 11th Edition, 2021
2) Machine Design An Integrated Approach, Robert Norton, Prentice Hall, 2008